New and Interesting Facts from Science and Life

Is THIS How PYRAMIDS of EGYPT Were BUILT?

A Modern ENGINEER'S THEORY May Solve HISTORY'S Great MYSTERY

HOW were the pyramids of Egypt built? By what means were the enormous blocks of stone, each weighing many tons, hauled into position up to nearly 500 feet above ground level? This is a mystery thousands of years old, which is still more or less of a puzzle and the solution of which is still today engaging the serious attention of modern engineers.

Engineers of the 20th century with their modern high-powered cranes could run up a structure like one of the Egyptian pyramids with comparative ease. But the Egyptians had neither cranes nor mechanical motive-power to run them. They did have ropes and plenty of men to pull. How, with a great multitude pulling on ropes, may be explained the raising of great blocks of stone to a height of 500 feet? The usual explanation is that the stones were hauled up inclined planes, or ramps, of earth, built gradually higher as the work progressed.

An engineer of the Orient has a new theory as to how the pyramids were built, which he sets forth in a journal called the Indian and Eastern Engineering, published in Calcutta. He says that the polished coating of the pyramids, now generally torn away, was not only an ornament but an aid to construction, and that the big stone blocks were caused to slide upward on this by means of ropes passed over rollers at the top. He believes, from what he knows of the mechanical abilities of the Egyptians and of the way in which they solved similar constructional problems, that this is far more likely than the use of huge earthen ramps.

Another theory is that the great stones used in the construction of the pyramids were rolled to the place of building and lifted into place by the devices pictured in the two accompanying illustrations reproduced from illustrations of Power, by courtesy of the Continental Motors.

"In examining the pyramids," says the Oriental authority, "the problem which has always confronted the engineer has been the method of their construction. It is one of the peculiarities of Egyptian archeology that among the many thousands of specimens of sculpture work on stone, depicting every possible aspect of early Egyptian life and many historical events, which have been excavated, not one has come to light depicting any phase in the construction of the pyramids—one of the most colossal works ever undertaken by mankind in that or any subsequent age. There is evidence to prove that the Egyptians of those days had acute intellect and power of geometrical calculation and also a sound knowledge of dynamics as applied to the construction of buildings. The pyramids themselves prove this beyond controversy. But no evidence of any kind has been unearthed to show that they had that profound knowledge of mechanics which would enable the construction and operation of cranes sufficiently large and powerful to swing blocks of stone weighing several tons and place them in position anywhere up to nearly five hundred feet in the air. The absence of such proof is only negative, of course; but, on the other hand, tools of that period brought to light by excavation are of the most primitive kind and altogether inconsistent with the theory that the people who used them had any knowledge of mechanical appliances.

"While several theories have been advanced, none has been propounded which has met with anything like general acceptance. The most popular (if it can be so called) is the earth (or rather sand) ramp theory, which propounds that as one row of blocks of stone was laid, from the foundations upward, an inclined plane of sand was constructed around all four sides until it was level with the top of the row. Up this inclined plane the blocks of stone for the next row were hauled, and when positioned the sand-ramp was lengthened and heightened to the top of them, blocks for another row hauled up, and so on and so on. In other words, the theory involves a belief that the Egyptians constructed one huge earth mountain to enable them to construct a smaller stone mountain, it being apparent that to get an angle for haulage over soft sand, the approach rise of the ramp would have to commence from nearly a mile away.

"To the writer this idea appears crude in the extreme. Also it gives very little credit to the master-builders of a very extraordinary age."

In explaining his new theory of how the pyramids were built, the writer says that it is known that the pyramids originally had an outer coating of a highly polished substance, very thick and very hard, like modern cement. This cement covering was stripped off the Great Pyramid in 1357 by the Mohammedans, and embodied in the construction of the Mosque of Sultan Hassan, where it may still be seen. In the case of the second pyramid, however, a good portion of the original outer covering still remains at the apex.

The engineer above quoted says that the general assumption that the surface coatings were plastered on after the completion of the pyramids is erroneous. "The smooth cement covering," he goes on to explain, "was put on from the bottom upward as the work proceeded. That is to say, when the first row of stones above the foundations, i. e., above ground, had been positioned, their outer sides were given the cement plastering. Assuming this to be so, the edifice had a smooth glissade of an ever-rising height as each layer of masonry was added. The object of such a method of construction will at once become apparent if we imagine a roller to have been placed at the angle of the flat top and a number of ropes laid over it down the sides.

"When the word 'ropes' is mentioned we must calculate upon long lengths, spliced into cables. The construction of, say, five such fibrous cables, about three-quarters of a mile in length, replaced as worn out, would have been a small undertaking compared with the manufacture of a colossal and totally unnecessary ramp, or huge mountain of sand, the erection and removal of which would have been a titanic operation alone. On one end of those gables would have been hitched a block, already faced and angled, with its smooth side against the cement incline. On the other end, a number of men would have been ranged in lines for hauling.

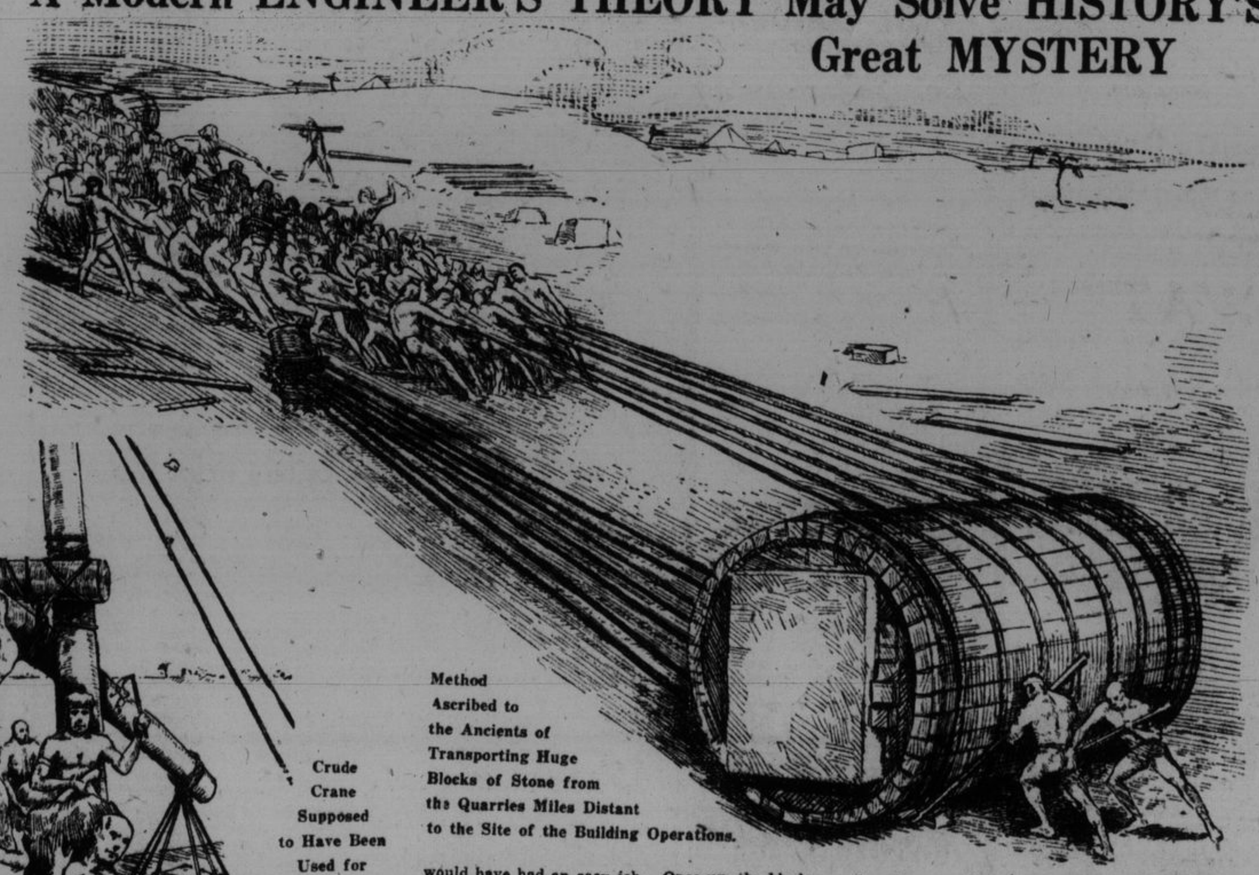
"The number would have been a great one, but history relates that nearly one hundred thousand men were employed in the construction of the pyramids. With regard to the hauling of the blocks into position, therefore, the only limits would have been the length of the cable and of the ridge. In such conditions, 10,000 men divided into five rows of 2000 each, hauling on a 20-ton mass over rollers, against a smooth glissade, would have had an easy job. Once up, the blocks would be hauled to the near side of the haulers, and the process of erection would go on away from them until the glissade was reached, when the latter would be built up to the new level, and work would begin again positioning another row of blocks.

"The theory advanced is supported by several considerations. The modern block-and-tackle system is unquestionably only an evolution of the very plan of handling heavy weights just described. Both the older and the modern methods required a number of parallel ropes or cables to take off and divide the tension of a very heavy weight, without which division the strain on a single strand would be too much. In each method also there is the division of the pulling force between several strands. The principles involved are the same, only the modern power or hand-driven block and tackle is more scientific and less cumbersome than the ancient cables working over rollers. But—and here is the point—how much less cumbersome is this method than the idea of mountainous sand-ramps, first thrown up and then thrown away?

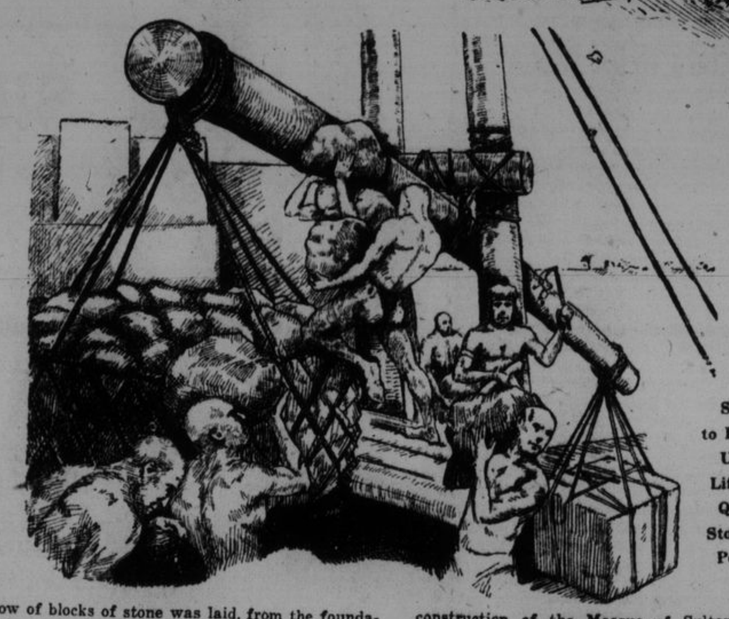
"That the method described was also peculiarly adapted to the science of architecture as then understood in Egypt, is demonstrated by a study of the grand chamber in the Great Pyramid. This chamber is a solution to a problem of statics, apparently founded entirely upon the distribution of forces upon parallel lines, and its method of construction is clearly indicative of the extent to which geometry was utilized by the trained Egyptian architect of the olden days. It is worth while describing how his problem was solved. It is apparent that King Cheops desired two rooms: one larger, a kind of antechamber; the other smaller, the sepulcher for the sarcophagus. It is with the first we are dealing. To make this chamber rectangular in form would, with 200 feet of granite overhead, have been to court disaster. On the other hand, to make it pyramidical in its lateral direction would have completely destroyed the imposing effect of the space. The problem was solved by the science of applied statics and geometry, by shelving each layer of stone inward, to overlap the last along parallel ridges, while a flat roof was preserved by continuing the process until the builder could close it over with single wide slabs of sufficient strength to support the enormous weight above. The angle of incline is along lines parallel with the exterior sides of the pyramid, to enable the pressure forces exerted to be distributed evenly and to be met, and to counterbalance the tendency to cave in. The effect in torchlight, illuminating the deep and settled gloom of the interior of the Great Pyramid, was the desired appearance of a vast rectangular room, fit antechamber to the tomb of a Pharaoh.

"The method followed in the construction of this chamber has been detailed at some length—first, to illustrate the knowledge of applied statics possessed by ancient Egyptian architects, and, secondly, to show the lines upon which the Egyptian mind apparently tended to work.

"It is contended that with all its ignorance of the long subsequent and varied discoveries (?) of Archimedes and Pythagoras, and of our modern use of power-driven metal cables working over blocks and pulleys, the same powers of intellectual and geometrical calculation as are evidenced in the grand chamber of the Great Pyramid were brought to bear upon the dynamical problem of constructing the whole edifice."



Method Ascribed to the Ancients of Transporting Huge Blocks of Stone from the Quarries Miles Distant to the Site of the Building Operations.



Crude Crane Supposed to Have Been Used for Lifting the Quarried Stones Into Position.

HOW HOT or HOW COLD Is the AIR?

WEATHER observations are even more important to an airship than to water-borne craft. Temperature has a great deal to do with the buoyancy of an airship. Here, however, is a paradox; for the aviator, prior to a flight, carefully shades his thermometer from the rays of the sun before reading it, although his airship is going to be exposed to full sunshine.

It is the same paradox that gives rise to indignation in the bosom of the average citizen, explains a writer in Popular Science Monthly, when, at the close of a broiling July day, he reads the official weather report, according to which the highest temperature was only 90. He feels positive it was at least a hundred—and so it was over a sun-baked pavement.

The universal practice of taking air temperatures in the shade is not sheer perversity on the part of the weather man. He would like to be able to answer the question, "How hot is it in the sun?" Unfortunately, this question merely prompts another: "How hot is what in the sun?" A thermometer exposed to the sunshine registers the temperature of the glass and metal of which it is made, not the temperature of the air.

The shaded thermometer registers more or less accurately the temperature of the air, perhaps the most important factor of weather.

An alternative to reading the thermometer in the shade is to whirl it rapidly in the air at the end of a cord. The excessive heat which the instrument absorbs is immediately lost by conduction to the air.

Why Red Means Danger

IT is not just by chance or through custom that red is the color used for flags, lights and other signs which indicate the presence of danger. Red has been definitely chosen for the purpose because it is more conspicuous and shows farther than any other color.

Many hues—such as blue, gray, brown, green and yellow—have a tendency to merge into their surroundings and become almost invisible at a short distance. Hence, of course, the green uniforms of the old days of forest fighting, and the khaki of later years. But red is always distinctly red and stands out from almost any background. White and green are also quite easily seen, but white would be impossible as a cautionary sign, particularly at night, for obvious reasons, while green is handicapped by the excessive use made of that color by nature.

Given lamps of an equal strength, fitted with colored glasses, scientists have found that where the red light would carry three and a half miles, white and green would carry but two and a half miles, yellow one mile and blue, purple and violet less than one mile.

MUSICAL BOTTLES

A VERY good musical instrument may be easily made by hanging eight or more bottles with strings as shown in the accompanying illustration reproduced from the Illustrated World. These bottles are then tuned by putting more or less water into them, as required, to get the right tone.

Bottles Tuned by Water Levels and Hung to a Line Make a Novel Musical Instrument.

Cut-glass tumblers may also be used by placing them on a table and adding water to tune them. These bottles and tumblers are played by lightly tapping them with a small wood hammer.

Newspaper Feature Service, 1921.

SHORTHAND 2000 YEARS OLD

TWO thousand years old, and going stronger than ever! Such is the amazing record of shorthand. How much older it is, who shall say? It is known that Marcus Tullius Tiro, Cicero's slave and secretary, was busily taking down his master's orations in a shorthand of his own invention some 11 centuries before a Norman soldier set foot on English shores. In fact, the world today would know little of Cicero's oratory but for Tiro's ingenuity and industry.

And ever since those remote days shorthand has flourished, with a growing band of devotees which today numbers its millions.

It was not, however, until the days of "Good Queen Bess" that shorthand, as known today, was cradled in England. Then one Dr. Timothy Bright evolved a novel system in 1588, with Peter Bates quick on his heels with another system two years later.

Then came John Willis with his disciples, just in time to take down and immortalize William Shakespeare's plays as they were acted on the Globe stage—for it was largely from the reporters' notebooks that the plays were first printed.

In the 17th century there seems to have been a small epidemic of shorthand, which became quite a popular hobby, adopted by no one more zealously than by Samuel Pepys, who made it the medium for his fascinating diary, to which we owe so much of what we know of Stuart times.

In the middle of the following century came Gurney with "an entirely new and wonderful system." It was this system that Charles Dickens surreptitiously struggled to master, perched on his stool in a solicitor's office; and what a struggle it seems to have been. No wonder he makes David Copperfield declare that shorthand was "about equal to the mastery of six languages."

And yet, what Dickens found so heart-breaking a task, Thackeray affects to scoff at. "What an accomplishment to boast of!" he exclaims. "Look at this! Nothing could be easier. You don't know what it means? Of course not. Neither do I. Neither does it. But what of that? Shorthand, indeed!"

But probably neither Dickens nor Thackeray knew Isaac Pitman's wonderful system of shorthand, which was to revolutionize and simplify the art, and to count its devotees in hundreds of thousands.

INJECTION of GOLD as a CURE for FEVERS

THE very latest post-war discovery is the treating of certain ailments by means of injections of diluted gold. This very expensive method of restoring lost health was discovered by a French doctor, who has completely cured a wealthy Parisian of a complaint similar to shell-shock.

Although gold is very scarce at present, a limited supply is available for medicinal purposes. The price for one injection of good quality gold sometimes reaches $250, while in one or two exceptional cases gold injections have cost over $500 each. Consequently, only very rich persons can at present undergo this gold treatment, which has been successful in rescuing several cases of complete nervous breakdown.

It should be remembered, however, that the gold itself is of no real value as a tonic. The idea in making the injections is to liven up the patient and prevent him or her from brooding too seriously. This done, doctors believe that half the battle is won.

It will also be very interesting to know that this gold treatment is now being used in several of the largest European hospitals. Until now only nervous people and those suffering from mental disorders have been treated, but experiments have recently shown that gold injections, costly though they are, are of great value in allaying fever and kindred diseases.

Strange to say, the injections are not made through the usual type of syringe, but generally through a conical-shaped tube of pure platinum costing $450.

HOW Japanese WOMEN FISH for PEARLS

IN Australia and India pearl fishing is conducted by men, but it is the women who obtain the pearl oysters by diving in Japan. In the region about Ago bay in the province of Shima, the Bay of Gokasho in the province of Ise, as well as in other parts of the country, women are almost exclusively employed in this work.

They commence their work at the age of 14. They are in the water almost all the year round, except in the coldest season, from the end of December to the beginning of February. But even during this inclement period they sometimes dive for pearls.

A boat in the command of a man is assigned to every five or ten women divers, and carries them to and from the fishing grounds. When the divers reach this, they land upon the rocks or islands, and then at once plunge into the water and begin their search for the pearl oysters.

These are dropped into the tubs, which are suspended by a rope from their waists. When these vessels are filled, the women pull them to the boat, help to lift them in, and then return to the shore. They can remain under water from one to two minutes. Some of them are so expert that they will gather a hundred oysters in a minute.

SINGING and BATHING

WITH running water giving the pitch and the resonance of the room encouraging them in their effort, persons taking their morning plunge "just naturally" burst into song.

This is the explanation of an English scientist of the fact that many persons who never open their lips in song at any other time are likely to sing while in the bath tub.

Deadened by the furnishings of other rooms, even a harsh voice has an unaccustomed quality in a bathroom which makes it pleasing to its possessor and not objectionable, sometimes, to listeners in other parts of the h[illegible]