For the Scientific American.

Design in the Natural World.

In the lower animals, who want both the accessory means of cleaning the eye and the ingenuity to accomplish it by other modes than the eyelids, an additional eyelid, a new apparatus is provided for this purpose. In fishes, whose eye is washed by their element, all the exterior apparatus is unnecessary, and is dismissed; but in the crab, the very peculiar and horny prominent eye would be quite obscured were it not for a particular provision. There is a little brush of hair above the eye, against which it is occasionally raised to wipe off what may adhere to it.

The forms of the bones and joints, and the tendons which play over them, afford a variety of instances of the most perfect mechanical adjustment. Sometimes the power is sacrificed for rapidity of motion, and rapidity for power. Our patella throws off the tendon, attached to it from the centre of motion, and hence adds to the power of the muscles of the thigh, which enables us to rise or leap. In the toes of the ostrich the material is different, but the mechanism the same. An elastic cushion is placed between the tendon and joint, which, whilst it throws off the tendon from the centre of motion, and therefore adds to the power of the flexor muscle, gives elasticity to the bottom of the foot. These cushions serve, in some degree, the same office as the elastic frog of the horse's hoof, or the cushion in the bottom of the camel's foot.

The web-foot of the water-fowl is an inimitable paddle; and all the ingenuity of the present day exerted to improve our steamboat makes nothing to approach it. The flexor tendon of the toes of the duck is so directed over the heads of the bones of the thigh and leg, that it is made tight when the creature bends its leg, and is relaxed when the leg is stretched out. In another class of birds, the same mechanism enables the animal to grasp the branch on which it roosts without any effort on its part.

A bird's egg consists of three parts: the chick, the yelk in which the chick is placed, and the white in which the yelk swims. The yelk is attached to the white at two points joined by a plane *below* the centre of gravity of the yelk. The chick, therefore, is always uppermost, roll the egg how you will; consequently it is always kept nearest to the breast of the mother while she is sitting.

The hexagonal form of the cells of honey-comb is proved to be that which the most refined analysis has enabled mathematicians to discover as of all others the best adapted for the purpose of saving room, work, and materials. And this form is the same in every country—the proportions accurately alike—the size the very same to the fraction of a line, the wide world over. The discovery was made about a century ago; and the instrument (the fluxional calculus,) that enabled us to find it out, was unknown half a century before that application of its powers. Yet the bee had been, for thousands of years, in all countries, unerringly working according to this fixed rule, choosing the same exact angle of 120 degrees for the inclination of the sides of its little room, which every one had for ages known to be the best possible angle, and also chose the same exact angles of 110 and 70 degrees for the parallelograms of the roof, which no one had ever discovered till the 18th century, when MacLaurin solved that most curious problem of *maxima* and *minima*, the means of investigating which had not existed till the century before, when Newton invented the calculus. The bottom of each cell on one side abuts against three on the other, and is supported by the divisions between them. It is formed of three plates meeting at an angle, and this angle has been ascertained, by a very intricate mathematical calculation, to be *precisely* that which enables the greatest strength to be attained with the least material. The celebrated mathematician, Maraldi, brought the results of his calculation to agree with the observed angle within two minutes of a degree. This near approximation has been generally considered quite close enough to establish the fact; but Lord Brougham has recently investigated the subject afresh, and shown that the bees were perfectly right and the mathematician wrong.

J. W. O.

Cingalese Jewellers and their Forges.

ALBION, OCT. 1, 1849.

MESSRS. EDITORS:—Noticing in the first number of the Scientific American a portable blast furnace, has induced me to send you the following: the Cingalese work in gold and silver with considerable dexterity and taste; and, with means that appear very inadequate, execute articles of jewelry—articles that would certainly be admired in this country, and not very easily imitated. The best jeweller requires only the following apparatus and tools:—a low earthen pot full of chaff or saw dust, on which he makes a little charcoal fire; a small bambo blow-pipe, about six inches long, with which he excites the fire, and through which the artist directs the blast of the blow-pipe; two or three small crucibles made of the fine clay of ant-hills; a pair of tongs, an anvil, two or three small hammers, a file, and, to conclude the list, a few small bars of iron and brass, about two inches long, differently pointed for different kinds of work. It is astonishing what an intense little fire, more than sufficiently strong to melt silver and gold, can be kindled in a few minutes in the way just described. Such a simple portable forge deserves to be better known; it is perhaps even deserving the attention of the scientific experimenter, and may be useful to him when he wishes to excite a small fire, larger than can be produced by the common blow-pipe, and he has not a forge at command. The success of the little Cingalese forge depends a good deal on the bed of the fire being composed of a combustible material, and a very bad conductor of heat. The smiths of Ceylon use a composition as a hone in sharpening knives, and cutting instruments, that is worth noticing. It is made of the capitia resin and corundum. The corundum, in a state of impalpable powder, is mixed with the resin, rendered liquid by heat and well incorporated. The mixture is poured into a wooden mould, and its surface levelled and smoothed while it is hot; for when cold it is extremely hard. It is much valued by the natives, and preferred by them to the best of our hones. Respectfully yours,

L. F. MUNGER.

Experiments on the Steam Engine.

MESSRS. EDITORS:—Having been a subscriber to your paper some time, I have noticed some articles relative to the crank and loss of power by the use of the crank. I do not believe in any loss of power directly attributable to the crank, but I do believe in a loss of power which I call incidental to the crank; I find practically a loss, which I say is occasioned by not cutting off the steam soon enough, and exhausting soon enough, in the unexpended momentum of the reciprocating parts, at the end of the stroke, which must be counteracted by an equal amount of steam, making the loss double the amount of such unexpended momentum. I find by cutting off one quarter of the steam and beginning to exhaust before the piston arrives at the end of the stroke, a saving of fuel is made, amounting in some cases to fifty per cent., the engines working much smoother, passing the centers much easier, and the wear and tear less. Such amount of saving cannot be attributed to the expansion, as it is greater than any theory of expansion will account for. I wish to call the attention of steam engine builders to the subject,

W. S. H.

The Cotton Experiment in Australia.

A sample of cotton grown in Australia has lately been exhibited in London. It is said to be of very good quality, and superior to the average American cotton imported into Liverpool. Two varieties have been raised—one a white cotton, the other a light drab or brown cotton. The former is distinguished by a silkness of texture, which is said to be very rarely noticed in American cotton. The question has yet to be solved whether the price which could be obtained for it in England would be sufficient to pay the expenses of culture and preparing for market, and freight, &c., to England.

Shagreen.

The true oriental shagreen is essentially different from all modifications of leather and parchment. It approaches the latter somewhat, indeed, in its nature, since it consists of a dried skin, not combined with any tanning or foreign matter whatever. Its distinguishing characteristic is having the grain or hair side covered over with small rough round specks or granulations.

It is prepared from the skins of horses, wild asses and camels; of strips cut along the chine, from the neck towards the tail, apparently because this stronger and thicker portion of the skin is best adapted to the operations about to be described. These fillets are to be steeped in water till the epidermis becomes loose, and the hairs easily come away by the roots; after which they are to be stretched upon a board, and dressed with the currier's fleshing knife. They must be kept continually moist, and extended by cords attached to their edges, with the flesh side uppermost upon the board. Each strip now resembles a wet bladder, and is to be stretched in an open square wooden frame by means of strings tied to its edges, till it be as smooth and tense as a drum-head. For this purpose it must be moistened and extended from time to time in the frame.

The grain or hair side of the moist strip of skin must next be sprinkled over with a kind of seeds called Allabuta, which are to be forced into its surface either by tramping with the feet, or with a simple press, a piece of felt or other thick stuff being laid upon the seeds. These seeds are lenticular, hard, of a shining black color, farinaceous within, about the size of poppy seed, and are sometimes used to represent the eyes in wax figures.

The skin is exposed to dry in the shade, with the seeds indented into its surface; after which it is freed from them by shaking it, and beating upon its other side with a stick. The outside will then be thorny, and pitted with small hollows corresponding to the shape and number of the seeds.

When we make impressions in fine-grained dry wood with steel punches or letters of any kind, then plane away the wood till we come to the level of the bottom of these impressions, afterwards steep the wood in water, the condensed or punched points will swell above the surface in relief. Snuff-boxes have sometimes been marked with prominent figures in this way. Now shagreen is treated in a similar manner.

The strip of skin is stretched in an inclined plane, with its upper edge attached to hooks, and its under one loaded with weights, in which position it is thinned off with a proper semi-lunar knife, but not so much as to touch the bottom of the seed-pits or depressions. By maceration in water, the skin is then made to swell, and the pits become prominent over the surface which had been shaved. The swelling is completed by steeping the strips in a warm solution of soda, after which they are cleansed by the action of salt brine, and then dyed.

In the East the following processes are pursued. Entirely white shagreen is obtained by imbuing the skin with a solution of alum, covering it with the dough made with Turkey wheat, and after a time washing this away with a solution of alum. The strips are now rubbed with grease or suet, to diminish their rigidity, then worked carefully in hot water, curried with a blunt knife, and afterwards dried. They are died red with a decoction of cochineal or kermes, and green with fine copper filings and sal ammoniac, the solution of this salt being first applied, than the filings being strewed upon the skin, which must be rolled up and loaded with weights for some time; blue is given with indigo, quick-lime, soda, and honey; and black with galls and copperas.

Fast Running on the Central Road.

The Central Georgian says: the Express Train on the Central Road, which left Savannah at eight o'clock on Saturday night, with the passengers who came out on the Tennessee, arrived at Tennille at two o'clock, making the distance, 135 miles, in six hours.

[This run was made at night, and it shows that Georgia is not a whit behind any of our Northern States in railroad speed.

Self-Made American Opticians

There are two self-taught men in Massachusetts, who are learned without pretence, and who, were they inhabitants of Europe instead of this Commonweath, would long since have been honored with the fostering attentions of philosophers for their distinguished attainments as Lolland and Fraunhofer were, in the same difficult but exceedingly important department of science, viz., optics.

One is Alvan Clarke, of Boston, a minature painter who has constructed several telescopes under circumstances very unfavorable indeed, partly during those fractions of time when he could not pursue his regular vocation, but chiefly late at night. These instruments are scarcely excelled, and not surpassed by those of the most celebrated foreign manufacturers. Mr. Clarke makes every part with his own hands—grinds and polishes the lenses, and has astonished those who are competent to appreciate the magnitude of his mechanical achievements, in the construction of a really splendid refractor. This, however is only a small part of the marvel. Mr. Clarke is profoundly familiar with the laws of light, and with his own beautiful instruments has made himself as familiar with the permanent and the telescopic objects of the heavens, as with the canvass on which he daily labors for bread.

The other, equally deserving for his moral qualities, mechanical ingenuity, and profound knowledge in the same field of science, is J. B. Allen, of Springfield, a modest, retiring, deserving individual, who, as in the other case, without a patron, without an instructor, and almost without the approving recognition of those who are reputed to be wise above the multitude, has few equals in the domain of optics. He, too, has fabricated excellent reflecting telescopes—and it would be an honor to the great town of Springfield to purchase one of them for the use of the public schools, as the period may come when it will be a boast that Mr. Allen resides there. At the late session of the American Association for the Advancement of Sciences, at Cambridge, Mr. A. exhibited a microscope which he had made.—If we are not misinformed, he had never seen one himself before. It was admired for its wonderful defining powers, and is enough to give him a permanent reputation. Amos Lawrence, Esq., of Boston celebrated for his acts of generosity and encouragement, purchased it at once, and Mr. Allen was elected a member.

[The above is from the Boston Medical and Surgical Journal. It puts us in mind of Gray's incomparable Elegy.

> "Full many a flower is born to blush unseen
> And waste its fragrance in the desert air."

There is a common factory operative in this State, who can make telescopes, and microscopes of a high order, and who has made some first class optical instruments.

There is another who is a good portrait painter, and has talents of no common order for executing artistic works of art. There may be many more such men walking in the humblest ranks of life. Their chief wants are friends, brass in the face, and brass in the pockets.

American Indigo.

The Indigo plant in a native of South Carolina and it grew spontaneously among its weeds and woods. More than one hundred years ago the planters there commenced its cul tivation. In the year 1748 South Carolina exported to Great Britain 200,000 pounds and the Parliament granted a bounty of 12 cents per lb. to induce its greater cultivation. In 1748 when that ordinance was passed, Indigo was one of the staples of South Carolina, and we believe of Georgia also. Now in 1849 not a single pound of Indigo is raised in South Carolina, or as far as we know, in all the South. A plant, which is indigenous to that region, and which in its early cultivation was exceeding profitable, has been driven from existence by the cheap labor of India. Great Britain now pays seven million of dollars a year for Indigo raised in India.

[The above we derive from an exchange, and we must say that we don't believe it. A great deal of indigo is raised for domestic dyeing in South Carolina, and other of our Southern States.