Blatchley is an old-time naturalist, a real naturalist in the broadest and best sense, as were Gilbert White, Rafinesque, Darwin, Agassiz, Audubon, Coulter and David Starr Jordan. They knew animate and inanimate nature as they saw her in the open. And so it was that Blatchley, being a naturalist and a philosopher, wrote so interestingly about the animals and plants which he saw in his Nature Nook near Dunedin. He tells the story in the form of a diary, in which he records from day to day his observations, his interpretation of their meaning and his philosophizing about the relations of plants and the lowly animals and human beings. The three hundred pages of this book are filled with fascinating accounts of the interesting habits of many of the animals and plants of the region.

Dr. Blatchley is primarily an entomologist, but he is more than that; he is also an excellent botanist and knows not a little about birds, mammals, reptiles and shells. His style as a writer is delightful, reminding one of Thoreau and Bradford Torrey. "My Nature Nook" is one of the most fascinating of recent nature books and should have a large sale.

BARTON WARREN EVERMANN

SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN APPARATUS FOR COUNTING SAND GRAINS

THE counting of sand grains is destined to play an important part in the analysis of sediments. In the past grain counting has always been done with the naked eye or under the microscope, but either of these methods requires much time and patience. The following apparatus, based on principles used in seed-counting devices, was designed to afford a quick and accurate method of counting rock particles.

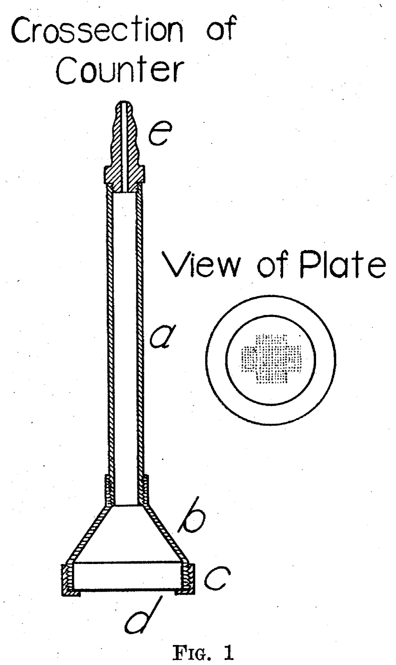


FIG. 1

The apparatus consists of a brass tube, a, having an inside diameter of ½″ (1.27 cm). A small brass nozzle, e, is screwed in one end to facilitate the attachment of a rubber hose. At the other end is a funnel shaped brass cup, b. A clamping ring, c, fits onto this cup and clamps a thin brass plate, d, to it. This brass plate contains a definite number of small holes which must have smaller diameters than those of the particles to be counted.

A rubber hose is connected to e and attached to a filter pump or other suitable suction apparatus. The instrument is then ready for use. When the plate is brought in contact with dry sand grains whose intermediate diameters are larger than those of the holes in the plate, a single grain is attracted to each hole and held there by suction. In practise this suction must be regulated so that it is not too strong, otherwise a miniature mound of sand will be held to the plate. It has also been found necessary to blow gently over the face of the plate or to use a small brush and needle to distribute the grains evenly. A few of the holes will hold more than one grain, and a few will not hold any, but holes that do not hold grains are balanced by those holding more than one, so that the resulting maximum error averages less than 2 per cent. for the count. With careful manipulation of small brush and needle even this error can be eliminated. A 300-hole plate drilled with a No. 80 twist drill (about .333 mm) gives satisfactory results for the .50–.35 mm grade size.

The following table shows the results obtainable with the above-mentioned type of plate. The time required to count 10,000 grains was about an hour.

Kind of fragments	No. by 300 grain capacity plate	Weight of 300 grains	Weight of 3,000 grs. by counter	Computed weight of 3,000 grs.	Difference	Per cent. of error.
Oolitic sd.	301	.0505 g.	.4910 g.	.505 g.	.014 g.	2.8
St. Peter sandstone	302	.0345 g.	.3441 g.	.345 g.	.001 g.	.03
Beach sd.	304	.0310 g.	.3009 g.	.310 g.	.009 g.	2.5

The seemingly large percentage of error for the oolitic sand is not due to lack of efficiency of the instrument, but to the range in specific gravity of the oolites. The error for the beach sand is due to the heterogeneous character of the material both in respect to shape and specific gravity of the particles.

This apparatus enables a rapid, accurate method of counting sand grains. The limiting factor is the size of the holes that can be drilled. The smallest drill I have been able to obtain has been a .004″ (.10 mm) jeweler's drill, which is extremely delicate and breaks easily. A small 25-hole plate made with this size drill worked well for the ⅛ mm grade size. A larger plate has not yet been attempted. For grains larger than ½ mm the punched brass plate made by the Harrington and King Perforating Co., Chicago, worked satisfactorily. Smaller diameter holes must be drilled by hand, or may possibly be made by means of the x-ray.

Although this instrument was made for counting sand grains, it can be applied for counting small particles of other types.

J. E. Appel

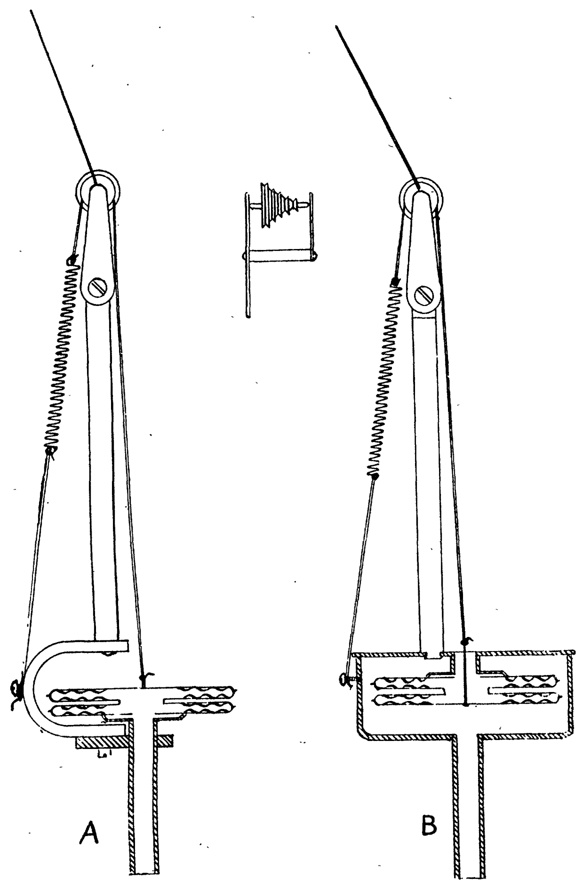
Department of Geology,
University of Chicago

A UNIT FOR KYMOGRAPH RECORDING[1]

The rubber membrane of the Marey tambour is the unsatisfactory feature of the usual method of pneumatic recording. If it is delicate it must be replaced frequently and it is difficult to calibrate if calibration is important.

This pneumodeik (Fig. A) replaces the Marey tambour. The essential part of this recording unit is a quadruple, corrugated, very thin phosphor-bronze diaphragm, 4 cm in diameter, such as is used for airplane instruments. The diaphragm is attached to a horizontal rod at the end of which an aluminum pulley-cone is mounted on needle-point bearings. A light silk thread is fastened to the front disc of the diaphragm, passed round one of the pulleys and brought back on the other side of the rod where it is fastened to a delicate steel spring, the tension of which can be regulated by a thumbscrew attached to the mounting. A thin stylus of bamboo is glued to the broader base of the pulley-cone and tipped with a glass filament or a tiny bit of photographic film. The deik can be constructed at a cost of from 10 to 12 dollars.

The rubber tube conveying the pneumatic impulse is attached to a metal tube leading directly to the diaphragm. When the diaphragm is displaced by the air pulses, the thread rotates the pulley-cone; the diameter of the pulley selected and the length of the stylus determine the amplification. As the pulley can be



made to slide easily under the thread, it is possible to shift the position of the stylus while it is writing on the drum. The writing stylus may be replaced by a small mirror and a beam of light recording on a moving photographic strip.

A useful modification of the pneumodeik (Fig. B) responds to changes in negative pressure. Muscular contraction can be conveniently recorded by applying to the surface over the muscle a light celluloid cup two or three cm in diameter with a light rubber tube leading to the deik. A simple aspirator connected by a Y-tube holds the cup in position by a negative pressure of c. 30 cm of water. No other attachment to the moving limb is necessary. Variations in the negative pressure caused by the bulging of the surface are easily recorded by the deik and furnish an accurate tracing of the muscular contraction at all speeds of movement.

The inertia of the moving parts of the deik is small, the system is under slight tension, and the rate of transmission is approximately that of a low sound wave. Tests show that the lag is less than .01 second, which is below the limit of error for ordinary kymographic work. The natural frequency of such a system is from 50 to 75 per second and is well damped

[1] Acknowledgments are due to Mr. B. J. Smyth, the Oberlin mechanician, who worked out the details of the design.