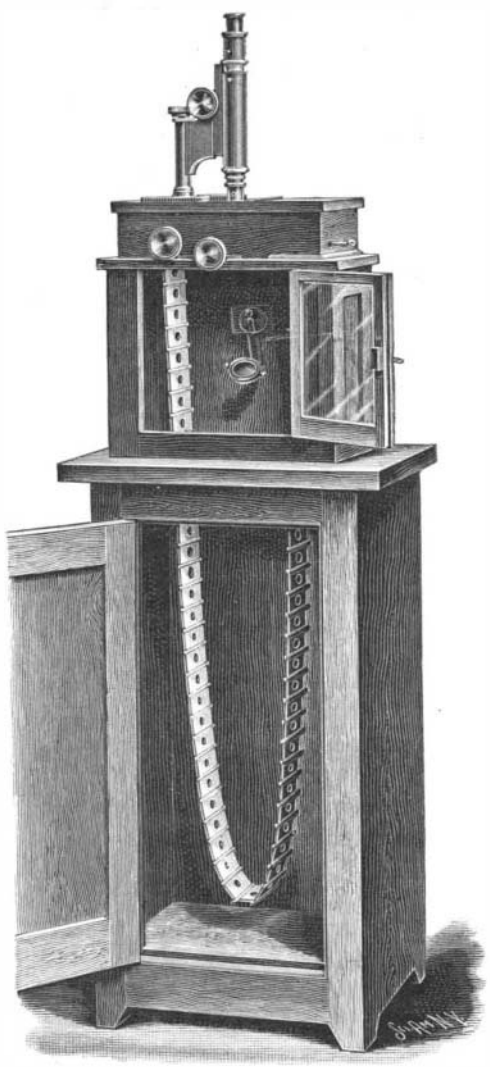
THE CLASS MICROSCOPE.

The question of the exhibition of microscopic objects to classes and the general public is an interesting and important one, and the subject appears to have been thoroughly examined by Dr. James M. Flint, U. S. N., one of the Curators of the Smithsonian Institution, who has given the results of his studies in the Report of the National Museum for 1896. He has devised several plans for exhibiting microscopical objects not requiring the use of very high magnifying powers. The instrument shown in our first engraving is in use in the National Museum, and it was made in



MICROSCOPE FOR EXHIBITING ORDINARY MOUNTED OBJECTS.

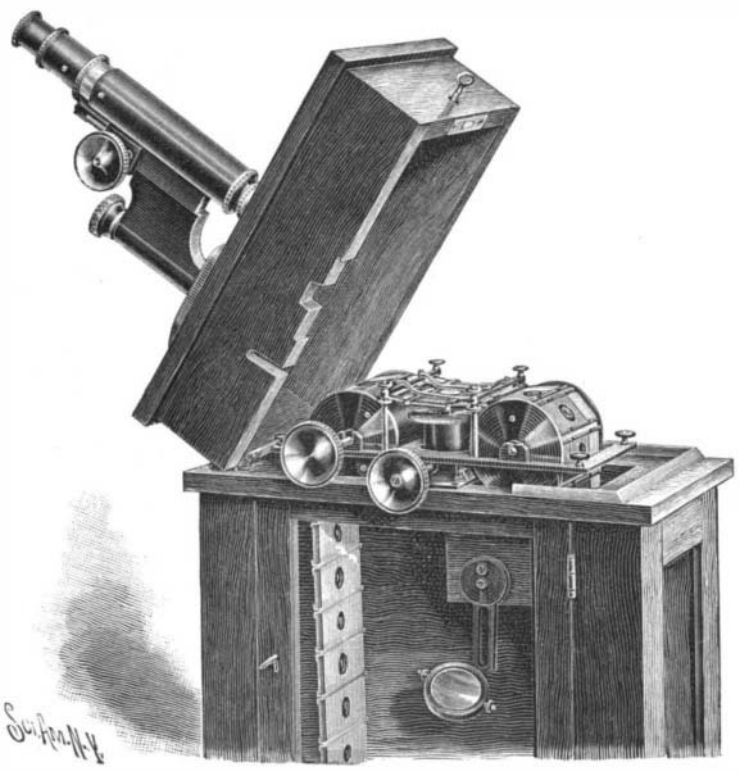
the year 1890 and has been modified in a few details since, and has successfully endured manipulation by thousands of inexpert hands—of children as well as adults—without injury, and this without attention or supervision of any kind.

The instrument was devised for the special purpose of exhibiting to the public a series of foraminifera—minute marine shells. These shells are mounted on concave brass disks having short stems which may be inserted in holes in the rotary stage. There are five concentric rows of holes in the stage, which is 15 inches in diameter, allowing the exhibition of two hundred and forty-two separate mounts. Illumination is increased by the use of a parabolic reflector adjustable beneath the plate glass cover of the box, just clear of the mounts. The stage is rotated by means of a friction roller placed beneath the stage and controlled by the milled head represented at the left in the illustration. The other milled head operates a slide upon which the stage is pivoted by means of a rack and pinion. The objective in actual use is a 2-inch, that being found sufficient for the purpose and more easily manipulated by the laity than one of high power. Much higher powers might be used, however, the only limit being a sufficient working distance to allow the mounted objects to pass freely under the objective. For the exhibition of translucent objects the only modifications of the instrument necessary would be the enlargement of the perforations in the rotary stage, the mounting of the objects upon small squares or circles of glass, and the adjustment of a mirror beneath the stage.

For the purpose of exhibiting a series of preparations mounted in the usual way upon glass slips, or slides, an entirely different form of apparatus has been devised. An indefinite number of slides from ten to a hundred are attached to an endless band of linen by means of thin brass holders which allow the slides to be changed when desired. This linen band passes over two rollers mounted upon a light brass frame which occupies the place of the stage of an ordinary microscope; the loop of the band carrying the slides hangs free. One of the rollers has a projecting pivot with a milled head, by which it may be rotated, and the two rollers are connected by a narrow belt at each end. As the rollers are made to revolve, the band carrying the slides passes horizontally under the microscope they rest upon the two narrow belts and are kept at a definite distance from the objective of the microscope by means of two guides which press upon the slides from above. The brass frame rests upon a grooved bed-plate, which permits of a lateral movement of the frame. This lateral motion is controlled by a screw operating by a second milled head in convenient proximity to the one giving a to-and-fro motion. As in the other instruments, the specimens, and nearly all the parts of the mechanism, are inclosed in a box secured by a lock, the only exposed parts being the microscope and the two milled heads controlling the motion of the slides. The advantages of this form of the apparatus are that the usual glass slides as used by microscopists, which are three inches long by one inch wide, upon which microscopic objects are usually mounted, may be used, and specially that the focal distance is not disturbed by difference in thickness of the glass slides.

It will be noticed that there is a glass door at the upper part of the case which allows the light to pass to a mirror which reflects the light upward exactly as with the ordinary microscope stand. The usual rotary diaphragm is placed between the rollers which carry the band. It may be worth while to mention a device to prevent injury to the instrument from violent twisting of the milled head which controls the lateral movement of the frame after the frame has brought up against the stages in either direction. This is effected by slightly tapering the pivot of the screw governing the movement and attaching the head by friction only, the amount of friction being regulated by a set-screw in the end, so that before a dangerous strain can be put upon the slides, the head turns harmlessly upon the pivot. In this instrument, as in the one first described, the magnifying power which may be used is only limited by the working distance of the objective. Since the upper surface of each slide is held at definite and unvarying distances from the objective, the only allowance that would have to be made would be for the difference in thickness of the objects, cover glasses, and cement rings; so that objectives of the classified scale of ¼ or ⅛ inch might be used without difficulty by those accustomed to the manipulation of a microscope.

The only disadvantage which the instrument labors under is that the mechanism is somewhat more delicate and complicated than in the other one where the slides are arranged on a circular disk. Microscopes copied from the originals have been in use for several years and no difficulties have been found in the way of their perfectly successful operation. We are indebted to Dr. James M. Flint, of the Smithsonian Institution, for the photographs from which our engravings are made.



DETAILS OF MANIPULATING DEVICES.

Bats in Burmese Caves.

Interesting caves exist at Hpagat, twenty-six miles up the Salween, from Moulmein. They are hollowed out in the base of an isolated limestone hill about 250 feet high, rising precipitously from the river. Capt. A. R. S. Anderson, the surgeon-naturalist, gives an interesting account of these caves in an Indian government report which is abstracted by Natural Science. The entrance is about 12 feet high and is much ornamented by Buddhistic sculptures. As the sun was setting the party took their stand on the sand-spit facing the entrance of the caves and soon saw a pair of falcons leave their perch on the trees and fly to and fro over the river. They were speedily joined by other birds, including common kites and jungle crows, and the entire flock, to the number of sixty or a hundred, flew to the entrance of the caves, close to which they remained wheeling about in midair. A few minutes later the bats began to issue in ones and twos, and were soon pursued by the birds of prey, but appeared to have no great difficulty in eluding capture by their rapid and jerky flight, and their pursuers made no very determined or long-sustained efforts to capture them, but soon returned to their vigil over the cave. A minute or two passed and a sudden rush of wings was heard, and the bats were seen to emerge from the cave in a dense stream which slowly became more and more packed, and continued of about the same density for some ten minutes and then gradually thinned away, until, at the end of twenty minutes, the last had emerged. The stream of bats when at its maximum was ten feet square, and so dense as to closely resemble smoke pouring from a chimney in a gale of wind. This resemblance was increased by the slightly sinuous course pursued by the bats as they flew off into the afterglow. They were so densely crowded that they frequently upset each other and fell helplessly into the river below, where they succeeded in reaching the bank only to fall a prey to the expectant crow. When the great rush occurred the falcons, kites, and crows entered the stream of bats and, flying along with it and in it, seized as many bats as they required for food. Capt. Anderson, by throwing his walking stick into the stream of bats, obtained six specimens. During the last twenty years the bats appear to have considerably diminished in numbers, owing to the depredations of their bird enemies and to their constant disturbance by collectors of bat manure.

CLASS MICROSCOPE ARRANGED FOR EXAMINING FORAMINIFERA.

A Scientific Excursion to Alaska.

Early in May a party of scientific men will be taken to Alaska as the guests of Mr. Edward H. Harriman, of New York. The party will go by special train to Seattle, thence making the inside passage to Sitka; from there the ship goes to Cook's Inlet and around Kadiak Island. A vessel will be chartered and will be equipped for the needs of her scientific passengers. A large complement of guides, packers, etc., will be provided, enabling any member of the party who wishes to leave the ship and explore inland on his own account. Among those who will take part in the expedition will be Prof. Prichard, of the United States Coast Survey, Prof. Coville, of the Department of Agriculture, Prof. C. Hart Merriam, of the Smithsonian Institution, and Prof. William Trelease, of the Missouri Botanical Gardens. The American Museum of Natural History will be represented by Frank Chapman and John Rowley, the Field Columbian Museum by Daniel G. Elliott, Amherst College by Prof. Emerson, Leland Stanford University by Prof. Gilbert. Messrs. R. Swain Gifford and Louis Agassiz Fuertes will go with the expedition as artists.

Messrs. Tiffany & Company have succeeded in making a crystal ball 5½ inches in diameter from an American quartz crystal taken from the Old Green Mountain Mine, in Mokelumne Hill, in Calaveras County, California. This is the largest perfect ball that has ever been made of American quartz crystals and is valued at $3,000. The largest Japanese ball ever brought to this country was 7½ inches in diameter. It is not, however, entirely free from flaws.