has never yet been clearly answered, will doubtless receive the careful attention of the Board of Works. That it will cost far more than the present illumination of the Thames Embankment is clear, since at present the electric light there is actually supplementary to the gas lamps, still kept burning, and necessarily so. When the cost has been ascertained, two points will present themselves for consideration: first, whether the luxury of an increased light is worth paying for, and second, whether for the same extra expense an equal and better diffused light cannot be obtained by gas. Meanwhile we are glad to see that in many directions, both in the metropolis and the provinces, a wide experience will be gained in the course of the next few months with the electric light, especially with the Jablochkoff system, which for the present appears to be the most suitable for general lighting purposes that has yet been introduced.

We should not omit to mention that the installations both on the Viaduct and the Embankment have been thoroughly carried out by Messrs. Wells & Co., of Shoreditch, under the superintendence of M. J. A. Berley, the representative of the Société Générale d'Electricité, at Paris.—*Engineering.*

AMATEUR MECHANICS.

CHUCKING.

In spite of all possible appliances to be used in a general way for chucking work in the lathe, a degree of inventive skill is often required to accomplish it quickly and securely.

The accompanying cuts are designed to aid the amateur in chucking, but after all is said, there is a world of knowledge that can be gained by experience only.

The arrangement of a metal disk in the lathe so that it can be turned on its face, and upon its edge, cannot well be accomplished by means of chucks; for this purpose recourse is frequently had to cement. A good cement for this purpose consists of Burgundy pitch, 2 pounds; resin, 2 pounds; yellow wax, 2 ounces; dried whiting, 2 pounds; melt together the pitch, resin, and wax, and stir in the whiting.

To chuck work with this cement, apply a small portion of it to a face plate devoted especially to this purpose; heat the plate so that the cement will cover the greater portion of its surface. The plate may be allowed to cool. Whenever it is desirable to chuck a metallic disk, it is heated and placed against the cement on the face plate, and allowed to remain until the cement begins to stiffen, when a tool having a right-angled notch is applied to the edge of the disk, as shown in the cut, the lathe being rotated until, by the compound action of the tool pressure and the rotary motion, the disk becomes perfectly true.

To chuck a spindle or any similar object a cement chuck like that shown in section in Fig. 2 is sometimes used. The larger portion is screwed on the lathe mandrel, and the inner end of the hole in the outer portion terminates conically. The hole is filled with cement, and the article to be chucked is warmed and introduced. It may sometimes be necessary to heat the chuck with an alcohol or gas flame. The lathe is rotated and the spindle is held lightly until it becomes true and the cement begins to harden.

To remove the work from a cement chuck, it must be warmed by means of a lamp or otherwise. Most of the cement adhering to the work may be wiped off after heating it; whatever remains may be removed with a little turpentine.

A common method of chucking work on the face plate is shown in Fig. 3; the wheel is temporarily retained in place by a pointed rod, A, which is forced against the wheel by the tail spindle. A little rapping one way or the other readily centers the wheel. A piece of crayon held in a crayon holder supported by the tool rest may be used to discover which side of the wheel is "out." After the wheel is trued, it is fastened by the short bars, B, whose outer ends rest upon any convenient blocking while they are drawn by the bolts, so as to clamp the wheel firmly to the face plate.

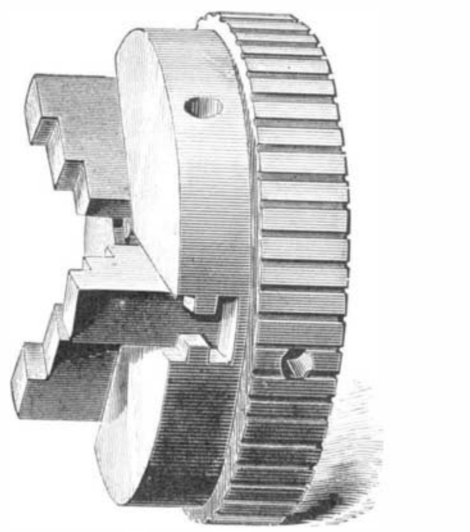


Fig. 14.—SCROLL CHUCK.

It is sometimes preferable to use the yoke shown in Fig. 4 instead of the bars shown in Fig. 3; it is placed diametrically across the wheel and secured by two bolts.

Fig. 5 represents a chuck, consisting of a wooden disk, *c*, bored to receive the wooden hoop, *d*, which may be forced inward by the common wood screws, *e*, which bear upon it. This chuck is useful where a considerable number of similar pieces are to be turned or bored.

Fig. 6 represents a simple and well known chuck. It is simply a block of wood secured to a face plate by a screw center and turned out to fit the work.

Fig. 7 represents an easily made chuck, which is useful for holding plugs of wood to be turned or bored. It consists of a piece of hard wood fitted to the mandrel, turned, bored, and split longitudinally, as shown in the engraving. Its outer end is tapered, and to it is fitted a metallic ring that serves to contract the chuck when it is forced on.

Fig. 8 represents a tapered and split mandrel, which may be either of metal or wood according to the purpose to which it is to be applied. The part F is bored conically at the smaller end before splitting, and to this hole is fitted the conical plug, G, which being forced in expands the mandrel.

In Fig. 9 the mandrel, C, has permanently attached to it the cone, D, and upon it is placed the movable cone, E, which is forced against the work held between the two cones by a nut which turns on the threaded end of the mandrel.

In Fig. 10 the manner of chucking work on the angle plate, H, is shown so clearly as to require no explanation. It may be well, however, to state that when the work is rotated rapidly a counterbalance should be attached to the face plate on the side diametrically opposite the angle plate.

Fig. 11 shows a jaw for attachment to the face plate, which consists of a right angled piece, I, a jaw, J, which has two guide pins, entering holes in the piece, I, and the screw, K, which passes through a tapped hole in the piece, I, and bears against the jaw, J. The piece, I, has a dowel, *a*, that keeps it from turning, and a screw, *b*, by which it is secured to the face plate.

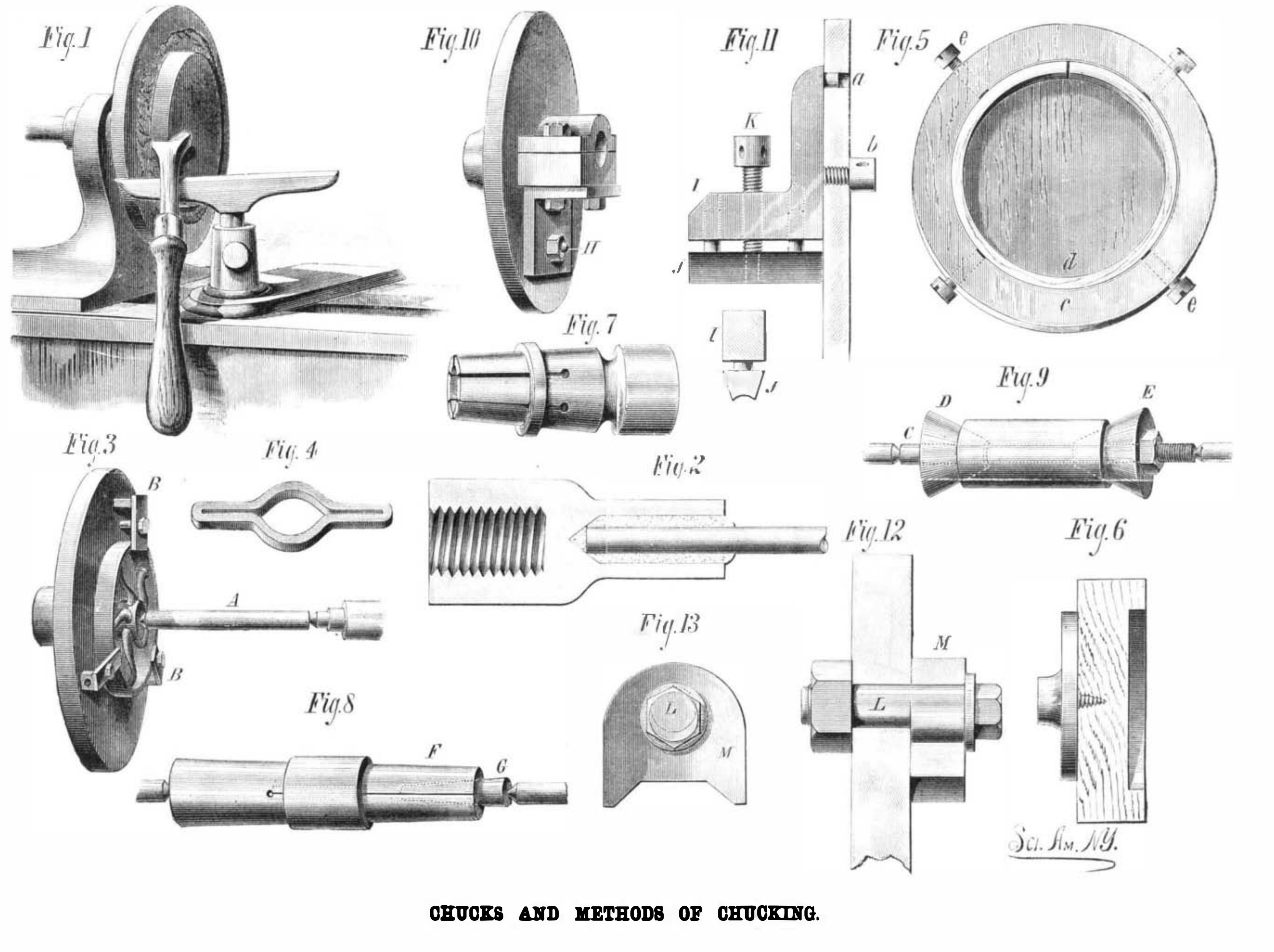
In Figs. 12 and 13 the pin, L, is fitted to the face plate, and has formed on its projecting end an eccentric which fits the jaw, M. It has also a hexagonal head for receiving the wrench by which it is turned. Three pins, L, are fitted to the face plate, which is quite thick. Two of the pins need not be turned after being adjusted for a certain kind of work; the third is loosened and turned when work is put in and taken out of the lathe. After the work is clamped tightly by turning the eccentric the nut on the back of the face plate is tightened.

In Fig. 14 is shown a type of the most convenient and most universally useful chuck in existence. Its construction and use are so well known as to need no description.

M.

Kerosene Dangers.

A correspondent mentions a source of danger in the use of kerosene lamps which seems to have been generally overlooked, namely the habit of allowing lamps to stand near hot stoves, on mantelpieces, and in other places where they become heated sufficiently to convert the oil into gas. Not unfrequently persons engaged in cooking or other work about the stove will stand the lamp on an adjacent mantelpiece, or even on the top of a raised oven; or when ironing will set the lamp near the stand on which the heated iron rests. It is needless to enlarge upon the risky character of such practices.



CHUCKS AND METHODS OF CHUCKING.

The Microphone.

Thomas S. Tait, of Baroda, India, communicates to *Nature* a suggestion as to new uses for the microphone. Two subjects of interest in connection with the practical application of the microphone have lately been brought to my notice, says the writer, by Raja Sir T. Madava Row, K.C.S.I., Dewan of Baroda. In the hope of securing a little assistance from some of your scientific readers I hasten to lay them before you.

The first question is with reference to the use of a microphone as a stethoscope. It seems that native ladies of high position decline altogether to allow a doctor to examine the chest in the ordinary manner. Sooner than submit to such an examination they would prefer to die—certainly rather a staggering fact for those imbued with European ideas. In the cause of humanity it is therefore desirable to do something for those whose position and caste would be imperiled by direct examination. If the microphone could be so delicately arranged as to transmit the auscultatory sounds, a medical ear, even at a distance, would surely be able to detect the existence of any disease of the heart or lungs. In the few experiments that we have made with our limited appliances we have been able to hear the ticking of a watch at a distance of about 200 yards, and the roar of a black ant when attacked by his companion, but as yet we have heard no internal sounds from the human breast. Perhaps with better devised instruments some one may have been able to obtain that which has yet been denied to us. I am sure many native ladies would be glad to get an affirmative answer to the question, "Can the microphone be used as a stethoscope?"

The second subject seems to be a more difficult one to grapple with:

"In the undulating region of Travancore, where the water bearing strata heave and fall according to the locality concerned, I have come across a set of professional men who are generally consulted by those who wish to sink wells in view to ascertain whether, at a given spot, a well may be sunk with the probability of finding water near enough. These professional men undertake to predict where the springs will be found near, and where they will be found at great depth, and their predictions are generally verified with great accuracy. I took some trouble to ascertain how these men are enabled to predict the proximity, or otherwise, of the springs underground. Brushing aside the ceremonies and incantations they perform in view to deceive others and perhaps themselves also, I found that they detect the proximity of the subterranean springs by lying down on the bare ground in the dead silence of night, with the ear in contact with the ground, and trying to hear the sound of the flow of water in the strata beneath. By practice the ear is made very sensitive, and the degree of distinctness with which they hear the sound of flowing water enables them approximately to predict the depth of the springs. It is in this manner that appropriate spots are selected for sinking wells.

"Now, would any of the instruments you are experimenting with magnify the sound of the subterranean flow of water so as to greatly facilitate the process I have described? If so, it may be a considerable practical gain."

To this query I have hitherto been able to return no other answer than a negative one. Both the subjects are practical ones, and I only hope that there will be before long some light cast upon them.

Le Conte's Theory of Mountain Formation.

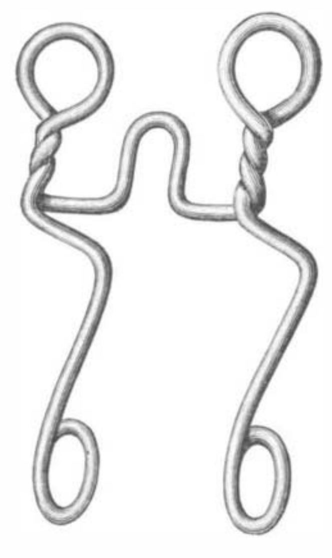
Dr. Joseph Le Conte, in his "Elements of Geology," lately published, gives a very complete theory of mountain formation, based upon the supposition that the earth is solid.

The earth is regarded as made up of concentric isothermal shells, each cooling by conduction to the next outer, and the outermost by radiation into space. For a long time the outermost would cool fastest. But a time would come when the outermost would become of a nearly fixed temperature, receiving heat from external and internal sources, while the interior would still continue to cool by conduction. The interior, because cooling faster, and also because the amount of contraction for equal cooling is greater at high than at low temperature, would contract faster than the exterior. The interior would tend therefore to shrink away from the exterior, which, following it down, would be subjected to powerful horizontal pressure, and must finally yield somewhere. Mountain chains are the lines along which the yielding of the surface to horizontal thrust has taken place. This yielding is not by upbending into an arch, leaving a hollow space beneath, nor yet into such an arch, filled and supported by an interior liquid, as usually supposed; but by mashing or crushing together horizontally, like dough or plastic clay, with foldings of the strata, and an upswelling and thickening of the whole squeezed mass.

The theory here presented accounts for all the principal facts associated in mountain chains. This is the true test of its general truth. It explains satisfactorily the following facts: 1. The most usual position of mountain chains on the borders of continents. 2. When there are several ranges belonging to one system, these have been formed successively coastward. 3. Mountain chains are masses of immensely thick sediments. 4. The strata of which mountain chains are composed, are strongly folded, and, where the materials are suitable, are affected with slaty cleavage; both the folds and the cleavage being usually parallel to the chain. 5. The strata of mountain chains are usually affected with metamorphism, which is great in proportion to the height of the chain and the complexity of the foldings. 6. Great fissure eruptions and volcanoes are usually associated with mountain chains. 7. Many other minor phenomena, such as fissures, slips, and earthquakes, it equally accounts for.

A NOVEL BRIDLE BIT.

We illustrate herewith a novel bridle bit recently patented by Dr. J. G. Peterson, of Morganton, N. C. It consists of a single piece of steel wire doubled and bent at right angles with the bar and twisted together, as clearly shown in the engraving. An expert blacksmith can make these bits very rapidly, as no forging is required; and the bit, when finished, is very strong, and is claimed to be equal if not superior to the more expensive kind.



PETERSON'S BIT.

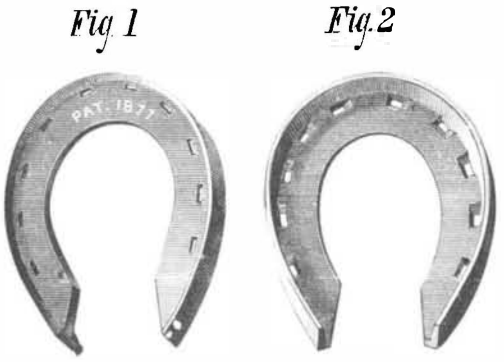
It is said that Americans can make anything out of wire; this bit is another example that goes to prove the statement true. Further particulars may be obtained by addressing J. G. Peterson, M. D., as above.

A NEW CONTINUOUS CALK HORSESHOE.

When a prominent horseman states that in the city of New York there are not ten horses in a hundred that have been upon our street pavements one year that have sound feet, and when eminent veterinary surgeons say that nearly all of their business comes from the present mode of shoeing horses, it becomes a matter of serious consideration to owners of horses to know whether there is a way of avoiding the evil. The remedy seems to lie in the adoption of a shoe of standard form adapted to the peculiarities of the horse's foot and capable of being easily applied by any blacksmith. A shoe which, we are informed, fulfills all requirements has been recently patented by Mr. John D. Billings, and is manufactured by the John D. Billings Patent Horseshoe Company, 265 Broadway, New York.

Fig. 1, in the engraving, represents the shoe as seen from the top, showing a level bearing surface. Fig. 2 shows the under or calk side of the shoe.

Fig 1 Fig.2



BILLINGS' HORSESHOE.

This shoe is made from an L shaped bar of steel, the steel being, by a patented process of manufacture, completely enveloped in a coating of tough iron, which renders it capable of being bent hot or cold, and imparts to it the desirable qualities of lightness, strength, durability, and elasticity. The bars being cut into suitable lengths and the ends of the pieces sheared off, they are then bent into shape around forms or dies made from drawings of the foot; the nail holes are then punched, and the shoe is complete.

The shoe has a continuous calk, which is similar in form to the crust or wall of the hoof, and is, therefore, the most natural, and, as stated by the manufacturers, the most efficient shape for a horseshoe. The upper surface of the shoe has a narrow beveled edge or rim, which takes the place of the clip in the ordinary shoe.

It is stated that the peculiar form of the shoe adapts it to all kinds and conditions of feet. The manufacturers state that it has cured tender feet, when existing, in every instance where the shoe has been tried; and the change which takes place in the tender footed animal, that has had an old shoe replaced by this, is said to be quite remarkable. While formerly he gave expression to the uneasiness and pain from which he suffered, by frequently shifting his weight alternately from one foot to the other, with the new shoe he stood squarely upon his feet without a sign of discomfort, showing clearly that he was at his ease.

The many advantages claimed for this shoe cannot be well enumerated here, but we are informed by the manufacturers that it is largely in use, and is giving excellent satisfaction.

Correspondence.

The Black Spot of Jupiter's Disk.

To the Editor of the Scientific American:

The call for information through your columns relative to the black spot on Jupiter's disk seems to elicit but little attention. In the last number of the SCIENTIFIC AMERICAN I notice that Mr. R. D. Schimpff, in reply to Mr. Eadie, says that "it was unquestionably the shadow of one of Jupiter's moons," from which any reader would infer that it could not possibly be anything else. By reference to any good work on astronomy, it will be seen that both bright and dark spots have been observed in Jupiter's belt at irregular intervals for the last two centuries. It was by watching these that the rotation of the planet on its axis was ascertained. One of these spots, first noticed in 1665, disappeared and reappeared regularly in the same form for more than 40 years.

On the night of August 23, the writer, while watching a transit of one of Jupiter's satellites, noticed the appearance of the black spot above mentioned. It came into view at 8:54 P.M., some time before the shadow of the moon had left the planet, and disappeared at 12:13. The next night at 8 P.M. it was plainly visible near the middle of the northern belt, the planet having made about 2 3-10 revolutions. On the night of the 10th inst. I saw it again. It is distinguishable from the shadow of a satellite by being both larger and darker, in fact black. As to what it is, or the cause of its existence, we do not pretend to say, but we do say that it is a veritable spot, and by no means the first one ever seen. A. S. HOWREN.

Corsicana, Texas, Nov. 23, 1878.

Shifting of the Grain Belt.

The Bureau of Agriculture furnishes some very interesting tables, illustrating the westward movement of the centers of grain production. The product of wheat per capita, in New England, has fallen between 1849 and 1877 from four tenths to three tenths. In the same period in the Southern and South Atlantic States, the per capita has risen from 2·38 bushels to 6·11 bushels, so that those States, from buyers, have become sellers of wheat. In the Ohio and trans-Mississippi States, in the same period, the per capita produced has increased from 12·65 bushels to 30·49, and in the Pacific States from 2·16 bushels to 27·49 bushels. The wheat crop of 1849 was 100,485,944 bushels, divided into equal volumes by the lines of 81° west from Greenwich. In 1877 the crop was 365,094,800 bushels, and the center line of production the meridian of 89° 6′ west. In 1849 the corn product was 591,071,104 bushels, and the central line in the 85° west longitude. In 1877 the corn product was 1,342,558,000 bushels, and the center line 89° 6′. In 28 years the movement westward has been: for wheat, 8° 6′ (about 500 miles), or from the eastern line of Ohio nearly to the center of Illinois; for corn, 4° 6′ (250 miles), or from the eastern line of counties in Indiana nearly to the longitude of Cairo.

The Antiquity of Weaving.

The earliest records of the art of weaving are to be found in the Old Testament. Pharaoh arrayed Joseph in "vestures of fine linen," and Job lamented that his days were swifter than the weaver's shuttle, the use of the simile proving that the shuttle was a common and well known object at the time. Portions of woven cloth and a weaver's shuttle have been found among the remains of the Lake dwellings, and as the latter are believed to belong to the stone age, the origin of the art may possibly have been nearly coincident with the existence of man. Few if any savage races have been discovered altogether ignorant of the art, and many of them have brought it to a considerable degree of perfection; while the relics of the ancient Peruvians and Egyptians show that they were skilled weavers. Some fragments of Egyptian cloth were found on examination to be woven with threads of about 100 hanks to the pound, with 140 threads to the inch in the warp, and 64 in the woof. Although the art was practiced extensively, and with no mean skill, in very ancient times, it progressed slowly and gradually—by small steps at long intervals. The great advances in the art of weaving have been made during the past 300 years, mainly during the past century.

New Coral Beds Near Sicily.

During the past year a new and valuable coral bed was discovered on the southwest of Sicily, between Sciacca and Porto Empedocle. The coral is not only abundant, but of excellent quality. One coral merchant of Torre del Greco, having fifty barks employed on the bed, secured in a few days ten tons of coral of the very finest quality. The Algerian coral grounds have been nearly deserted on account of the new finds.

Military Improvements Wanted.

The Board on Army Equipment, in session in Washington, invites brief communications from persons in the military service regarding any improvements that can be made in the general equipment of troops, which have been suggested by observation and experience, and requests inventors and manufacturers to send to the Board samples, accompanied by drawings and specifications, of any improvements made in the equipment of troops, keeping in view the lessening of weight to be carried by the soldier, increasing his efficiency, and at the same time preserving and increasing the durability of the articles to be used.