

Nature's Geometric Workmen

Microscopic Animals That Lay Down Stone Skeletons of Amazing Form

By William Butterfield

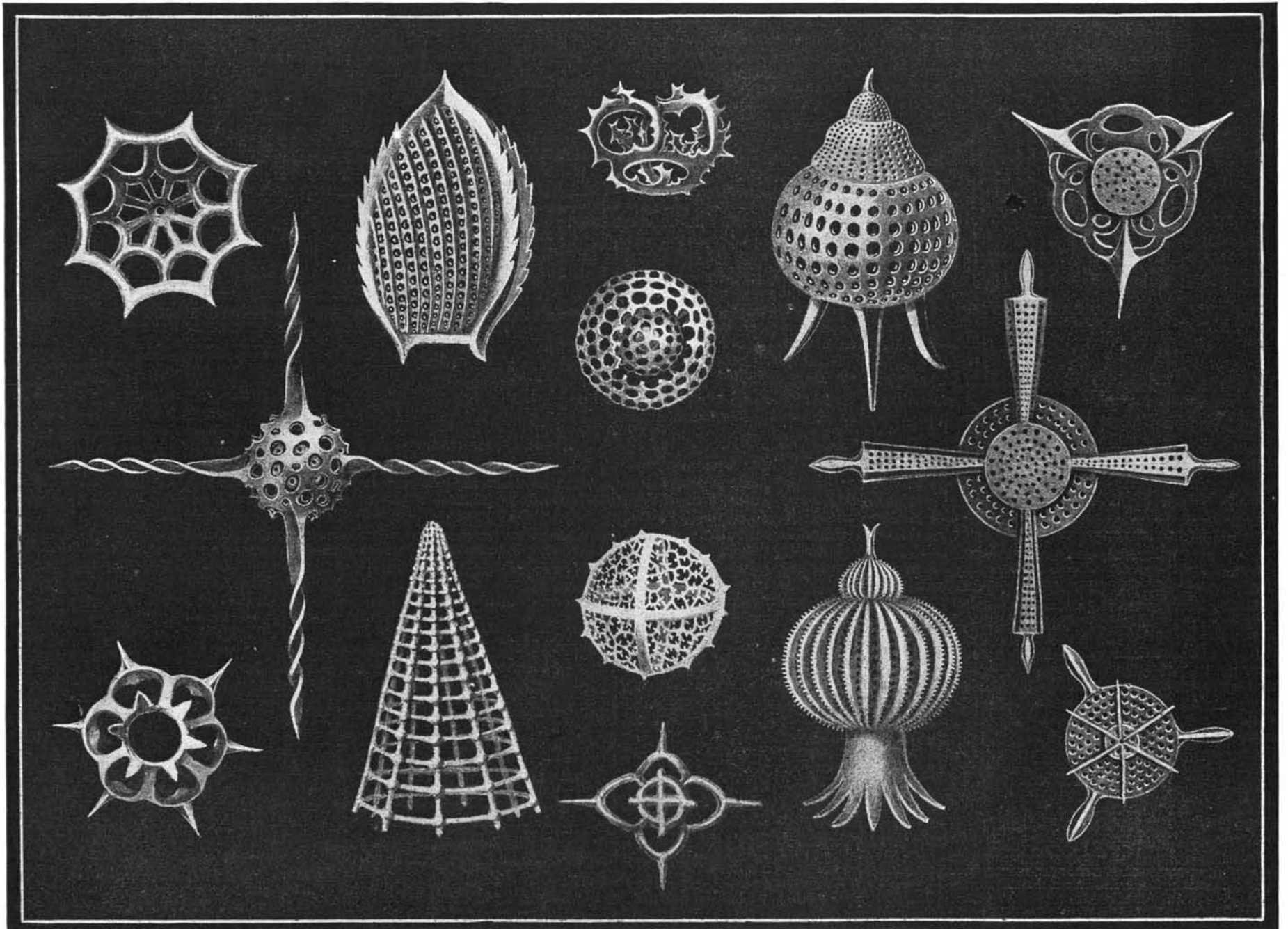
MOST of us have admired, in the specimens of Chinese carving that have come under our observation, a piece of ivory cut in such a manner that series of beautiful perforated balls are produced, the lesser fitting within the greater; indeed, men of all countries for centuries have admired the genius and dexterity of John Chinaman in producing such artistically puzzling results. And so has the world marveled at the skill and patience of the workers of all nations; their exquisite carvings on wood, metal or stone; their intricate scrolls and patterns on reticulated mountings for paintings, jewels and porcelains; their buildings, monuments, machines and other complicated creations—all attesting to the persistent in-

and, during the processes of development, each individual provided itself with a silicious or transparent glass skeleton of insoluble properties. These skeletons, as the creatures died, fell to the ocean floor where their bodies soon disintegrated. The insoluble skeletons, however, in time formed deposits hundreds of feet in thickness—in the island of Barbados these remains have a thickness of 1,100 feet, while the whole island is composed of about seventy-five per cent of these skeletons. In the course of ages the deposits were converted into stone, and after other ages raised, by the tilting action of the earth's crust, to become dry land.

That "animals" can by any imaginable process of

as in a matrix, the insoluble objects it has covered and surrounded. A common form of this kind of stone, usually found in boulders, is "pudding stone" composed of pebbles cemented together in the manner described.

Remarkable, and, as we shall have to say, minimizing to the vaunted industry of man, this geological history-making is not the most extraordinary peculiarity of this particular group, for there are other microscopic stone-building animals and plants that have contributed to a far greater extent in the recent geological formation of the earth—of which the writer will have something to say in following articles—yet to introduce this peculiarity we must introduce the animal, and of



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Typical forms of the Polycystina whose aggregated skeletons constitute the foundation of the island of Barbados

dustry of man as a group, yet, like the crystals of frost on a window pane, created with slight lasting practical service to creation.

Whereas the Nicabar Islands and the island of Barbados stand as permanent monuments to a far more persistent, and as skillful, industry of another group of nature's artisans, but so small that a million individuals will not fill a lady's thimble. These minute creatures worked throughout their whole existence to play a most *lasting* important part in the great plan of creation. They belong to nature's creators, man to the destructionists. They created islands that man may decimate or destroy them.

These tiny creatures lived in the ancient seas where they absorbed the flinty matter suspended in solution,

nature have anything to do with the ultimate formation of stone will be a new thought to many, while the assertion that the skeletons of such minute animals are, during the development of the earth, accumulated in sufficient numbers to form stone from which islands are composed, seems perhaps incredible at first thought.

Proof is in the stone, however, where the skeletons form the major part of its substance, held together by crystallized carbonate of lime. Liquid carbonate of lime is brought to the surface of the earth in the warm waters of thermal springs, thence into the waters of lakes and seas. Here constant sedimentation is continually going on, as the waters become overcharged with lime. This sediment crystalizes, binding together,

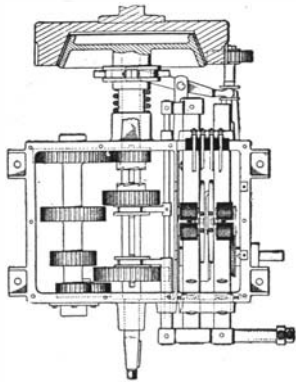
course say something of its position in the catalog of natural phenomena. Such ancient deposits are known as fossil deposits, the skeletons as fossils, and the Barbadian and Nicabar groups are still commonly called by their original scientific name Polycystina. These fossils are progenitors of a present-day more attractive living group, inhabiting all zones of the oceans, from the surface to a depth of five miles. It was not until the introduction of the microscope, however, that Polycystina was known, and the great new kingdom revealed by this instrument cleared so many of the dark "mysteries of the universe"—confined by inexperience to the affairs of our earth alone—and so radically upset the accepted theories of the time, that a perpetual war has

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RECENTLY PATENTED INVENTIONS

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ELECTRIC GEAR SHIFTING MECHANISM.—A. P. RIEDELE, 216 Fourth Ave., S. E. St. Cloud, Minn. An object of the invention is to provide a device which will prevent the stripping of the teeth of gears when the latter are shifted. A further object is to provide an electric



A PLAN VIEW, CERTAIN PARTS BEING SHOWN IN SECTION

device for shifting gears which may be set for certain speeds so that when the main clutch is thrown out and the load is taken off from the gears the latter will be shifted to produce the proper speed when the main clutch is again thrown in.

VENDING MACHINE.—F. M. HUME, 8964 118th Ave., Edmonton, Alberta, Canada. The object of the invention is to provide a machine especially adapted for vending packaged goods, wherein a plunger is provided for ejecting the package, and a coin released lock for preventing the movement of the plunger until released by the insertion of a coin, and a follower for moving the packages beneath the plunger operated by the movement of the plunger to advance the package.

OIL WELL PUMP.—R. B. THURSTON, Box 305, Oil Center, Cal. The invention more particularly relates to apparatus for actuating the plunger rod of oil well pumps, the object being the provision of means which will automatically permit of vertical creasing of the plunger of the pump in the plunger casing or working barrel, and in this way avoid certain disadvantages in operation to which pumps and their connections are subject.

MECHANISM FOR ROTATING EARTH-DRILL BITS.—W. NIPPERT, Vernon, Texas. The invention relates to mechanism for rotating drills in a cable rig in which a jig or up and down motion is given. An object is to provide a drilling mechanism in which the drilling operation will be performed solely by the weight of the drill stem. Another object is to provide mechanism which shall by rapid reciprocal rotation of the drill cause a round hole to be made, and to prevent packing up the walls of the well.

COMBINED SCREEN AND ELEVATOR.—E. E. CARPENTER, 3152 Lewiston Ave., Berkeley, Cal. The invention is especially intended for elevating and screening ores, the object being to provide a screen adapted to have delivered thereto the material from a tube mill or ball mill, or other grinding machine, and arranged to carry upwardly such of the material as shall not have been reduced sufficiently fine for further treatment, and whereby the coarse material may be returned to the mill or grinding machine.

ENGRAVING MACHINE.—B. R. CORLEY, care Turner Bros., 409 Pearl St., Brooklyn, N. Y. The object of the invention is to provide an attachment for an etching machine whereby the operator is enabled to accurately space letters, numerals, signs or other characters irrespective of their width and shape. In order to accomplish the result the work bed, carrying a coated plate, is mounted to slide sidewise under the engraving needle and a spacing device is connected with the work bed.

ADJUSTABLE SPIDER CHASE AND LOCKUP FOR PLATEN PRINTING PRESS.—E. KARL, 20 West Main St., Litchfield, Conn. The object of this invention is to eliminate furniture, quoins, and waste of time in locking up forms for printing. The device includes side bars comprising pairs of spaced members, upper and lower form bars mounted between the side bars, stay bars slidably mounted between the members of the spaced bars and adjustably engaging the outer edges of same, and adjustable locking means carried by the upper form bar, and engaging the opposite ends of the stay bar.

Musical Devices

INSTRUMENT ATTACHMENT FOR PIANOS.—D. CRINO, 116 First Ave., New York, N. Y. Among the objects of the invention are,

to equip a player piano with auxiliary accent monotone instruments to install the auxiliary instruments in mechanically played musical instruments of usual make, to provide means for manually controlling the use of said auxiliary instruments, and to employ the instrumentality used for actuating the usual mechanically played musical instrument for at will playing auxiliary accent instruments.

Prime Movers and Their Accessories

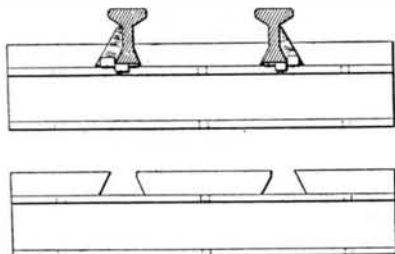
OSCILLATING PISTON ENGINE.—N. PAVIA and G. CASALIS, Turin, Italy. The invention has for its object to produce an engine which is compact, simple, inexpensive, and durable, and in which no residual of the burnt gases remains; the charge is pure and not so high in its temperature, not being mixed with residual gases; a long expansion is permitted; the distribution is made by the pistons without any valve or supplementary organs under control.

SUPERHEATING MANIFOLD.—J. G. LAWSHE, Flemington, N. J. The invention relates to internal combustion engines such as are used in automobiles and similar vehicles, its object is to provide a superheating manifold arranged to supplement the usual explosive mixture with a superheated charge of air or steam or both to enrich the explosive mixture and thus render the same more forceful.

DECARBONIZER AND GAS SAVER FOR INTERNAL COMBUSTION ENGINES.—M. PRZECZALSKI, 423 W. 42d St., New York, N. Y. The invention has for its object the provision of an attachment for preventing deposit of carbon on the cylinders of an engine. A further object is an attachment for an internal combustion engine connected with the accelerator pedal for adding to the explosive mixture auxiliary air and steam or water in addition to the air supplied to the mixture by the carbureter.

Railways and Their Accessories

RAILWAY TIE AND FASTENER.—W. H. WILD, 1905 E. 10th St., McKeesport, Pa. One of the principal objects of the invention is to provide a rail fastening device in which keys are utilized in securing the rails in place, fasteners being employed for preventing displacement of



SHOWING SIDE ELEVATIONS OF THE TIES AND FASTENINGS

the keys. Another object is to provide a device which may be easily and quickly put in operation, the construction being such that the fasteners may be removed when desired to allow of replacement of the rails.

RAILWAY TIE.—J. R. DOOLEY, W. Hazel 5 S. Springfield Ave., Mobile, Ala. The invention has for its object to provide a tie and means for securing the rail thereto. The device combines a concrete tie section having an under-cut recess, a cushioning block secured in the recess having channeled sides, and rail-securing devices fitting in the channels of the sides of the cushioning blocks and having hooks to extend under the blocks and over the rail flanges.

Pertaining to Recreation

TOY BOAT.—O. E. WALL, Box 648, Honolulu, Territory of Hawaii. The invention has for its object to provide a toy boat of the submarine type wherein propelling mechanism is provided and approximately horizontal vanes or rubbers are provided for causing the boat to drive or rise in the water, wherein the propeller is spring controlled and the vanes are controlled by the same spring, when under tension holding the vanes in driving and when relaxed permitting them to move into rising position.

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MUNN & CO., Patent Attorneys
233 Broadway, New York, N. Y.
Branch Offices: 625 F Street, Washington, D. C.
801 Tower Bldg., Chicago, Ill.

Food versus Feed

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but even for this purpose it has not been successfully marketed in large quantities, because alone it lacks the finely divided fat which in cooking gives the milk a shortening value, and which enriches and makes more palatable the cooked or baked food product. The use of pure fat for shortening is not the best method of introducing this element into cooked foods, because it tends to soak in and mass the other ingredients. It has long been recognized that rich milk or cream is better for cooking because the fat in milk or cream is so finely divided that it mixes more readily and evenly than does pure fat, such as lard or cooking oils. Therefore, one of the essentials to the successful marketing of this great amount of now wasted food is the addition of fat.

Great advances have been made in recent years in food chemistry, particularly in the matter of developing vegetable-oils as substitutes for animal fat. Corn, cotton-seed, peanuts and many other vegetable products are now used for the manufacture of cooking oils, and cocoanuts have been found to make a superior grade of vegetable oil. Chemists have discovered a process by which the fat pressed from the clean white meat of the coconut and highly refined can be emulsified or combined with skimmed milk, thus restoring its food balance and value as a cooking ingredient. This combination, when condensed or evaporated and canned, will keep indefinitely, and can be used as a substitute for whole milk in all cooking operations.

Not long ago, in an effort to save some of the skimmed milk fed to stock and render it available for human food, the Department of Agriculture conducted a cottage cheese campaign, and under the direction of the home demonstrators throughout the country, taught the women of the dairying communities how to make and market cottage cheese. The campaign was quite a success, and in some communities the daily consumption of cottage cheese rose from a few hundred pounds to many thousands, and a great deal of the milk formerly thrown away was thus saved for cheese making. If this campaign of education can be continued, and the demand for cottage cheese and synthetic foods stimulated, our food resources would be very materially strengthened.

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been waged for more than a hundred years between the theorists and the microscopic investigators.

When the study of Polycystina had become a vogue—and it had a very large vogue in the early days—the regularity with which facsimiles of the ivory ball carving of John Chinaman was simulated in pure white transparent glass by certain species of these animals was confusing if not altogether puzzling to these early observers. Their literature always referred to the ivory balls in describing the beauties of Polycystina. But it was soon found that the animals had not confined themselves to producing the original ivory ball design alone, but had produced a multitude of forms; balls within disk-like boxes of the most beautiful lacy reticulated patterns; some with star-like projections, others with spear shaped spines, and still others with delicate spines with twisted flutings; indeed, there seemed no end to the fantastic notions of the various species. So aggravatingly interesting did this make the creatures that in a short time tons of Barbadian rock were distributed in small pebbles over the civilized globe for the ostensible purpose of study. Indeed, the island has since become the most densely populated island in the world, although human kind no longer have much interest in Polycystina.

It was not until the British sea-exploring ship "Challenger" brought home its deep-sea treasures that the microscopical world was again startled by a second appearance of Polycystina, this time represented by specimens of living forms but under the name of Radiolaria. So vast were these collections of the animals, that their classification, description and illustration occupied Professor Haeckel—with the assistance of other scientists and of illustrators—more than ten years. The result is three immense volumes, with 140 plates, showing 739 genera and 4,318 species, for this one report; while Haeckel assures us it would take a lifetime to work out in catalog-manner all of the forms of living Radiolaria.

Radiolaria, with their predecessors Polycystina, have, we see been honored by two separate investigations that have brought each into the limelight of popular interest. And, although it is true that other groups of microscopic animals and plants have had their vogues, it is also true that Radiolaria are as universally popular with all classes of observers today as they have ever been. The extreme beauty of the Barbadian group made them in the early days, when the microscope was less perfected than it is now, easily the most popular of microscopic fossils. So was it with the investigations of Haeckel, spurred on by the study of our Alexander Agassiz, resulting in the voluminous report for the "Challenger." More than this Haeckel places this group among the highest of the protozoa, of which it is a class, and therefore gives to it racial supremacy. Observers, nevertheless, have been primarily interested in the startling magnificence of their skeletons, later by a vague though none the less drawing attraction which is not at first easy to explain.

During the making of the drawings for the Haeckel investigations something of this mysterious attraction was made clear, that is, it was evident to the draughtsman, who consciously or unconsciously developed exceptional skill in the execution of graceful geometric forms. The copying of the skeleton was bringing forward his greatest talents. Beginning as a noted and exceptional draughtsman—and none but an exceptional man can draw these beautiful forms satisfactorily—he was forced to excel himself. Here before him was an endless aggregation of geometrical combinations, more perfect, more insinuatingly complex, more interestingly attractive than any group that he had been called upon to illustrate. Nature had provided these animals with a faculty to fashion their skeletons with perfect geometric precision. How? That was the question. It is a tribal characteristic. Why? Here lay the crux of interest in these animals for all studious observers, and the draughtsman of the 140 plates for the "Challenger" Report came nearer to understanding its pulling mystery than any other man.

How to Get the Most Out of a Motor Truck

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operating the truck should familiarize himself with these points where slight friction comes, and see that they receive the attention which they require as the number of such bearing points vary with all trucks.

It is essential for the proper care and maintenance of any truck that the following maintenance routine schedule be adhered to, with such modifications as the truck design demands. Preparedness for emergencies can only be obtained by keeping the truck in excellent condition, and this necessitates proper adjustment at regular intervals of time.

Daily Routine

Engine: Examine all wiring terminals for tightness. Clean magneto externally.

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