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## 

## NEW YORK, DECEMBER 16, 1876.



## NEW ROTARY DIAMOND MILLSTONE DRESSEB

We illustrate in the annexed engraving a new application of the black diamond, or carbon, to the dressing of mill stones. The device is the invention of M. A. Millot, of Zurich, Switzerland, and may be applied to millstones of any size and nature. The cutting is done by a rotary head to which the diamonds are attached
The machine works entirely automatically, the mechan The machine works entirely automatically, the mechanism being attached to a solid base, whic center of the stone. The rotating cut-
ter moves forward and back; and when it has completed its travel in one direction, a ratchet wheel advances one tooth, and the machine operates so as to present a new surface of the stone to the action of the diamonds. The cutter head revolves at the rate of 12,000 turns per minute without the slightest vibration. The diamond points work in oil, and the adjustment is such that they always fall into the old series previously cut. But very old series previously cut. But very little power is required, and a simple cord serves for its transmission. In less than an hour, it is stated, an or
dinary stone is dressed with an accudinary stone is dressed with an accuracy never before attained. The edges are disposed to any desired eccentricity, in order that the increase may take place under the most favorable conditions, and so as to overcome the centrifugal force corresponding to the diameter of the stone.
M. Millot states that the automatic action of his machine is an advantage more than sufficient to compensate for its cutting only in radial direction. Waste of diamonds is prevented by completely imbedding the stones in the cutter head, so that these points never project beyond their metallic holder.
In one of the largest mills in Zu rich there are eight pair of stones, four of which turn to the right and four to the left. No difference what ever is noted between the two sets in point of product obtained. In order to test the durability of stones cut by the machine with those dressed by hand, two pairs were prepared, one in each way, and worked for eight days. At the end of this time the hand-dressed millstone was considerably worn while that dressed by the machine was unaltered. It wa also noted that the diamond-dressed stones remained more perfect at the circumference. One diamond cutter, it is fur ther stated, will serve to dress several hundred stones.

## PRICE'S IMPROVED HOSE COUPLING.

The annexed illustration represents a new hose coupling which offers the advantages of easy connection by simple automatic catch mechanism, and which embodies a nove way of securing the hose, so that the latter is held with great firmness. At the same time means are provided whereby the hose can be quickly released from the coupling. Fig. 1 is a sectional view, and Fig. 2 an end view, from which it will be understood that the two parts of the coupling are precisely alike, and are interchangeable: so that, if one portion should become injured, another may be readily substituted, and thus the failure of one part does not necessitate the removal of the entire union.
$A$ is the main ring. In a recess on its front side is secured rubber packing, B. Pivoted in its upper portion is a catch, $C$, which bears against a bent rubber spring as shown. Cast on the corresponding lower part of ring, $A$, is a projection, $D$. As the opposite half of the union is made in similar manner, hal will readily be seen that the projection, $D$ it will readily be seen that the projection, $D$,
on one half enters under the hook of catch, on one half enters under the hook of catch
C, on the other, and is engaged thereby, and C, on the other, and is engaged thereby, and
vice versa. Hence it is only necessary to bring the faces of the parts together, when the catches become fastened; and the pack ing, B, being compressed, effectually closes the joint.
The principal difficulty encountered in de vices of this description is the fastening of


PRICE'S HOSE COUPLING,
servatory have been unable to detect any such star, even servatory have been unable to detect any such star, even
with the great telescope. M. Struve is repeating his obser vations; but as he has since noted companion stars to Regu lus and Arcturus in the shape of fine spots of light, distant about 10 seconds, where it is certain that no heavenly bodies of the kind are in existence, it appears that the optical deficiencies of the astronomer himself have led him into error

## Chinese Views on English Science

If the election were not over, we should direct the attention of our po litical contemporaries, whose ingenui ty is so fertile in devising campaign anecdotes not wholly complimentary to their opponents, to the author of a book called " Ki-king-lu," who seems to possess a special aptitude for that species of literary work. The volume is published in China; and the author who has resided in England, returns home and accounts for British scienti fic progress by the fact that the En glish have undoubtedly robbed the Chinese of their learning. One me thod adopted by English scientists has been the making of an extract from the eyes of Chinese who have becom Christians, and touching the eyes of foreigners withit, by which they have been enabled to understand astronomy and perceive the mineral wealth of the earth. This clearly accounts for Pro fessor Proctor's remarkably rapid mas tery of the science of the stars. An other valuable medicine for the promo tion of intelligence has had, for on of itsingredients, the brains of a Chi nese girl who had embraced Christian ity. Other medicines have been mired with the brains, and the compound made up into pills, which received their final touch in the shape of in cantations instead of sugar coating.
Our English readers will perhaps identify the author of this remarkable book from his statement that he lived three years in England, during which time he had three princesses given him to wife by Queen Victoria, and that he was only permitted to return to China upon giving a promise not to expose

## MILLOT'S ROTARY MILLSTONE DRESSER.

Patented through the Scientific American Patent Agency April 18, 1876. For further particulars, relative to sale of rights or of patent, address, before January 1 next, George W. Price, Smithtown Branch, Suffolk county, N. Y., or J. A O'Brine, northwest corner of Front and Pine streets, Phila delphia, Pa.

The Companion of Procyon.
It now seems probably that M. Struve was mistaken in his upposed discovery, made some time ago, of a companio star to Procyon. The astronomers at the Washington Ob

A Curious Grain-Drying Procese
A correspondent of the Chicago Inter-Ocean describes a new process for drying grain, which he states is now in successful use in St. Louis and other cities, and by which grain, in any condition short of actual decay, can be restored to a merchantable grade and rendered safe to ship to any part of the world. The machinery consists of two conical-shaped revolving cylinders, the inner one being heated by confined steam, and the outer one fitted with appliances by which the grain is carried up and dropped through several feet of heated space upon the hot smaller cylinder. The cylinders being of conical shape, a draft is created, and the damp and impure vapor arising from the grain is carried off at the larger end of the curer in stifling clouds. Upon both cylinders electro-magnetic metals are attached in such manner as to generate a constant current of electricity, which is said to act upon the grain in some such manner as electricity acts upon the human skin. The grain becomes electrically excited. The result of the process upon grain is scarcely less than wonderful. Corn, wheat, and oats, in such wretched condition when they went into the machine that no one would ever think of doing anything with them but throw them away, came out entirely dry and thoroughly cleansed of mold.
[The foregoing may relate to some new process, but the description is evidently ab. surd. There are no "electro-magnetic metals," and we cannot perceive wherein "electricity" could, under the circumstances, exercise any effect, beneficial or otherwise, on the grain. Possibly some one can send us definite information regarding the process to which the writer refers.-EDs.]

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For the Week ending December 16, 1876. table of contrents.







1v. LESSONS IN MECHANICAL DRAWING, No. 31. By Protesor C

 bution of Plants.




 IUNN \& COn POGubzars

MONET.-In order to guard against the possibility of loss through the mails, we advise our subscribers to send their money either in money postal orders, bank checks, or drafts.

## PUBLISHERS' CARD.

Some twenty thousand of the subscribers to the Scientific Americas and Scientific American Supplement will find printed on the wrappers which envelope this week's papers the information that their subscriptions are about to expire, coupled with a request that the same may be renewed for the coming year. But one number of either journal, besides the present issue, remains to com plete the volume; and as it is our fixed rule not to send pa pers after the term subscribed for is ended, those desiring the weekly visits of our papers to continue without inter ruption; will therefore serve themselves by remitting as soon as possible. At the same time they will, in so doing, greatly favor the publishers, as the latter are thus enabled to form proper estimates as to the magnitude of the edition which it will be necessary to print at the commencement o the year. The rates of subscription to either journal or to both combined remain as heretofore.
The success of the Scientific American Supplement has proved so genuine, and its circulation risen so greatly beyond our anticipations, that we shall continue its publi cation and use our best endeavors to increase its value. As to the programme and plans which we have in hand for ren dering both Scientific American and Supplement indis pensable to workers in every branch of art, of industry, and of science, the reader will find them fully detailed in the advertising pages of this issue.
Those who have taken the papers through newsdealers arerecommended to continue to do so, and those in the habit of procuring their papers weekly from the stands will find them there as of old; and those who neither subscribe for nor buy the Scientific American nor its Supplement may peruse them both on file in any working men's reading room in the country, or in the library of any institution of learning in the world.
A handsome subscription list will be sent as usual on ap plication by those desiring to form clubs.

## THE EXTENSION OF SENSE

In "What the Coming Man may be" we considered, not ong ago, some of the possibilities of humanity in respect to the development of man's moral and intellectual faculties and seeing, with the hero of Locksley Hall, that the thoughts f men are widened with the process of the suns, we looked orward to a time when faculties such as Shakespeare, New ton, Mozart, Michael Angelo, and other men of great genius enjoyed shall be the common inheritance of the race: a time when the average man shall as far surpass the highest men of today in moral and intellectual force as the latter do the lowest savages or the most brutal of our prehistoric ancestors.
In his suggestive address before the American Chemical Society, Dr. Draper touched another aspect of the question, the extension of man's faculties of sense. Referring to the wo well known classes of nervous fibers-those whic the the impressiens of external things and convey them of the will from within oura improvement of the capabilities of one of the former by tele improvement of the capabilities of one of the former by tele
scopes,microscopes, and other sight-aiding contrivances, we have an earnest of what may hereafter be done as respect the four other special organs of sense: while as concerns th second class, the increase of man's power is not less remarkable. The resolves of the will may already be transmitted beyond us with even a greater velocity than in the living ystem itself, and that across vast terrestrial distances and beneath the sea. "Telegraphic wires are, strictly speaking, continuations of the centrifugal nerves, and we are no without reason for believing that it is the same influence which is active in both cases."
The learned lecturer might have added that the extension of sight by no means exhausts the improvements of specia ense already arrived at. In range and delicacy of action he aural apparatus of the skilled musician surpasses that f the savage even more than his visual organs de: whil the extension of sight by means of lenses is all but paralleled in hearing by means of modern acoustic apparatus. Already we may here by telegraph the intonation of a speaker, or the notes of an instrument, many miles away; the entangle ments of sound are analyzed by the inventions of Helmholtz as completely as those of light are by means of the prism while by Kœnig's apparatus the eye is constrained to do the work of the ear,sounds inaudible by the ear are,so to speak heard by the eye, and the range of human knowledge and capacit
In a scientific point of view, Dr. Draper groes on to say, such improvements in the capabilities of the organs for re ceiving external impressions, such extensions of the dis tances to which the results of intellectual acts and the dic tates of the will may be conveyed, constitute a true develop ment, an evolution none the less real though it may be of an artificial kind. "If we refiect carefully on these things," he adds, "bearing in mind what is now known of the course
of development in the animal series, we shall not fail to remark what a singular interest gathers round these artifi
cial developments-artificial they can scarcely be called, since they themselves have arisen interiorly. They are the results of intellectual acts. Man has been developing himself. He, [so far as the earth is concerned, is be coming omnipresent. The electrical nerves of society are spread to a plexus all over Europe and America: their com missural strands run under the Atlantic and Pacific."
When shall this line of development have an end? In his reach of sense-perception, his mastery of time and space, his ability to foresee and control the course of Nature, mak ing the powers of earth and air to serve him and do his bid ding, the man of today surpasses the gods of yesterday Who shall say what the man of tomorrow may not be ?
It is high time to cease canting about the degeneracy of of man in these latter days. Those who spend their lives among the dreams of the ancients, knowing nothing of the powers and achievements of modern man, may be pardoned for prociaiming their own inferiority; but they have no call to speak for the real men of the real world about them the men who are doing the world's work, at the same time steadily lifting humanity to higher and yet higher planes of capacity and power.
In spite of those who persist in facing backwards, deny ing that scientific progress is any measure of human evolu tion, the progressive development of human force and faculty is a reality. Where the ancient athlete could strike a blow of a hundred pounds, the modern mechanic can deal one o as many tuns; the steam hammer, the rifled cannon, the ock-rending dynamite being as truly human as the muscle on his shoulder. In creating them, man has added to his personal power as truly as if he had increased by so much the forces of his right arm. The telescope, the microscope and the spectroscope are extensions of his eye. Theresonator he manometric cell, and the electric sounder are additional ars. The electric telegraph enables him to be and to act in thousand places at once. Indeed all that science and ar ave done to make man master of the conditions and force of Nature may be considered so many extensions of his or anic endowments
Yet, much as has been accomplished in this direction, much as the civilized man excels the savage in scope and reach of faculty and force, the scientific development of uman capabilities has but just begun. As Dr. Draper hap pily expresses it, we have in what has been done merely an earnest of what the future has in store. In the direction of taste and smell, the Universe is almost entirely unexplored. Properly disciplined and aided by mechanical and other means of increasing their range and acuteness, these senses may prove as efficient in the explcration of Nature, as ser iceable for the mental and material advancement of hu manity, as either sight or hearing. Already we have an in imation of what discipline may do for the sense of touch in the exquisite tactile sensibility of some blind people, in the xtreme sensitiveness of the bat's wing and the antennæ o insects: and even greater promise is held out by taste and smell as exhibited in the chemist's ability to distinguish thereby many sapid or odorous substances, in quantity to mall to be otherwise detected. Still more strikingly ar the possibilities of these senses manifested in certain ner vous states produced by drugs or disease, especially that con dition of exalted sensibility known as hyperæsthesia. And is quite possible that, as the microscope, acting externally ncreases the natural acuteness of vision, so the range and acuteness of the senses excited by contact may be corres pondingly increased by substances acting interiorly through he nervous system.
It is true that such exaltations of sense-perception are apt to be attended with mental disturbances more or less dis qualifying the subject for logical thinking; but we canno pronounce it impossible for chemistry to discover or pro duce compounds capable of bringing about the one state unattended by the other: in other words, capable of highten ing in any desired degree the acuteness of any sense withou deranging at the same time the proper balance of the purely mental faculties. Besides, a telescope or a microscope in the hands of an untrained savage is quite as puzzling in its action, as confusing in its results, as the direct testimony of our senses is under hyperæsthesia. And it seems not less reasonable to suppose that the mind may learn to adjust tself to the new conditions of perception as readily in the ne case as in the other. In either event-the discovery of ther means of exalting sense, or the education of the mind to act normally under such new conditions-an enormous extension of human faculty must result; and the coming man may find therein the means of surpassing us, as signally as we do the most brutish of barbarians, in our power o penetrating the secrets of Nature and turning them to our advantage.

## THE GREAT CYCLONE IN BENGAL.

If the disasters which have overtaken the unfortunate in habitants of Bengal, India, had occurred in ancient times we should now possess traditions of punishments inflicted by an offended deity, besides which the legends of the Flood, Sodom and Gomorrah, and the Egyptian plagues would be altogether inconsiderable. The population of the provinc is now as numerous as that of the United States. Through the failure of the rice crop in 1878, owing to protracte droughts, a famine occurred which killed off the people by the hundred thousand, and the deaths would undoubtedl have reached millions had not the British Government ex orted itself to send immense quantities of food among th starving cultivators of the land. Now comes one of th most terrible hurricanes ever experienced in that land of yphoons and fierce storm; and official reports tell us that over 250,000 people have fallen victims to the three great
storm waves which have submerged the country for over 3,000 square miles.
The cyclone, which occurred on October 31 last, arose in the Bay of Bengal, and took a northward course, wrecking several large vessels which lay in its track. It just missed Calcutta, but struck Chittagong, which lies in the most northeasterly corner of the bay, stranding every vessel in the harbor and nearly destroying the town. Meanwhile the deep, and Dakhin, lying in one of the mouths of the Ganges, cover, and Daknin, ling in covered several smaller islands, and then flo
land for five or six miles toward the interior.

It appears that the immense waves were projected with astonishing velocity. Up to 11 o'clock on the night of Oc tober 31, Calcutta despatches reporting the storm said that no especial danger was anticipated, but before midnight the waters had overrun the land to a depth of 20 feet
An examination of the map shows that the islands men tioned are situated near an estuary of the river Megna, and they owe their origin to the deposition of soil washed down by the Ganges. They constitute part of the Sunderbunds, as the low, marshy land thus produced is called, from its being covered with the "sunder" tree; and the district is not only the hottest but probably the most unhealthy portion of British India. Malaria reigns everywhere, and the forests and jungles abound with tigers and other ferocious beasts. and jungles abound with tigers and other ferocious beasts. The English Government for some time past has labored to
reclaim the islands, and has offered strong inducements to reclaim the islands, and has offered strong inducements to
settlers to cultivate the ground, which is rich and extremely fertile. These efforts have resulted in the clearing of a large portion of the territory, and the raising thereon of valuable crops of cotton, rice, sugar cane, mulberry trees for silkworm food, and timber: while the population of Dakhin, the largest island of about 800 miles in extent, has increased to 240,000 , and those of Hattiah and Sundeep together number some 100,000 inhabitants.
Of course the devastation in this district has been complete. The country is dead flat; and the people, when the wave burst upon them, had no place of safety but in the tree tops. And there such as were able found their way, sharing their refuges with the wild beasts, birds, and serpents. Houses by the thousand were utterly swept out of existence, and the only relics of human habitations afterwards found were cast up on the Chittagong shore, ten miles distant.
The Calcutta Government Gazette says that, "wherever the storm wave passed, it is believed that not a third of the population survived. The islands have barely one fourth of their former inhabitants." All the cattle were destroyed and the stench of the decomposing remains has already generated an outbreak of cholera which it is feared will prove general. The British Government is taking steps to relieve thedistress which prevails.

## AN INDIAN DUST STORM.

In his clever account of Bannu, a district in the Punjaub Thorburn describes a dust storm on the great plain of Marwat, a phenomenon of such imposing force and grandeur as to be well deserving of the important position lately accorded it, by American scholars, among the great geological agents.
Marwat, the bed of an ancient lake, is now a vast treeless plain of undulating, sandy down, lordered by a region of soft loamy clay, deeply furrowed by watercourses, and overlaid by a layer of gravel and smooth, rounded stones, called "hell stones" by the people, because of their black and scorched appearance, the effect, probably, of natural sand blast attrition. Seen in autumn or in a year of drought, it appears a bleak, howling wilderness, fit home for the whistling, heat-laden dust storms that often sweep across its surface in the hot months; but in late spring, after a few rimely showers, it presents an interminable sea of wheat, the vivid green of which gives place here and there to streaks and patches of darker shaded grain.

The approach of a dust storm over this place in the dry season, and witnessed from one of its boundary hills, is a grand and impressive sight. At first but a speck on the distant horizon, it rapidly elongates until it stretches from east to west, a mighty, threatening wall a thousand feet high and thirty miles in length. Nearer and nearer it comes, phantom-like, its rushing noise being inaudible to the spectator. Now one wing is pushed forward, now another, nearer still: and now the birds-kites, vultures, and a stray eagle or two-circling its front are visible, and one by one the villages at the foot of the hill are enveloped and hidden from the eye: a few minutes more and the summit of Shekhbudin, till then bathed in sunshine and sleeping in the sul-
try stillness of the June morning is shrouded in yellow, try stillness of the June morning is shrouded in yellow,
scudding clouds. Vanished is the grandeur of the scene in scudding clouds. Vanished is the grandeur of the scene in dust, flying and eddying about in all directions, penetrating everywhere. Outside nothing can be seen but a darkness which can be felt, and nothing is audible but the whistling of the wind and the flapping of bungalow chicks: but inside the lamps are lighted, and a quarter of an hour is idly passed, until the storm, which generally expends its fury on the hillsides, subsides or passes on.

## LOW FLYING BALLOONS

In his very excellent report, recently made, on the pro In his very excellent report, recently made, on the progress of aeronautics, to the British Aeronautical soci
"It is singular that no one has taken advantage of an ascertained fact to put the balloon to more pleasurable, because more prolonged, use than has hitherto been attempted." After instancing how a boat may be caused to
travel with the current of a stream by simply using a pole
to push it clear of the banks, he adds: "'There is every probability that, with a balloon so balanced, a push with a long
pole would send it up spinning for fifty feet or more, and pole would send it up spinning for fifty feet or more, and
one might traverse a few hundred yards before it neared the arth and required another push.
Shortly before undertaking the ascension in which he lost is life, Mr. Donaldson, the well known aeronaut, described to us his experience in just such balloon sailing. He stated it as his belief that, if ever the time came when people would step into balloons as readily as they now do into rail road cars, the air ships would not sail above the clouds, bu would skim close along the surface of the ground. He gave would skim close along the surface of the ground. He gave
many reasons for this view-notably increased safety and economy, since balloons could be made much smaller, as they would not require a large amount of gas to keep them afloat, and there would be little difficulty in stopping to re plenish the supply when exhausted. He had found no trouble in balancing a balloon at four feet above the ground, and at keeping it accurately at that hight for hours. He told us, further, that he frequently traveled along country roads in this way during calm weather, using a pole to push himself along when there was no wind, or to guide himself when being wafted by a breeze. As an instance of how exactly a balloon can be balanced, he stated that, while thus sailing over a road, he carelessly dropped overboard bout a quarter of a loaf of bread, whereupon the air ship sprang aloft a hundred feet or more. We asked him how he aroided wagons and similar obstacles in his path withou disçharging ballast, and so losing equilibrium? "Jump ver them" was his answer. "A good strong push down wards on my guiding pole has sent me flying over many a ree in which I thought I was sure to be entangled." This flea-like mode of progression was a favorite mode he had of astonishing rustics.
Mr. Brearey's paper is published in full in Scientific American Supplement, No. 50 ; and among other remarkable facts, it notes that a one horse power engine can be made to weigh only thirteen pounds. There are also de criptions of Moy's steam flying locomotives and others of the most nearly successful efforts toward solving the prob he most nearly successful

## THE RADIOMETER NOT A LIGHT MOTOR

The immense quantity of evidence in the shape of experi ents on the radiometer, which has been accumulated by th rincipal physicists of Europe, leaves no reasonable doub ut that the claim that the apparatus is driven by light is unfounded. It is maintained by our correspondent, M. Del saulx, that the radiometer is an electrical engine; a majority of observers pronounce it simply a machine driven by heat So long as it is decided that the radiometer is actuated by forces which are intrinsically perfectly well understond, leaving the problem merely one of determining how the same are applied, the whole subject sinks at once to secondary im portance. It was only because the apparatus appeared to demonstrate the ponderability of light, and hence was an apparent serious contradiction to the undulatory theory, tha t has excited the close attention of the scientific world. Dr. Frankland's recent experiments on the radiometer are he the true source of its motion. The disks of his instrument
were of aluminum, polished on one side and blackened on were of aluminum, polished on one side and blackened on
the other. They were extraordinarily sensitive, and continthe other. They were extraordinarily sensitive, and contin-
ued rotating often for twenty minutes after the sun had descended below the horizon. Placing this radiometer in a room where the conditions were such that it remained motionless, Dr. Frankland enclosed its globe in his hands so as to cut off light from the disks. Yet they at once began to rotate, polished side in advance. On withdrawing his hands, the motor, after the lapse of two or three minutes, stopped then after another brief interval, it resumed in the opposite direction for a short time. There was rotation set up with out the aid of light, and clearly due to the temperature of he investigator's hands.
The next experiment was exactly the converse, and involed testing the apparatus under light destitute of heat. It is well known that the moon, although reflecting the sun's rays, sends but a very small amount of heat to the earth. With a lens 3 feet in diameter, concentrating the lunar rays on a thermoscopic pile, Melloni proved that the deviation of the needle was from $0^{\circ} 6^{\prime}$ to $4^{\circ} 8^{\prime}$, according to the phase of the moon. This indicates so extremely small a heating power that it is practically inconsiderable, and is destitute of any known effects upon the earth. Dr. Frankland therefore ex. posed his radiometer to bright moonlight, but it did not stir. Then. with a powerful lens, he rendered the intensity of the rays 200 times greater, and directed the brilliant image of the moon, produced at the focus, directly upon one of the disks of the radiometer. Not the slightest movement was ppreciable, although the light was kept unaltered for over quarter of an hour.
Dr. Frankland's conclusions sum up the true facts re garding the radiometer in brief terms. He says: that light not necessary to the motion of the instrument: that light does not contribute to its motion unless (by absorption) it be transformed into heat,which did not take place (or occurred ment of the disks is due to the unequal heating of the two faces of each disk, the cooler face always preceding the hotter one. When the globe is taken in the hands, the blackened face of each disk absorbs heat rapidly, while the bright side reflects it. Thus the surfaces of the black disks emain hotter than the metal situated below, but soon communicate their heat to said metal. If the hands be with drawn, the thermal conditions are reversed: the black face, being a better absorbant and at the same time a better radi
ator, cools much more quickly, and hence the opposite mo ion of the mill already described.

## THE LIMITS TO PHYSICAL CULTURE.

We have frequently had occasion to dwell upon the fact that, while moderate physical culture is a great benefit, inleed a neceasity, to ensure a proper balance of mental and bodily powers, and consequent health and longevity, physi al overculture is a great evil, leading to results diametrical y opposite to those sought to be attained. At one end of he series is a constitution weak and unfitted to resist dis ease or the effects of labor, on the other an organization strained to its utmost and ready to yield under the slightest addition to the stress. Obviously between these extremes here must be a mean up to which all culture is beneficial and beyond which all is overculture. The question is however, whether that mean is in the nature of a persona equation for every one, differing for each individual consti tution, or whether it is possible to formulate general laws rue for all systems. The tendency of modern investigation in all cases relating to the science of life and of living, is fa varable to the latter view. Mr. Charles Darwin sends out vorable to the latter view. Mr. Charles Darwin sends out
his formulated questions the world over, and deduces rehis formulated questions the world over, and deduces re-
sults from the replies proportionally considered. Candolles sults from the replies proportionally considered. Candolles
does the same in his elaborate investigations into the antedoes the same in his elaborate investigations into the ante
cedents of scientific men; the statistics relative to the re cruits for our army we have shown, in recent articles, to ad mit of valuable deductions relative to our national character istics; and we might add numerous examples, all showing tha hat which is proved true, on the average, for a large numbe of persons, may with reason be assumed to be true of an entire class, or even a race, when surrounded by generally similar conditions of life
Now in the case of physical culture, the point specially to be determined by actnal physiological investigation is to what extent the body may be benefited. This known, any one may easily discover for himself when the limit is eached, and will understand that to carry his training stil further is a positive disadvantage and injury. Such an in vestigation has lately been made by Dr. Burcq of Paris, in the Ecole de la Faisanderie, a gymnasium where are drilled the soldiers who are destined to be the gymnastic instructors of he French army. No better set of men could be selecled or examination, for the reason that each individual is vir tually intended hereafter to serve as a model for others, and therefore his physical culture is brought to the best possible state. Dr. Burcq continued his investigations with the ut most care and minuteness, for six months, during which period the progress of over a thousand men was closel watched and criticized. As a general result, he tells us now that gymnastic exercises :

1. Increase the muscular forces up to 25 and even up to 38 per cent, at the same time tending to equilibrate them in he two halves of the body.
2. Increase the pulmonary capacity at least one sixth.
3. Increase the weight of men up to 15 per cent, while on the other hand diminishing the volume. This augmenta ion exclusively benefits the muscular system, as is demon trated by its elevated dynamometric value.
And Dr. Burcq further observes that, during the first hal of the six months' course at the school, the increase of rce was most markedly noted.
To Dr. Burcq's admirable studies upon this body of rained gymnasts may be added those of M. Eugene Paz who for a long period has been observing the results which methodical physical exercise produces in certain invalid and in a large number of people of various callings, notably rtists, literary and business men, and others whose mus les are normally less voluminous than those of the picked oldiers at the Faisanderie School.
By means of a variety of ingenious mechanical apparatus, and by a course of investigation wholly different from that o Dr. Burcq, M. Paz reaches precisely the same results. He notes especially the increase in weight and decrease of vol ume of the body, above referred to, and also the augmenta tion of pulmonary capacity. Three operatic singers who were rigorously trained for a year attained a maximum lung power corresponding exactly to an increase of one lung power corresponding exactly to an increase of one
sixth. It follows, therefore, that Dr. Burcq's results may be considered in the light of a general law, and likewise as a guide to what is correct physical culture. In this view, we commend them to the attention of college authorities and students.

## English Views of our silk Industry

At a meeting of silk weavers at Macclesfield, England, the At a meetigg of silk weavers at Macclesfield, England, the satisfaction was expressed that no steps had been taken to exhibit English silks at the Centennial, the speaker stating that, were the United States once made aware of the $\in \mathrm{xcel}$ lence of the goods, the 60 per cent duty on them, imposed by our laws, would probably soon be removed. The Cen tennial correspondent of the Macclesfield Courier, himself an expert in silk, denounces their expressions as "false and foolish." After mentioning that the reduction in cost of labor is fast removing the chief obstacle with which Ameri can manufacturers have to contend, he says to his country men: "We shall firid that the ample labor saving appliances and greater intelligence of the work people will bring us face to face with a competition such as we have never ye dreamed of, and I venture to say that before long England mother of free trade as she is, will find herself compelled to impose a duty on the importation of American silks, in order to protect her manufacturers from being beaten in their own markets."

THE"JOHN BULL" LOCOMOTIVE AT THE OENTENNIAL The annesed engraving represents a curious old relic of early railroading in this country, which attracted consider able attention during its exhibition at the Centennial. It is the locomotive "John Bull," built by George and Robert Stephenson, at Newcastle-on-Tyne, England, for the Camden and Amboy Transportation Company, and shipped to Philadelphia in 1831. From Philadelphia the machine was carried in a sloop to Bordentown, N. J., and, being packed in wagons, was hauled out to the only piece of permanen track of the Camden and Amboy company then completed, a line about $\frac{8}{4}$ of a mile in length, and situated about 1 mile a line about in of a mile in length, and situated about 1 mile from Bordentown. The machinery was $p$
track, and a tender was constructed track, and a tender was constructed
from a whisky hogshead placed on a from a whisky hogshead placed on a
small platform car which had been used by the contractor in building the road. The connection between the pump of the locomotive and the tank was made by means of leather hose fitted up by a Bordentown shoemaker.
Steam was first raised in the boiler on September 15, 1831, and after several trial trips the first public exhibition took place on November 12. R. L. Stevens acted as conductor and general director, and the entire New Jersey legislature were present as witnesses. The " John
Bull" remained in Bordentown until 1833, and was occasionally used elsewhere until as late as 1866. The cylinders are $9 \times$ 20 inches, and the driving wheels 4 feet 6 inches in diameter, with hubs of cast and tires of wrought iron. The entire weight of the locomotive is 10 tuns.
With the old machine was exhibited a portion of the original track above mentioned. The rails were rolled in Engfand, and were supported on stone blocks prepa


## THE "JOHN BULL" LOCOMOTIVE.

in a moment by turning a binding eye on the upper side of
he chest. Lastly, on the under side of the lid may be in troduced two resistance coils of one to ten Siemens' units, which, again, may be similarly inserted or excluded.
In testing a lightning conductor, the process is as follows: 1. The wire is unwound from the roller, drawn up to the roof, and the end of it wound about the point of the conductor. 2. The chest is opened, the element lifted over into the salt solution, the chest rlosed again, and so placed that the needle is still; then the binding screw of the roller is connected with that of the chest with a piece of wire. 3. By means of the small binding screw in the bottom of the chest, a wire is connected with the lower part of the wire rope o the lightning conductor, and is brought to the second bind

ing screw of the chest. If there be perfect electric connection between the upper point of the conductor and the lower parts, the needle will be defiected. Should the lefiection not occur, the place of interruption is sought for by connecting the lower binding screw with the wire at successively higher points. 4. For investigation of the earth conduction, the point of the lightning conductor is excluded, by detaching the wire and connecting it with a neighboring gas chaning the wire and connecting it with a neighboring gas chan-
delier, an iron spring, or an iron rod forced deep into the delier, an iron spring, or an iron rod forced deep into the
ground, and then the circuit is completed as before. The ground, and then the circuit is completed as before. The
deflection of the needle will be greater, the more perfect the earth conductor. Important advantage is here derived from the above mentioned arrangements for insertion of the re sistance coils, or only one or the whole of the galvanic windings. After use, the element is lifted back out of the solution into the empty glass, and the galvanometer needle again arrested.

## How Psycho is Worked

lt will be remembered that not long ago we illustrated Messrs. Maskelyne and Cooke's famous automaton Psycho, which has been exhibited in London, and which has puzzled every one who has attempted to explain its interior mechanism. The figure is seated, cross-legged, on a cushion which is supported by a hollow clear glass cylinder, so as to show that no mechanical apparatus connects the automato with the space beneath the stage or platform where a manipulator might be concealed. It has often been conjectured that the motive power was compressed air forced up through the eylinder, and this connection was strengthened when a prying Yankee, in one of Mr. Maskelyne's audiences, requested to be allowed to place a newspaper beneath the low er end of the tube, which request the exhibitor refused. Subsequently, however, the compressed air adherents were thrown into confusion by Maskelyne withdrawing his refus al and allowing the insertion of the newspaper. Now the London Spiritualist returns to the charge, with the same heory advanced in a new way. Psycho, its says, "is worked by varying the pressure of the air inside the glass cylinder on which the automaton stands; the compression of the air acts like a push, and the partial exhaustion of the air act like a pull. The pashing and palling action of this invisi ble rod-for committee men are not like provincial pigs, able
starts and stops clockwork machinery at the proper moment inside the automaton. The air enters and leaves the glass cylinder through the green baize or other fabric on which the cylinder stands, portions of the air channel being concealed under the baize. There are two ways of working the figure. In the one case, the pedestal may be directly connected with the air pump apparatus by means of a pipe passing through the stage. In the other case, the figure may stand upon a pedestal connected with no pipe. Compressed air is then contained in a metallic vessel inside the pedestal, and its escape is permitted or stopped at will by means of an electro-magnetic valve. To work this valve, the feet of the pedestal are connected with fine wires running through the stage to the battery and the electrical commutator.
"Any committee men who wish to stop the working of Psycho can do so by placing a large folded newspaper over the top of the pedestal, so that air cannot be blown backwards and forwards into the bottom of the glass cylinder; but they must watch closely that Mr. Maskelyne does not punch a hole in their newspapers to let air through. Another way of stopping the working of Psycho is to mount the bottom of the glass cylinder pon three or four bungs, which anybody may take in his pocket to the Eapption Hall. If the bottom of the cylinder is thus removed from the surface of the green baize, no blowing of air through the baize will much vary the pressure of that inside the cylinder.
The Spiritualist ought to be expert in matters of this kind, and therefore we look upon its opinion as semi-professionIn any event it is the most plausible elucidation of the mechanism that has yet appeared.

## $\triangle$ NEW TACKLE.

We illustrate herewith a novel apparatus for setting up ships' rigging, which may also be applied to any purpose whereheavy weights are to be moved over small distances. It was paten ted October 3, 1876. through the Sci entific American Patent Agency, by Mr. Thomas F. Hall, of Omaha, Neb A are two guide rods, the upper ends of which are connected by bars, B, to and between which is pivoted a pulley, C. The lower ends of the rods, A , are connected by bars, D , to and between which is pivoted a pulley, E , the pulleys, C and E , being thus always kept at the same distance apart. $F$ is a double chain pulley, the two parts of which are of different diameters. The double pulley, $F$, is arranged between the pulley, $F$, crossbars of the frame, $G$, at th crossbars of the frame, $G$, at
onds of which are arranged the rods ends of which are arranged the rods,
A, which are capable of sliding up A, which are capable of sliding up
and down through the frame. Beand down through the frame. Be-
tween the bars, $H$, are pivoted pulleys, $I$, at such distance from double pulley, F, that the chain, J, can pass between them freely. $J$ is an end less chain which passes over the pulley, $C$, and the parts pass down upon the opposite sides of the double pulley, F, one part passing along the groove of the part of said pulley of greatest diameter, and the other part passing along the groove of the part of the pulley of smallest diameter The parts of the chain, J, pass o cross each other between the pulleys, F and I, pass down upon the opposite sides of said pulleys, $I$, and around the pulley, E. The power is applied to the shaft of the double pulley, F. The crossbars or frame, $B$, is connected with the rigging or weight, and the end of the frame, $H$, is connected with the side of the vessel or support. As the pulley, F, is turned in one direction, it moves slowly up the chain, J, toward the pulley, C, drawing the frames, G H, toward the bars or frame, B, slowly, but with immense power, the pulleys, C E, keeping the chain, J, always taut, and the pulleys, I, holding the said chain in place upon the pulley, $F$.

## Smoky stoves.

There is a very simple way of avoiding the disagreeable smoke and gas which always pours into the room when a fire is lit in a stove, heater, or fire place, on a damp day. Put in the wood and coal as usual; but before lighting them, ignite a handful of paper or shavings placed on the top of the coal. This produces a current of hot air in the chimney, which draws up the smoke and gas at once. Not one person out of fifty ever thinks of this easy expedient.

Iron is a dangerous ingredient in fire brick. When a brick containing iron is exposed, even at a low temperature, to gases containing carbon, part of the carbon is deposited near the iron. This has often not only caused the brick to lose its cohesion, but may even burst it so as to throw dowr. lose its cohesion, but may even burst it so as to thr
the iron walls of furnsces and the linings of flues.

IMPROVED TOOL HOLDERS AND CUTTERS.
The forms of tool holders and cutting tools shown in the annexed iliustration are the subject of a patent to Messrs. New and Matthews, of Nottingham, England, and Mr. W. H. Berry, of the same place. They speak for themselves, says the English Mechanic, and require but little description, The tool holder is adapted for holding securely in a rectangular tapered slot a right hand or left hand cutting tool at suitable and fixed cutting angles (such tools being secured firmly by a serrated wedge and clamps held down by a swivel bolt and nut), also for holding in suitable tapered slots a straight tool and a cross tool cutting on either side at right angles. These tools are secured firmly by clamps held down by swivel bolt and nut. This holder is adapted for using the patentees' special sections or round or square steel. I'he in vention further con sists of three specia sections of steel, and may be made to any may be made to any size required. These sections of steel can be formed into uni form, angular, or round-nosed tools for right or left hand cut ting. From these special sections a variety of tools suitable for various cutting pur poses can be produced which are particular ly adapted for the rectangular tapered slot in the. holder From the saime From the same uni form bar $\mathbf{o}_{\mathrm{f}}$ steel, tool can be cut in suitable lengths, a.nd then without being forged, ground to a proper

lishments for the making of all such pharmaceutical preparations as may reasonably be expected by a chemist of the present day. Whether it is the duty of the Council to act the part of an educating body, either for students or mature pharmacists, I leave for the present (although I have a very decided opinion on the subject), my object on the presen occasion being to assist those who may be in the same diffi culty which I have felt. Having no set of apparatus to guide me, I should have been glad of information. I therefore send a short description of what $I$ have found to answer my purpose, with a drawing of the apparatus.
A is a copper boiler holding about 12 gallons, fixed in a wrought iron jacket and heated by a ring gas burner.
is turned into the worm, $H$, about 4 gallons of water per hour are obtained. Two gallons of aromatic spirit of ammonia may be run over during the day, in conjunction with ther preparations. I would add that it is well to cove the top of the boiler, and the sides of the pans and pipes, with felt, which effectually prevents a considerable loss of heat by radiation.

In the Dock Warehouses of London
A writer in the British Trade Journal has been exploring he vast warehouses of the East and West India Docks of London, where the cargoes of whole fleets of vessels ar stored, pending the sale of the goods to wholesale mer ored, pending the sale of the goods to wholesale mer the most valuablear ticles of importation such as drugs, ivory feathers, etc., and about which a large variety of curious and interesting inform tion was gathered. In the drug depart ment one sees such costly articles as va nilla, musk, amber gris, and the variou kinds of essential oil undergoing manipula tion. Each packag of musk is carefully sorted, and every indi vidual pod subjected to close scrutiny, for Ah Sing has a peculiar knack of deftly introducing differen foreign substances in to the pods and closing them up again. Some mysterious compound known as Chinaman'

## MESSRS. NEW, MATTHEWS, \& BERRY'S TOOL HOLDERS AND COTTERS.

 earth, is a favoritcutting angle for the several purposes required. Further, the novel shape of these special sections, when placed in the new holder, gives a positive and fixed angle for cutting.
Fig. 1 is a side elevation of tool holder in section (on line, G H, 4). A is a rectangular tapered slot; $B$ is a tapered slot at right angles to the lengthway of the holder; C is a tapered slot parallel with the lengthway of the holder; 2 is an elevation of the tool holder; 3 is an elevation in section (on line E F, 1), showing the tapered slot, C; 4 is a plan of tool holder, showing the rectangular tapered slot, $A$, and tapered slots, B B and C; 5 is a front elevation of serrated wedge, and 6 is a side elevation of it; 7 is a front elevation of clamp, and 8 is a plan of it; 9 is a front elevation of swivel bolt and nut, and 10 is a side elevation of the same; 11,12 , and 13 are the special sections of steel particularly adapted for the tool holder to be held in the rectangular tapered slot, A, $1 ; 14$ is a side elevation of the right hand tool for cutting out corners, 15 is a front elevation, and 16 is a plan of it; 17 is a plan of a left hand tool for cutting out corners, and 18 is a front elevation of it; 19 is a plan of a right hand round-nosed tool; 20 is a plan of a left hand roundnosed tool; 21 is a side elevation of a straight tool, and 22 a plan of it; 23 is a side elevation of a cross tool; and 24 a plan of it. The tapered slots, B and C, in 1, are adapted for holding cutters severed from a bar of steel of uniform section, but thicker upon one edge than the other, as shown in section in 25 . The patentees claim the constructions of the tool holder, as described and illustrated, and the three special sections of steel, particularly adapted for the rectangular tapered slot of the new tool holder. 11, 12, 13, and 25 are full size, as shown; the others are half size.

## PHARMACEUTICAL APPARATUS.

by ootavive oordre
It has been frequently urged upon the Council of the Pharmaceutical Society of England to provide in their rooms a set of apparatus suitable for the use of retail estab
iron, the water is brought to a boil much more rapidly; it does not foul so soon, and is altogether better adapted for was so cheap as coal, but from its being clean, free from smoke, and at once lighted lowered, or put out, as occasion may require.
The boiler is supplied with water direct from the main by merely turning on the tap, B. The boiler is provided with steam gage, $C$, which blows off at 5 lbs. pressure, also with a water gage, $D$, and with a suitable arrangement for blowing out the boiler whenever it becomes foul by deposit of lime, etc. H is a galvanized iron tank, provided with a tin worm,so that all waste steam may be condensed as distilled water; those who are accus tomed to use distilled water for all dispensing purp ises, making tinctures, infusions, decoctions, indeed all pharma ceutical preparations, will fully appreciate this part of the arrangement. The whole of the pans, etc., being copper tinned, all the condensed steam is available as distilled water. The pan, E, holds 16 gallons, and is adapted for decoctions, etc.; its evaporating power is about 2 gallons per hour The pan, F , holds 6 gallons, and being fitted with a suitable head and worm, is used for all the distilled medicated waters, such as dill,cinnamon,peppermint,etc.,also for recovering the spirit from extract of colocynth and such like preparations, It distils about 1 gallon per hour. $G$ is fitted with an earthenware still (holding about 3 gallons) with head and worm of the same material, fixed in an oval jacket. This is only used for aromatic spirit of ammonia, for which pur pose it is well adapted; being the furthest from the boiler the steam power is less, and there is but little risk of the luting being displaced, especially if the carbonate of ammonia is added at several times in small quantities.

The amount of gas used is about 50 feet per hour, costing in London somewhat less than 6 cents; but by saving the condensed steam, sufficient distilled water will be obtained $t$
adulterant of this highly priced natural perfume. Amber gris, a peculiar secretion of the sperm whale and the bas of many scents, was not a great number of years ago ac counted worthless, but as much as five guineas an ounce has since been paid for it. Essential oils occupy an impor tant place in the drug warehouse
We noticed a large vat for the reception of cassia oil, capa ble of holding 200 gallons. This oil has to be turned out of its original packages and bulked, or mixed together, buyers being chary of investing in an article which exhibits very unequal quality. Proceeding from the drug warehouse, we ascend to the department devoted to ivory and tortoiseshell The greater proportion of the former produce which reaches the London market finds its ways to this warehouse. Every separate tusk is examined here at the hands of men whos long familarity with the business enables them to detect th slightest imperfection. Each tooth bears on its surface record of its own defects, which are expressed by certain cabalistic characters well understood by the trade. The dealer is able to place perfect reliance on these descriptive marks, and they, perhaps more than his own judgment determine his biddings. Of the ivory of commerce, that hailing from the Gaboon is considered the best. It has a pe culiar transparency, and, keeping its color well, is used for carving articles of a superior description. The largest tusk are those from Egypt and Zanzibar. One was pointed out to us from the latter place which weighed 128 lbs ., thi being, however, a tooth of quite exceptional size. Its de funct possessor would no doubt have proved an immense acquisition to a menagerie, for he must have been a very giant among giants. Every now and then a parcel of ante diluvian ivory is forwarded from Siberia for sale. A pass ing glance at the tortoiseshell department reveals a good stock of that remarkable product. The cleats or pieces o shell which bind the plates together on the reptile's $b_{a c}$ were at one time valueless, but, strangely enough, now find a market in Japan as the material for the native jewelry Another floor of the warehouse introduces us to a $r_{a}$.he

sImple pharmacedtical apparatus.
novel show, that of birds, birdskins, and feathers. Here are cases upon cases and piles innumerable of feathered victims, from the magnificent Impian pheasant off the Himalayas to the tiny humming bird of tropical America. The birds and birdskins are carefully sorted, and particulars taken for the transmission to the brokers, who are thus able to prepare their sale catalogues. One of the latter is before us, and although it is only a supplementary one the following are among the goods it specifies: 3,297 jays, 1,073 kingfishers, 1,047 ospreys, 649 red and orangetanagers, 394 parrots, 98 red ibis, 1,095 bee eaters, 653 bronze merles, 1,416 humming birds, and 2,023 various. Coming to the feathers, ostrich, of course, occupy the place of honor, both as regards quantity and relative value. Among other feathers are those of the osprey and the marabout or paddy bird of India. The latter are very pluffy and graceful in appearance, and in color are either a snow white or gray. The whole of the feather and bird business of London is concentrated in
this warehouse, and the value of the peculiar merchandise here on show monthly is something about $\$ 250,000$.
The storage room, devoted to silk, is very considerable; and as far as possible, the different varieties, of which the and as far as possible, Che different varietas, and Japan, are kept distinct. Each skein has to pass muster, the inferior or damaged ones Each skein has to pass muster, the inferior or damaged ones
being thrown out; and the merchantable bulk of every bale being thrown out; and the merchantable bulk of every bale
is then enclosed in a hessian covering, which, when sewed up, constitutes a company's package. Bengal silk is in
skeins, that from China in flattened bundles or books, and the Japanese skeins are tied up in grape-like bundles. The twine used by the Japanese silk packers is made of paper, but nevertheless wonderfully strong and of beautiful regularity. They are very liberal in the use of paper bands, which enclose the skeins in all directions; but as this paper is carefully preserved by the sorters and weighed off agains their object, which is to get credit for paper as if it wer thilk. In the storerooms are between five and six thousand silk. In the storerooms are between five and six thousand
bales of silks. The fac's of blinds being fitted to all the bales of silks. The fac's of blinds being fitted to all the
windows is calculated to puzzle the uninitiated, but this is windows is calculated to puzzle the uninitiated, but this is
a precautionary measure of some importance, it being found that the exposure of silk to light and warmth results in appreciable loss of weight.
The chief source of the indigo supply is India, but of late years the Central American States have been sending increasing quantities to this market. Bengal indigo, especial-
ly that classed by importers as Bengal blue, is most highly ly that classed by importers as Bengal blue, is most highly esteemed. Then follow Bengal violet and copper indigoes,
and after these rank Oudes and Madras. The culture of the indigo plant is very precarious; and it thus happens that, al though the consumption is tolerably uniform, the price is liable to violent fluctuations.
Inside the indigo warehouse there is but one universal color, and that is blue. The atmosphere is of a cerulean haziness, and the men, as they move about, give one the im pression of having been in a dye bath. Certainly the blue ness of Gainsborough's blue boy would have been doubly intensified by a brief sojourn in this region. The cases of indigo are weighed, tared, and samples drawn for display in the show rooms on the fifth floor. The skylights of these fine rooms are so arranged as to throw the light from the north on the samples of indigo arranged in long lines of
trays below. Color is, of course, the chief guide to quality, lightness being also a characteristic of good indigo.

## Gutregymuleutr.

## A Colossal Fortune Undeveloped

## To the Editor of the Scientific American:

For many years the subject of limiting the production of cotton, to bull the price to a more remunerative figure, has engaged the attention of many cotton planters in the South. If but a tithe of the mental labor which has been fruitlessly expended in this direction could be devoted to the invention of means by which the cost of production of cotton
could be diminished 1 cent per lb., we might well look for most important results.
In the great Northwest, there has grown up within a few years a gigantic empire, teeming with its millions of thrifty farmers, who are able, by the aid of improved agricultural machinery, to produce the grain crops which feed a notable part of the civilized world. It is well known that this great result would not have been possible without the labor-saving machinery which has enabled them to compete in the markets of the world. But if we look at the cotton culture of the South, it is matter of great surprise that the production of so important a staple, involving so much constant manual labor, should have received so little assistance from inventors. There cannot be a more inviting field for memuch thought for ten years, I wish to direct the attention of mechanics to the nature of the demand and the probable means by which the supply can be achieved.
A given number of hands, in the rich cotton belt, can plant and cultivatedouble the quantity of cotton during the spring and summer that they can gather and prepare for the market in the fall and winter. Here, then, is a limit to the
production of cotton which compels the culture of other crops in connection with cotton, crops which do not require labor in the season of cotton picking. Machinery for harvesting the cotton crop will enable the planter to double the quantity of cotton which can be produced by a given number of laborers. Here, then, is the first great want of the cotton grower.
I believe the man who successfully supplies this great
ton crop what the improved reapers are doing for the wheat crop of the Northwest, will require a sewing machine to make his money bags. Then application of the buggy plow
to the cultivation of the cotton plant will naturally follow and still further diminish the cost of production.
Shortly after the late war, an ingenious Yankee exhibited in the South a device for picking cotton, which did the work, it is true; but it required to be brought to bear upon the cotton boll with something of the precision which points
a gun at a bird. A southern negro would easily gather ten gun at a bird. A southern negro would easily gather ten
ocks of cotton in the time required by the inventor to bring locks of cotton in the time required by the inve
If I could be permitted to advise the would-be inventor of a cotton-picking machine, I would say: Take your first les ron in a cockleburr patch, as it is here called; pass through it,and note how tenaciously the numerous barbed points up.
on the burrs catch and hold your clothing. Thus you will on the burrs catch and hold your clothing. Thus you will find the first elementary principle of the cotton picker. Pass through the patch again upon a windy day, and note how your coat tail flies about in the wind, hunting, as it were, for the burrs that so readily seize it; and note also the in creased number of burrs you bring away with you. Here ou have a second lesson in the elements. Expand the ockle burr into a drum or cylinder covered with card clothng, such as is used in treating cotton or wool, but with eeth so fine as to exclude the limbs and leaves of the plant, seiztog anly the lint. Let there be two of these card cylin ders, revolving in opposite directions, one upon either side of the row of plants; let them be placed nearly upright, eaning obliquely towards each other like the opposing raf ters of a roof, so as to conform somewhat to the pyramidal form of the plant; let them be geared so that they can be raised or lowered by a lever to suit the hight of the to suit the breadth of the plant. Let each cylinder be provided with a comb or counter card, to remove the accumulated cotton from the card teeth, and drop it into proper receptacle upon the machine. Let the whole e mounted upon broad-tired wheels and drawn by two horses, one upon each side of the row of plants. Let a sui-
table rotary fan be attached below, to send a strong draft of air up through the cotton plant to put the long, loose locks of lint in active agitation, so that they shall industriously search for the card teeth, and also to blow away sand and dust from the lint, and thus improve its quality. Do this, and you have the dry bones of a cotton picker, to be carefully studied, elaborated, and clothed in suitable habiliments,
vise.
Itis
It is not necessary that the cotton picker shall do its work cleanly; if it can but garner two thirds or three fourths of of the crop, manual labor will take care of the remainder. The customary price for picking cotton by hand is 75 cents per 100 lbs. of seed cotton, the average yield of which, in
marketable lint, is 33 lbs. The cost of hand picking,therefore, is 24 cents per lb., a very large item, which ought to be re duced, by appropriate machinery, by more than one half. A successfulinventor who should exact as his royalty only $\frac{1}{8}$ of 1 cent per lb. upon the cotton crop of the United States might fairly figure his annual income at more than $\$ 3,000$, 000, a sum worth striving for by any mechanic who has the gift of invention.
If these suggestions should drop a germinating seed into the fertile brain of the coming man whois destined to immortalize himself by the invention of a successful cotton picking machine, I shall be most happily rewarded for my Rome, Ga.

Robert Battey, M. D.

## Boller Explonions.--A Suggention to Experts.

To the Edditor of the Scientifc American:
The importance of the subject emboldens me, although not an engineer, to ask for a little space in your valuable journal, to allow me to rejoin to a communication from L. B. Davies, as to the cause of boiler explosions, which appears in your issue of November 18. I beg to be understood in advance that I have no intention of opening a controversy with an expert such as Mr. Davies seems to be, and that what I shall say is to be taken merely as a suggestion to practical ongineers that, possibly,there may be a cause for such accidents which has been overlooked. The experiments as to the action of water under repeated heating, that I shall preontly detail, wereinstituted three years ago in consequence of a series of investigations described, if Irightly remember, in the Journal des Débats, of Paris. The point was not diectly raised by the article, but some collatoral statements ed me to question whether water, such as is ordinarily used for motive purposes, might not possibly acquire an explosive property by frequent heating. Although water is a protoxide of hydrogen, as a matter of fact, as found in its natural state in rivers and reservoirs,it contains a considerable percentage of nitrogenous admixture, partly in the form of animal and vegetable life containing nitrogen, and partly in compounds resulting from the decomposition of animal and vegetable tissues. The sedimentary coating it deposits in boilers, and the column of sediment that settles in a test tube after protracted boiling, are sufficient evidence as to the importance of the compounds held in solution to any
careful and accurate investigation of thecauses of explosion, in instances where inspection has failed to reveal any defects in the boiler itself. Again, under protracted jar, iron columns often acquire molecular properties that render them extremely brittle, and it is very possible that boiler iron under frequent heating and tension, saying nothing of that cannot readily be detected even by an expert.

The experiments I have to detail were conducted in test tubes, with Croton water first, and afterwards with water obtained from the Hudson river. The degree of heat em. ployed was uniform. The tubes used were two ounce,tightly corked with rubber stoppers, through each of which was passed longitudinally the refuse spout of a subcutaneous syringe, for the escape of steam. For the experiment I used seven tubes, each loaded with half an ounce of water. Six of the tubes were employed in this manner, namely, five of the six as a reservoir with which to replenish the sixth,thus eliminating one after another until only the sixth should remain : the seventh to be replenished with fresh water as often as the exhaust reduced its contents to one
third of an ounce. That is to say, heating each in succession for five minutes: as often as the contents of any one of the first six was less than one third of an ounce, it was brought back to the original volume of water by replenishing from out its fellows, and so on until five of the six were empty; while, when the seventh had lost one third of its con tents,the deficiency was supplied with fresh water from two and a half ounces reserved. The tubes were of average thickness. The interval allowed between boilings was one hour, during forty minutes of which the tubes were sus pended in cold water to insure the necessary lowness of temperature. The thermometrical tests in each case were made with a very correct medical thermometer; and the external urface of each tube after cooling was carefully cleaned with astrong solution of caustic potash. The heating instru ment was an alcohol lamp, filled after each series of heating and carefully trimmed; and previous to each series I took the precaution to heat four ounces of fresh water in a tin cup for seven minutes, and then to test the heated water with the medical thermometer, in order to prevent any apreciable variation of temperature. Under these conditions the test tubes being suspended by a wire loop always at the same distance from the tip of the wick, each time found that there was a fixed diminution in the time re quired for perceptible boiling, after each experiment, and that the loss in volume by conversion into steam increased a rifle at each heating. The average first term with all the tubes was 3 minutes and 41 seconds. The last half ounce of the three ounces allotted to the six tubes roplenished from oach other boiled in 2 minutes and 47 seconds. The same quantity in the seventh tube, constantly replenished with fresh water, boiled in 3 minutes and 5 seconds, the diminu tion in time being 54 seconds in the one case, and only 36 in the other. Using three ounces of water from the Hudson iver, in six tubes, under the same conditions, the average time of boiling at the first series of heatings was 3 minutes and 38 seconds, while the last half ounce boiled in 2 minutes and 27 seconds, a diminution of 71 seconds. Using three ounces of filtered Croton water, under the same conditions, the first term was 3 minutes and 49 seconds, and the second minutes and 13 seconds, a difference of orly 36 seconds. I have carefully repeated these experiments a sufficient number of times to convince me that these phenomena are pretty constant; and, from the difference between filtered and unfiltered water in respect to them, it must be concluded I think, that the presence of organic compounds has con siderable influence in bringing them about. There is also a phenomenon, not readily described, but one readily appreciable by the eye-a manner of boiling, so to speak-which would enable an expert to guess pretty accurately whether a volume of water had been frequently heated, or was merely undergoing that process as virginal. It consists principally in the fact that water that has been persisteatly poiled and cooled breaks suddenly and violently into ebulliboiled and cooled breaks suadenly and violently into ebull.
tion, as compared with fresh water under the same degree of heat. The experiments seem to indicate that nitrogenous
ore of heat. The experiments seem to indicate that nitrogenous
compounds are responsible for this phenomenon, which in the last half ounce of a three ounce reduction pretty broadly suggests that the liquid under experiment has acquired an explosive property that, under such conditions of high heat as occur in using steam as a motive power,might prove very dangerous and destructive. I will not presume to say that experiments conducted on such a small scale are conclusive, save as establishing the fact that ordinary water acquires the property of yielding to heat the more readily in proportion to ne number of times that it is heated, and that an in creased rapidity of conversion into steam accompanies each ncrement of this change in molecular properties. I believe and for the sudden violence of ebullition that accompanies it; but this point I have not been able to verify with the faciliies at my command.
New York city.
F. G. F.

Suspended Animation à a Prenerving Agent.
To the Editor of the Scientifc American:
On page 225 of volume XXXIII of the Scientific Ameri can, you have an article on the above named subject in future experiment. These are: 1 . The power some animals have of rendering their natural prey utterly insensible for an indefinite period. 2. The peculiar effect of cold on some of the lower animals, which reduces them to a state, not death, nor yet the ordinary torpidity caused by low temperature in other organisms. 3. Hibernation. In considering each in turn, you give as an instance of the first the complete torpor or anesthesia produced by the sting of the female of the "digger" wasp upon its prey; of the second, the well known torpor produced by cold in the case of serpents and certain fish, with subsequent return to activity on the application of heat: and lastly, hibernation is explained by the fact that "the muscular irritability of the left ventricle of the heart, highly increased, permits it to contract under the weak stimulus of
the non-oxygenated blood. It is this exaltation of a single
vital property which preserves the animal life." One or two quotations from recent lectures of Dr. Brown-Séquard in your city will serve to indicate several other methods of investigation. The learned doctor gives an instance of a dead ox having been kept 56 days without putrefaction. M. Flourens considers that a spot in the medulla oblongata is the focus of vital force. There is, you know, a spot which is pierced by the matadors in Spain when they rush to kill a bull immediately. Death occurs instantly. * * It is interesting to know what becomes of the nervous force in these cases. It seems to have been altogether lost. I say it seems, for if we examine a little further we find that it is only dormant. The nervous centers have lost it almost altogether, but the nerves are quite rich in nerve force, so much so that I have kept one of those animals for nearly 65 days in my laboratory, without any trace of putrefaction, at a temperature which varied between $45^{\circ}$ and $65^{\circ}$. The lack of putrefaction certainly depended on the long persis tence of the nerve force after death,"
Animals thus killed could no doubt be transported across the Atlantic from North or South America, in sailing vessels, without loss of weight and with little expense. It would be interesting to know if simple compression of the medulla, as by a ligature, for example, would not so suspend anima tion that it could be recalled at pleasure.
I quote further from the same author: "You know that they (the fakirs of India) may remain dead to all appearance for a number of days, and, it is even said, for months, without any change occurring in the body, withoutany change in the weight, without their receiving any food. They show neither circulation nor respiration, as their temperatures diminish very considerably, and altogether present a series of effects which are certainly very marvelous. But in the light of the fact that $I$ had a dead animal in my laboratory lying fox several months without any sign of decompnsition, in a
temperatưre varying from $40^{\circ}$ to $60^{\circ}$ during day and night, temperature varying from $40^{\circ}$ to $60^{\circ}$ during day and night,
we can understand that these fakirs may remain able to live we can understand that these fakirs may remain able to live
although they do not live-that is, they do not have actual although they do not live-that is, they do not have actual
and active life. But why, you will say, do they come out? and active life. But why, you will say, do they come out?
Admit that there is in us a power which is quite distinct from our ordinary power of mind, which is quite distinct from that which we call consciousness, which during our sleep is awake and watches: with this admission and the facts I have mentioned above, we have all the elements, I tbink, for an explanation of what has been said about the fakirs."
Although I do not quite comprehend this explanation. have thought it well to allude to it, as leading to a possible solution of the problem given toward the close of your article, namely that of having our own sensation and volition


Chatham, N. B., Canada.
John McCurdy, M. D.

## The Supposed Planet Vulcan.

To the Editor of the Scientific American:
I felt much interest in the discussion on the planet Vul can ; and if all the observations are genuine, they are to tally irreconcilable with any hypothesis as to the periodicity of the planet yet proposed. I think it was in the winter of 1872 that I gave you my observations, which you published, of a transit of the planet seen-as I have since de-termined-by me on September 15, 1859, in the forenoon. If I recollect rightly, I gave the diameter of the planet as apparently 24 inches, taking the apparent diameter of the sun as 28 inches. This was about 8 o'clock, A. M., when the planet had just entered on the eastern limb of the sun, a little south of the sun's equator. The sun being near the horizon, it was enlarged by refraction. The planet was nearly, if not quite, two hours in making the transit, and I looked at it every five or ten minutes. We used only a smoked glass. In studying and comparing the phenomena I attributed to this planet, I found a regular recurrence of the phenomena at about the end of 23 days. By averaging the periodicity, I fixed it at 23.02 days. During over ten years I have minutely observed the recurring phenomena, with a view of verifying both the theory and the periodi city, and I have found but little if any variation in the periodicity. I do not claim that it is exact, but I am satis fied it is as near an approximation as can be
til the planet's true position is determined.
I believe that the planet has an enormous size, at least equal to that of Uranus: and therefore the planet has never been seen by the observers who saw small black specks
make transits of the sun. If any such speck has been make transits of the sun. If any such speck has been
seen, of which there can be no doubt, then it was a satellite seen, of which there can be no doubt, then it was a satellite
and not the planet. I believe, however, that Mayer saw the and not the planet. I believe, however, that Mayer saw the planet make a transit on March 15, 1758, when he saw a size with my observation in 1859.
It is to be regretted that M. Leverrier rejected all the observations where no forward movement of the speck was observed; for if it were a satellite, it might for a time be stationary, or have even a retrograde as well as a forward movement. The following calculations have recently been made:
From 1758, 74 days, when seen by Mayer at the descend ing node, to 1859, 258 days, when seen by Tice at the ascend ing node, is 101 years and 184 days $=37074 \cdot 24$ days $\div \mathrm{R}$ $(23.02)=1610 \frac{1}{2}$ revolutions +0.55 days.
From 1758, 74 days (Mayer), to 1859, 85 days (Lescarbault) is 101 years 11 days $=36900 \cdot 25$ days $\div \mathrm{R}=1603$ revolutions +0.19 days. Both these observations were at the descending node; therefore a whole number expressed the number of revolutions.
From 1758, 71 days, to 1876, 91 days (Wolf and Weber,

April 4, 1876), is 118 years and 20 days $=43119 \cdot 50 \div \mathrm{R}=1873$ $\mathrm{R}+3 \cdot 08$, from which deduct 2 days for the time it will take ing 1.0 days. My position for the planet was for April 3 , 1876, at its inferior conjunction, or the day before the observation of the small speck.
From 1859, 85 days (Lescarbault), to 1859, 258 days (Tice), is 173 days $=7 \frac{1}{2}$ revolutions $+0 \cdot 36$ days. From which has is 173 days $=7 \frac{1}{3}$ revolutions 0.36 days. From which has
to be deducted difference between time in Europe and Amto be deducted difference between time in Europe and Am-
erica, which will leave a difference of between 2 and 3 hours.
Mayer's observation and the observation of October, 1802, ives 707 revolutions +2.98 days, deducting 2 days for passage from node; this leaves 0.98 day; but one is an obser vation at the ascending node, and the other at the descen ding node, therefore there should be half a revolution. It is therefore half a revolution, say 11.50 days, short. But here a remarkable fact occurs, a series coming in as though there around the sun in the same period, 23.02 days.
From October 10, 1802, to October 2, 1839, is 13,506 day $=591$ revolutions $+1 \cdot 58$ days.
From 1839, October 2, to March 12, 1849, is 3,448 days $=$ $145 \frac{1}{2}$ revolutions +0.9 day.
From 1830 to either of the observations of 1859, there acks half a revolution. The observations of 1802, 1839 1849, lack half a revolution when compared with 1758, 1859, 876. The observation of March 20, 1862, has no corre sponding observation, differing with one series 7.56 days, and 14.08 with the other. The observations published in Scientific American for July 23 and October 24, 1876, belong to the series of 1802,1839 , and 1849. They are midway between the latter series and those of 1758, 1859, and
1876 . From July 23 to October 24 is 92 days; four revo 876. From July 23 to October 24 is 92 days; four revo utions of 23.02 days are 92.08 days.
It will be seen that the component elements of the probem as far as known are irreconcilable, because some may not be authentic. The way out of the difficulty is to look for the planet, not the satellites, outside of the sun when at its greatest eastern or western elongation. Its immense size will render it visible twice for a day or so on each rev lution, under proper conditions of the atmosphere. I did see it, and showed it to my family on the afternoon of June,
1876, in the exceptionally blue and serene atmosphere of 1876, in the exceptionally blue and serene atmosphere of orthwest of the sun.
It probably may make a transit of the sun on March 12 , 1877, as it will be at its inferior conjunction on that day and 4 or 15, 1878 , node. I expect it to make a transit on March may be visible at the total eclipse of July 29, 1878, but it will be very near the sun, having passed its inferior con unction a day or two before.

John H. Tice. junction a day
St. Louis, Mo

## New MIethod of Cutting Screws.

To the Editor of the Scientific American:
Thinking a method for cutting screws would be of bene to some of your readers, I send you the following, which not generally known
When the screw tool has cut the required length of screw he quickest way of taking the saddle back is by hand nd to do that, the part of tailstock which comes in contac with the saddle must be set a certain distance from it; and o find that distance, it must be known which are the right places for putting the nut in and out of gear with the leading screw. But previous to setting the tailstock the required dis tance from the saddle, the screw tool must be set true and opposite the end of the work to be screw-cut-wherein some cases a hole is drilled-likewise the nut in gear with the leading crew. The following rules for getting the above distance wil be found to answer for any pitch of leading screw: First, when he number of threads per inch required to be cut can be dirided by the number per inch of the leading screw without any remainder, the nut will be right when in gear with any
part of the leading screw. And in all other cases, multiply he number of threads per inch that you wish to cut by some number of inches (which will depend upon the length of the screw to be cut) that will give an even number, which will be the proper distance to move the saddle.
I have used this mode for several years on both male and emale screws of single, double, and triplethreads, andhav ever known it to fail.
Smithville, N. J.
Edwin Jodd.
Smilerg Health Lift.
Dr. Smiler, says Max Adeler, had a large tank placed on the top of his house from which to supply his bathroom, and so forth, with water. The water had to be pumped up about fifty feet from the cistern in the yard, and the doctor found it to be a pretty good-sized job, which would cause him constant expense. So after thinking the matter over very carefully, one day an idea struck him. He built a room over the cistern and put word " Sanitarium" over the door. Then he concealed the pump machinery beneath the loor, and he rigged up a kind of complicated apparatus with handles and hinges and a crank, so that a man by standing
in the middle of the machine and pulling the handle up and in the middle of the machine and
down would operate that pump.
Then the doctor got out circulars and published advertis ments about "Smiler's Patent Health Lift," and he secured testimonials from a thousand or so people who agreed that the health lift was the only hope for the physical salvation it, and Smiler would rush them out to the "Sanitarium" and set them to jerking the handles. And when a custome
had pumped up fifty gallons or so, Smiler would charge him a quarter, and tell him that three months of that kind of thing would give him muscles like a prizefighter.
The thing became so popular that he had to enlarge his tank and put in a smaller pump; and he not anly got all his pumping done for nothing, but the people who did it paid him about $\$ 1,500$ a year for the privilege.
One day, however, Mr. Maginnis, who had been practis ing at the health lift every day for months, broke the boar upon which he was standing, and plunged into the cistern,
and just as he was sinking for the third time Smiler fished him out with a crooked nail in the end of a clothes prop.
A few days later Maginnis came round with a lot of othe patients, and cross-examined Smiler's servant girl, and learned about the truth, and then they went home mad. A consultation was held, at which they resolved to prosecut Smiler for damages and for obtaining money under false pretences. It is thought by good judges that, by the time the court get through with Smiler, it will be about the un healthiest lift for him he was ever interested in.

## Sawmill Machinerv.

The building devoted to the sawmill exhibit, which is ituated at the base of George's Hill, presents, says one of situated at the base of George's Hill, presents, says one of our contemporaries, a sight to the inquiring mind both in
teresting and instructive. In it may be seen, in operation, teresting and instructive. In it may be seen, in operation,
all the processes and machinery of a regular sawmill, all all the processes and machinery of a regular sawmill, all the leading manufacturers of this important branch of mathe most attention is that of the Stearns Manufacturing Company of Erie, Pa., who have some of the most beautiful pieces of mechanism at work that we have ever seen. To them was awarded a prize medal and diploma of merit for their machinery, on account of its manifest superiority of construction, in the many novel features and important improvements they have made (which are patented), and general excellence of workmanship. The Stearns Manufacturing Company have long been regarded as being at the head of this branch of business,and their productions may be found in sawmills all over the 'country. The central object of in erest in the whole sawmill building, one which command the attention of all the mill men,is a saw which cuts through a sixteen foot $\log$ in one and a half seconds of time, every revolution of the saw cutting in $10 \frac{1}{2}$ inches. This is the highest speed ever before attained, and shows conclusivel to what a high degree of perfection they have brought thei machinery. The work exhibited by them, in all its details, peaks emphatically for itself, and shows that the Stearn Manufacturing Company have no need to fear any rivals in their business,as their workmanship cannot be excelled. This is all the more true when we consider that those articles are taken from regular stock, and are not made specially for ex hibition. A better idea, therefore, can be had of the general excellence.

## Prompt Payment

" Prompt pay is the key to all success in business. There are times in the history of every trader when he finds it in convenient to meet his bills promptly, and in such case we
find the man who knows his credit to be good becoming find the man who knows his credit to be good becoming lukewarm, forgetting that his creditors are calculating upon him perhaps to meet some pressing obligation. The result is that he disappoints them, and thus, after one or two repe titions of the same, even the man whose credit is first class can soon impair it, and sometimes to a degree that makes it hard for him to recuperate. Now let us take the man of moderate (say fair) credit. He knows under such circum tances that his credit is scrupulously watched; and if his ills begin to lapse, he is at once notified of it, andinformed hat unless past bills are paid no more goods can be procurred. With such a contingency facing him, he sees it is to his interest to meet his payments promptly, and is on the high road to success. Prompt pay does two important things it inspires confidence in the seller, putting the buyer upon first class basis, and it insures the prompt shipment of goods.'
Our English contemporary, whence we extract the above sound advice, forgets to point out that there is a still greater advantage in seeking no credit at all, but in making pay ment at once. Persons who have not tried the cash system and we mean not merely in ordinary business transactions, ut everywhere, even in the small expenditures of the household) has any idea how much it simplifies the transac ion and benefits both the buyer and seller. Moreover it is saving to the purchaser of a very large percentage. We
have found, by inquiry among many retail dealers in this have found, by inquiry among many retail dealers in this city, that such houses as are in the habit of allowing credit
to their customers, from six months to one year, add on an average of at least ten per cent to the cash price. And this must be so, because the dealer cannot afford to lose the interest on his money and take the risk of a failure of payment of a portion, which is inevitable. Another fact for debtors, more especially of wine merchants, tobacco sellers, and tailors, is worth remembering: and that is that, where one of these dealers gives credit, he calculates that a certain percentage of the debts will never be paid, and this percentage is necessarily added to the charges made to all customers, both time and cash. There are multitudes of other benefits, which will suggest themselves to any thoughtful person, all accruing by the prompt cash system.

The American Institute Fair closed on November 25. Mr. . D. Curtis delivered an oration, in which he stated that the entries at the exhibition numbered 1,233 and the visitors over 500,000. Awards were given in the usual wholesale manner.

## DENNEY'S IMPROVED WASHING MACHINE

We illustrate herewith a new roller washing machine which is claimed to wash fabrics of any degree of fineness thoroughly and without injury. It is also adapted to the cleansing of garments, etc. The frame of the machine is made of cast iron, galvanized. The top roller, $\mathbf{A}$, has longitudi nal corrugations, and is covered with a sleeve of vulcanize rubber, which consists of a ply of cotton duck, having mere ly sufficient rubber on its under side to protect it from th action of the water, the requisite degree of elasticity being secured by the application of the greater thickness of rub ber to the outer surface. The lower roller is provided with peculiarly shaped channels, differently spaced from the the corrugations on the top roller. There is thus created an abrading action when the machine is working, while a pres sure is exerted by the top roller, which is held down by de tachable springs. The endless apron, B , passes over the lower roller and down around small carrying rollers, as shown. The rubber cloth of which it is made is prepare with the greater amount of rubber on the upper surface which fits it for contact with the most tender articles to b cleaned. The band is perforated so that the air and water contained in the channels of the under roller are utilized by being driven through the clothing. The inclination given to the band causes the clothes to adhere to $i t$, so that they can be run through past the top roll, and thereby cleansed out to their extreme ends. The apron acts as a conveyer, also to carry a larger quantity of water along with the clothing

to the rolls while the water may be used much hotter than usual. The rubber conforms to the uneven thicknesses of the clothing. The machine is designed to be used in an or dinary washtub.
In order to prevent the finer articles from sticking to the endless apron, a small narrow band, $C$, is passed around the apron, which band is carried down around a lower roller, so as to pull off the articles as they descend into the water
Patented by S. L. Denney, June 1, 1875, and May 9, 1876. For further particulars address the inventor at Gap, Lan caster county, Pa .

A Variety of Rare Chemicals for Twelve Cents.
A writer to of one of our exchanges, who has been assiduously perusing our scientific dissection of a cigar, wants to knowhow, with such an array of rare chemicals as pyridine, lutidine, pyridine, etc. ("' not to mention cabbagine and bur dockic acid"), any one can expect to buy a good cigar for less than ten cents. This is a financial view of the subject which had not occurred to us, but a moment's consider ation shows that it conceals a specious sophistry. Let u reply, Yankee fashion, by anotherquestion.
How can any one expect the cost of living to be furthe reduced when a pound of butyrolic acid, butyric acid, ca pric acid, caprilic acid, caproic acid, palmitic acid, myristic acid, vaccinic acid, stearic acid, oleic acid, oxide of lipyle, chlorine, sodium, potassiom, phosphate of lime, phosphate of magnesia, casein, lactose, mucus, albumen, iron, glyce rin, hircine, lacto-protein, lacto-albamen, besides bixin and orellin and hair (all of which, according to an actua assay of one of our metropolitan chemists, go to make the compound known as boarding house butter) is obtainabl for 12 cents?

## THE SPIROPHORE

This apparatus was recently described to the Paris Acade my by M. Woillez. It is for restoring asphyxiated persons, especially such as have been in danger of drowning, and new born infants. We are indebted to the Journal de Phar macie et de Chimie for the annexed engraving of the apparatus. It consists of a cylinder of sheet iron closed at one end and open at the other. The case is large enough to receive the body to be treated, which is let down into it as far as the head, which remains outside. A tightly fitting diaphragm closes the aperture about the neck. A strong air pump, C, containing more than four and a half gallons of air, is situated outside of the case, and communicates with it by a thick tube, T. It is worked by means of a lever, the descent of which produces aspiration of the air confined about the body. The raising of the lever again restores the abstracted air to the case. A transparent piece of glass, $D$, on the upper part of the cylinder enables one to see the chest and abdomen of the patient, and a movable rod, E, sliding in a vertical tube, is made to rest on the sternum.
M. Woillez states that he has made several experiments with the apparatus, the general results of which are as follows: When a human body is inclosed as described, and the lever quickly lowered, a vacuum is produced round the body, and immediately the external air penetrates into the
chest, the walls of which are seen to rise as in normal life. The ribs separate, the sternum is pushed up 0.393 inch a least (indicated by the movable rod which rests on it). Fur ther, the epigastrum, and even the abdomen below, presen an inspiratory projection, which shows that the enlargement of the chest is effected during this artificial inspiration no merely by the raising of the ribs and the sternum, but also

by the descent of the diaphragm. All returns to the forme position when the lever is raised again. These compiete espiratory movements may be repeated fifteen to eighteen imes in a minute, as in a living man.
By means of a tube fixed into the windpipe of the body and communicating with a graduated reservoir of air over a vessel of water, M. Woillez has measured the quantity of ir which thus penetrates into the chest at each pressure of the lever. He finds that this is, on an average, $1 \frac{1}{4}$ pints whereas the physiological average is only ${ }_{1} 70$ pint. More han 22 gallons of air can be made to traverse the lung of the asphyxiated person in ten minutes.
It is easy, then, to see the advantages presented by thi apparatus for treatment of the asphyxiated, especially rowning persons and new born infants. In all cases of as phyxia by vitiated or insufficient air, or by certain poison ings, in paralysis of the respiratory muscles, in most dys phoric affections, in asphyxia by bronchial mucosities, and that due to inhalations of chloroform, and lastly, in deter mining some cases of apparent death, the spirophore ma used to produce an efficacious artificial respiration.
This respiration is without danger to the lungs, which re not liable to rupture, however strong the action of the lever. This innocuity is due to the fact that the force of penetration of the air into the lungs is never superior in this case (as also in the case of normal life) to the weight of the atmosphere.

## A NOVEL AIR COMPRESSOR.

The annexed engraving represents a new machine fo compressing air by water pressure. Two cylinders, placed side by side, have an inlet pipe, B, and an outlet valve, $C$ water; there is also an inlet, $D$, and outlet, $B$, nd each cylinder contains a fioat, $F$. The pipes for admit ing water extend from near the bottom of the cylinders, to at off the air, into the curved bottom of a penstock, $H$, in which is a rock valve, J, for alternately opening and closing the passages to the respective cylinders. The stem of this valve extends out through the penstock in a saitable stuffing box, and connects with a rocking beam, $L$, one end of which connected to the fioat, $F$, of one of the cylinders by a rod $M$, and the other is connected to the other fioat by a simila

rod. The valves, at C, are so connected to the floats that, when they are raised by the water to the required hight, the loats open them to let the water escape and reverse the machine. By the filling of the cylinders with water the air is forced out through outlet, E , into the receiver; and by the ascape of the water the cylinders fill with air again, to be again expelled into the receiver. This device was patented October 24, 1876, through the Scientific American Patent Agency, by Mr. Henry H. Sawtell, of Randolph, N. Y.

## spontaneous Combustion of Sawdust.

Sawdust is a dangerous material wherewith to fill spittoons, nor is it a wholly safe substance to strew upon fioors. Several cases have recently been noted where conflagrations have been caused by cigar stumps igniting the sawdust, which smoldered slowly in the receptacles, unperceived, and inally set fire to the adjoining woodwork. Sawdust, wore ver, when slightly impregnated with oil or grease, is ver prone to spontaneous combustion. We published, not very ong since, an instance where the sawdust sifted down hrough cracks in the fioor boards, and accumulated between he beams, where it absorbed spilled oil. It eventually burst into fiames which nearly destroyed the entire edifice.

## A SOUNDING FAND SIGNAL FOR RAILROADS

To the end of the handle, to which the ordinary signa fiag is attached, a bell, C, a rattle, or other sounding device is fastened, so that it may sound when the fiag is waved, and thus call to it the attention of those who may be looking the other way, and who might not observe the signal Instead of a fiag, a lantern or other sight signal may be used 0 as to give a sight and a sound signal at the same time. This device might be useful in foggy weather, when loco motive engineers may not be able to discern the color of a

lag, or when the latter is altogether, at short distances, ob cured by the fog
Patented through the Scientific American Patent Agency, September 19, 1876, by Mr. S. Brown, of Philadelphia, Pa.

## Removing Nuts from Clips and Bolts.

The London (England) Carriage Builders' Gazette, in an wwer to a writer who asks as to the best means of getting ff the nuts of bolts and clips, and of driving up bolts and clips, without destroying the screws, gives the following reclips,
ply:

When the clips twist ever so slightly in trying to unscrew the nuts, cease to try until you have enlarged the nut by holding it for a minute or two with a pair of red hot tong If the clip has an extra point on it, file it round and oil it then try. If still firm, cut the nut in halves with a chisel, having another long chisel or iron bar held against the op posite side of the nut to take the force of the blows of th hammer. Be sure to use a light bolt hammer, which is more effective than a heavy hammer-it is better to cut off twen ty nuts than to break a clip. For driving up bolts so as not to bruise or burr up the screw, unscrew the nut one turn only, or enough to cover the point of the bolt; then drive the bolt back by striking the nut; if immovable, get some body to hold a heavy hammer on the nut while you strike forcibly the iron on each side of the head; if set fast, apply the end of a hot iron bar to the side of the head of the bolt to expand the iron. If you cannot start the bolt for the want of room to strike a fair blow on the bolt point, get want of room to strike a fair blow on the bolt point, get
somebody to hold the edge of a long piece of heavy tire iron somebody to hold the edge of a long piece of heavy tire iron
on the bolt point: them with a heavy hammer strike the bar on the bolt point: them with a heavy hammer strike the bar
as near the bearing as you can get at. Sometimes if the bolt as near the bearing as you can get at. Sometimes if the bolt
is through a scroll iron, and where the spring is in the way of the hammer, a peculiar shaped drift pin has to be usedit is someting like a tuning fork; the fork being put on the driving bar at right angles, the bar is struck to drive the drift pin up the bolt hole.

## The Supposed Planet Vulcan.

Astronomer Royal Airy gives M. Weber's observation-on which it will be remembered the recent predictions by Le verrier of a transit of the supposed planet were foundedits coup de grace by producing two photographs of the sun, taken on April 4, Weber's date, showing the imaginary planet to be a sun spot beyond question. It appears as a nucleus, without penumbra and surrounded by a small group of facule.

In accordance with a long-established rule, all subscrip tions terminating with this volume will be discontinued a that time. We trust that all our subscribers will not only renew, but that they may find it convenient to induce som of their neighbors to become subscribers. We shall in the future, as in the past, give our readers full measure and ranning over, in return for their money.

## NEW CHINESE DEER.

Towards the end of 1873, Michie, an English naturalist in China, discovered in the mountains, near Ningpo, a new species of deer, termed by the inhabitants the shanyang. The skin of the animal being sent to England, it was there carefully studied, and Mr. Swinhoe, a well known zoollogist, declared not only the species to be new, but that the animal belonged to a new generic type, different from any yet known. He applied to it the name lophotragus Michianus, the first Herd having reference to the peculiar tuft of hair on the word having reference
animal's head, and the animal's head, and the
last referring to the last referring to the name of the discoverer.
A living deer has lately A living deer has lately
been placed in the Zoölogical Gardens, London, and the identity of the genus, with that of the elaphodus discovered by Abbé David in the moun tains of the principality of Moupin, has been de termined.
The lophotragus is a The lophotragus is a
deer of small size, resembling the hydropo sembling the hydropotes or Chinese aquatic
deer. Its hight is about deer. Its hight is abou
21 inches. On the sum21 inches. On the sum-
mit of the head the hair mit of the head the hair
forms a tuft about 1.5 inches in length, which is slightly inclined rear ward between the ears, presenting a very singu lar aspect. By separa ting this tuft with the fingers, two bony protufingers, two bony protu
berances may be recog berances may be recog nized, starting from the
skull; but no skull; but no genuine horns can be found, no have any appeared in
the specimens examined. the specimens examined. canine teeth, which extend past the lip and protrude from each side of the mouth. The eyes are large and expressive, the lachrymal forsæ being nearly an inch in length. The nostrils are confluent with the upper lip. The color of the skin is a blackish brown, which becomes very dark on the forehead, the tuft, the rear of the ears, the dorsal line, and on the outer sides of the legs, but which lightens considerably on the belly. Insides of the ears are white, covered by black bands. There are also two white bands near the mouth. Our engraving affords an excellent idea of the general charOur engraving affords an
acteristics of the animal.

CURIOUS FISH AT THE NEW YORK AQUARIUM.
In the accompanying illustrations are represented three

remarkable creatures which have recently been added to the New York Aquarium. The first is the

## JAPANESE KINGIYO,

a fish which, apart from its great beauty, possesses an exceptional interest in that it is one of the most curious results attained by the processof artificial selection carried on over a long period of time. The animal appears to belong to the carp species, and possesses the brilliant color of the gold fish. The body, however, is almost oval, and the belly is very protuberant. Forming an exquisite contrast with the deap golden red of the body are the fins and tail, which seem to be pure, pearly white, silky membranes, edged with a delicate fringe. The tail at rest is canopy-shaped; but as the fish moves, it fioats into the most graceful undulations. reminding one of a filmy cloud or curling smoke wreath. It is hardly possible to divine by what series of steps this wonderful finny creation was produced. No naturalist would hesitate an instant in classing it under a new species, were it discovered in a wild state; but the fact that it is an artificial production, obtained from monstrosities or sports of artificial production, obtained fom onstrositios or sports of well known the same time renders the annal lingevidence in favor of the evolutionary hypothesis as advocated by Darwin. There are but very few kingiyos in this country at the present time. Eighty-eight constituted the first lot brought from Japan not
long since, but of these all but seven died during the voyage, or shortly after. The survivors were successfully carried to Baltimore, and during the last summer they spawned, the result being about fifty young fry, which exhibit all the peculiarities of the originals. It is the intention of the owner, when he has a sufficient stock, to donate them among persons who will take an interest in them and carefull raise them. Menwhile Mr W S. Ward the naturalist of the aquarium, has taken measures to apply and test the Ori the aquarium, has taken measures to apply and test the Ori
ental methods whereby this curious animal was produced
tained well developed eggs attached by a membrane to the ovary. These eggs are laid in a connected string, and are deposited alngg the muddy banks of the river. At this time there is a change in the external appearance of the creature The tail broadens, and there is a plaited extension of the skin along the sides of the body
The menopoma furnishes a connecting link between the fish and lizards in the chain of evolution. On the fish side the menopoma is a higher development than the lepidosiren amphibious axolotl amphibious axolotl.
THE TWIN SALMON,
or "salmonese twins," as some witty individual has termed them, are re presented in our third engraving. The two fisk were hatched from a sin gle egg; the two bodies are attached to one sac but each fish is perfec in itself. The connect ing vesicle is filled with oil globules, arteries, an veins; and it was expec ted that a microscopic ex amination would discor or a diaphragm separa ting the circulation int distinct systems. Th closest scrutiny, how ever, fails to discove this wall, and the circu latory systems appear so so intimately connected that the blood flows free ly from one body to th other, impelled, how ever, by two hearts.
Mr. Mather is of the opinion that there is but little chance of thei living after the absorp tion of the sac; for $i$ they survive till tha

## CHINESE DEER.

and the aid of the most improved piscicultaral appliances will be invoked during a series of experiments intended to produce still more curious fish as the result of sp
ture. In our second engraving is represented the ALLEGHANY HELL-BENDER,
or menopoma Alleghaniensis, an exceedingly ugly half lizard, half fish, found in the Alleghany river and other tribataries of the Ohio. Mr. A. R. Grote records in the American Jour nal of Science the interesting fact that this animal sheds a transparent membrane, which he believes to be the exterior the Buffalo Society of Natural Nciences, an almost complete skin, all the feet and toes being readily perceived, was seen floating in the water; and later the creature was discovered in the act of swallowing his former covering, a practice in the act of swallowing his former covering, a practice
which has also been observed in the toad. In a recent comwhich has also been observed in the toad. In a recent com
munication Mr. Grote describes this operation of shedding munication Mr. Grote describes this operation of shedding
the skin, from which we learn that this thin and transparent membrane is first seen to loosen and separate from the entire surface of the body, appearing at this stage like an envelope or glove in which the animal is contained. By a number of wide gapings, during which the mouth is opened to the fullest extent, the skin is parted about the lips, and then commences to fold backward from the head. Convulsive and undulating movements with the body and fore legs are employed to extract these from the loose skin. The skin then readily falls backward, as the animal crawls forward and out of it, until the hind legs are reached, when the me nopoma turns round upon itself, and, taking the skin in its mouth, pulls it over the legs and tail. The operation remouth, pulls it over the legs and tail. The operation re-
minds one of taking off clothes. The cast-off skin is retained in the mouth and finally swallowed. The operation tained in the mouth and finally swallowed. The operation
is quickly performed. The visitor who watches the menois quickly performed. The visitor who watches the meno-
poma will observe a swaging motion of the body; this action is no yet fully accounted for, though $i$, is possible that

is connected with the animal's desire to rid himself of his aly skin.
A female hell-bender, opened on the 21st of Augast, con-
brane of the sac, and being thus compelled to swim on their sides, great difficulty will be experienced in obtain ing food. In this instance, however, a careful system of artificial feeding will be adopted in case the pair reach an age when they will need such nourishment. From the extended observations of Mr. Mather, it appears that these deformities are quite frequent in the salmon family, which includes the trout; and in hatching one hundred thousand eggs, there may be from three to five hundred abnormal specimens, comprising crooked backs and twisted heads and tails and in some instances two or even three heads are attached to one body.
We are indebted to Mr. W. S. Ward and to the Newo York Aquarium Journal, an excellent little paper published at

the aquarium and devoted to popularizing scientific knowledge concerning the fish, for the engravings and facts presented.

## The First Sound Telegraph.

The project at present under consideration in England, of establishing a line of telegraph across the African continent from the Cape of Good Hope, reminds us of the curious fact not generally known, we believe, that the earliest system of not generaly known, we believe, liat istances originated telegraphy for signaling over long distances originated among the African negroes. It is still more remarkable
that the means used were telephonic, and the signals were that the means used were telephonic, and the signals were
read by sound, and not by the eye, as in the case of the semaphore or other early signaling devices. The "elliembic," as the instrument used is termed, is still in existence, and has been in use from time immemorial in the Cameroons country, on the west coast of Africa. By the sounds pro duced on striking it, the natives carry on conversation with great rapidity and at several miles distance. The noises are made to produce a perfect and distinct language, as intelligible to the operator as that uttered by the human voice.
M. Gustave Delvigne, who died at Toulon, was the inven tor of the explosive bullet and the rifled gun barrel bearing his name.

## LOCUST FLIGHTS EAST OF THE MISSISBIPPI.

## by profzsooz o. v. biley.

To the unscientific mind there are few things more diffcult of apprehension than that species, whether of plants or animals, should be limited in geographical range to areas not separated from the rest of the country by any very marked barriers or by visible demarcations. Yet it is a fac well known to every naturalist : and the geographical distribution of species forms at once one of the most interest ing and one of the most important studies in natural history. Some species have a very limited, others a very wide, range; and while in the course of time-in the lapse of centuries or ages-the limits have altered in the past and will alter in the future, they are, for all practical purposes, permanent in present time. These limits may in fact, for the purpose of illustration, be likened to those which separatedifferent nations. Though frequently divided by purely imaginary lines, the nations of Earope, with their peculiar customs and languages, are well defined. Along the borders where two nations join, there is sometimes more or less comming ling; at other times the line of demarkation is abrupt ; and in no case could emigrants from the one long perpetuate their peculiarities unchanged in the midst of the other. Yet in the battle of nations the lines have changed, and the map of Europe has often been remodeled. So it is with species. On borders of the areas not abruptly defined, to which species are limited, there is more or less modification from the typical characters and habits ; while in the struggle of species for supremacy, the limits may vary in the course of time. The difference is that the boundaries of nations result from human rather than natural agencies, while those of species result mostly from the latter, and are there fore more permanett. I found sume difficulty, at the late conference of governors at Omaha to consider the locust problem, in satisfying those present that the Rocky Mountain locust could not permanently thrive south of the 44th parallel or east of the 100th meridian, and that there was no danger of its ever extending so as todo serious damage east of a line drawn a little west of the center of Iowa. They could not see what there was to prevent the pest from over running the whole country, and thought that Congress should be appealed to, n 0 t country that has suffered from its ravages, but also of the whole country that is threatened therefrom. In my last two reports I have discussed the native home of the species, and the conditions which prevent its permanent
settlement in the country to which it is not native. Briefly, settlement in the country to which it is not native. Briefly,
the species is at home and can come to perfection only in the highand dry regions of the northwest, where the winters are long and cold, and the summers short ; and whenever it migrates and oversweeps the country to the south or southeast, in which it is not indigenous, the changed conditions are such that the first generation hatched out in that, to it, unnatural climate either forsakes it on the wing, or perishes from debility, disease, and general deterioration. On the soundness of this conclusion depends the future welfare of most of the more fertile States between the Mississippi and the mountains ; and Science, as well as past experience, shows it to be sound. Upon this hypothesis the people, of nearly the whole country so scourged during the year, and so threatened next spring, may console themselves that the evil is but temporary: they may have to fight their tiny foe most desperately next spring, but they have also the assurance that, even if he prove master of the field, he will vacate in time to allow of good crops of some of the staples, and that he may not return again for years. On the other hypothesis, for which there is only apparent and no real reason, ruin stares them inevitably in the face.
The causes which limit the eastward flight of the winged swarms that come from the northwest are, with the majority of people, still more difficult to appreciate, for most persons can see no reason why a swarm that overruns the western portions of Minnesota, Iowa, and Missouri should not extend to the eastern borders of the same States, or into Illinois, Indiana, Ohio, and eastward. Without discussing ome of the more occult climatic influences that bear on the belief that they never will, the principal arguments rest in the facts, that: 1. The power of tight of any insect that has a limited winged existence must somewhere find a limit. 2. That all past experience has shown that caloptenus spretus has never extended in a general way beyond the limit indicated; and, 3 , that, as long as the present average conditions of wind and climate prevail, it is reasonable to suppose it never will.
One of the principal difficulties in the way of a proper apprehension of these facts is found in the failure of the popular mind to properly discriminate between species. The ordinary newspaper writer talks of the grasshopper, or the locust, as though, all over the country and all over the world, there was but one and the same species. One of the governors present at the conference referred to was at first fully of the belief that our Rocky Mountain pest came all the way from Asia. In the case of this destructive species, even some entomologists have added to the difficulty by erroneously claiming that it is common all over the country, to the Atlantic.
The above thoughts are suggested by the following reports that have just met my eye in the Cincinnati Aazette of October 24, from Dayton, Middleton, and Hamilton, respectively until Monday evening, in great numbers throughout this city
is a most remarkable incident. They were found early on
Sunday morning, and left, as suddenly as they came, on Monday evening.
ur town and vicinity on Saturday night. wame down upon our town and vicinity on Saturday night. We have neve
seen such large ones before, and we understand from old cit izens that they are entire strangers in this part of the coun try. We saw a boy have a string tied to two of them (which were as long as a man's finger) trying to drive them, and he
succeeded pretty well." ucceeded pretty well.
A fiock of grasshoppers alighted in Hamilton about 11 o'clock on Saturday night, from the northwest. Those that were not drowned in the river, or killed by the heavy rain,
were, probably gobbled up before Sunday night by the chickas.

Such reports as these very naturally confirm the unscien tific in their idea that the locust plague of the West, or so called "Kansas grasshopper," has overstepped the limits entomology prescribes to it, and is upsetting the conclusions of Science. The same swarm passed over Oxford in th same State, in a southwesterly direction; and fortunatel that veteran and well known apiarian, the Rev. L. L. Lans troth, who has not forgotten to be a close observer, had specimens sent to me. They prove to be the American cridium, acridium Americanum. As stated in my 8th re ort, it is our largest and most elegant locust, the prevail ng color being dark brown, with a broad, pale yellowish line along the middle of the back when the wings are closed
The rest of the body is marked with deep brown, verging to black, with pale reddish brown, and with whitish, or green ish jellow: the front wings being prettily mottled, the hind wings very faintly greenish with brown veins, and the hind shanksgenerally coral red with black-tipped, white

lubricating properties recognized for hundreds of years as its peculiar characteristics, it would seem improbable that properties could be claimed or acknowledged at this late day; yet it is by no means uncommon to find advertisements mplying the right in some party to the sole use of asbestos or this or that purpose, or to find that capitalists have been nduced to invest their money in the experimental manufac ture of asbestos products, to be protected under the paten aws.
Asbestos, or amianthus, is a mineral of a white or greenish white color,found in dense heavy blocks. It is capable of be-
ing divided into fibers of greater or less fineness and length, resembling hair silk; it is smooth and unctuous to the touch, ike plumbago; these qualities are available for lubri cating or anti-friction purposes. The mineral is extensivel distributed, but much of it is coarse, discolored, or in a dis ntegrated condition, which renders it unserviceable for any urposes to which asbestos has yet been applied. The finest ads are in Corsica and Italy, but a very fair article is found xtensively in Canada, Pennsylvania, Maryland, Virginia nd other places. Efforts to utilize this mineral were early ade in the historic period, and one of the first application was in the manufacture of incombustible fabric. For this purpose vegetable filaments were combined with the mineral iber, to give strength and consistence during manipulation he vegetable fiber being burned away after the formation f the fabric. Notwithstanding this fact, the combination f asbestos and animal or vegetable fiber has constituted the basis of many patents, some of which are in existence whil hers have expired. An English patent, No. 145, for the year 1857, describes a lamp wick of silk and asbesto woven together. Prior patents describe wicks whol ly of asbestos; and a latter patent, No. 2,647, for 1865, describes the plaiting of asbestos in a braiding machine, and also felting it or weaving it into ordi nary fabric, to be used for lamp wicks. As a fabric asbestos was once used in the manufacture of shrouds One of the earliest applications was in the form of paper, and the efforts to render it available for thi purpose have been most persevering and unremitted to the present time. An early description of the mode of making asbestos pulp for paper is con tained in an English patent, No. 1413, for the year 1853, the process consisting of boiling the miner
spines. The species is quite variable in color, size, and marks, and several of the varieties have been described as distinct species by the species grinders. It has a wide range hibernates in the winged condition, and differs not only in ize and habit from the Rocky Mountain locust, but entomo logica
cow.

It is a species common over the country every year, and during exceptional years becomes excessively numerous, and acquires the migrating habit, its wings being long and well adapted to flying. It has been very abundant in the pres ent year; and toward the end of July, while in the unfledged condition, did an immense amount of damage to the cotton and other crops of Georgia and South Carolina. The papers were full of graphic accounts of their destruction, and not only editors very generally took it for granted that they om wis the western op ${ }^{2}$ 27, supposed they were the same. Specimens which he subsequently sent me howere revealed at once their true character.
In September, 1875, large swarms of locusts passed over Illinois, and those who were bent on the idea that there was no reason why that State should not be overrun with the Rocky Mountain locust found apparent justification for their views in the said swarms. Yet these proved to be composed of three species*, indigenous to Ilinois and every year common there; and after settling they did no harm, and nothing was heard of their progeny the following springall which would have been very different had it been a quesion of the western spretus.
Thedamage done by some of the more common locusts that occur over the country is sometimes very great, especially during hot dry years. In some of the New England States their ravages have, in restricted localities, fairly equaled those of the voracious spretus of the West. But while a few of them, under exceptional circumstances, develop the migratory habit, they none of them ever have compered, and in all probability never will compare, with
caloptenus spretus in the vastness of its migrations and in its immonse power for injury over extensive areas. In eco nomic entomology, discrimination between species is very important, and the lack of it often leads to most erroneous conclusions. Whenever we hear of locust flights east of our Rocky Mountain pest, and are, comparatively, harmless. Manhattan, Kan.

## Asbentos. -IIts History and Usen

Mr. C. E. Foster has compiled, for the American Exhange and Review, the following interesting history of the pplication of asbestos in the practical arts
The daily increasing importance of asbestos in connection with packings, bearings for journals, coverings for boilers, and similar purposes, has directed attention to other applications and uses of this material, and to the patents under which exclusive rights to its employment are claimed. Being a natural substance, long known as a possible substi *The diferential locust (caloptenus diferentialis) the Atlantic locust caloptenus Atlantis)and the red-legged locust(caloptenusfemur rubrum)
, dividing the fibers, and mixing alum therewith. Ad of asbestos in early taken of the non-conducting qualies use for this purpose being made in an English patent of 1834 No. 6,555 ; but it was not until 1870 that it was applie as a non-conductor in not until 1870 that it was applied a United States patent for a refrigerating car. Being flexi a United States patent for a refrigerating car. Being flexi-
ble, non-combustible, and a natural lubricant, its employ ble, non-combustible, and a natural lubricant, its employ-
ment as a packing for pistons and piston rods, joints, and ment as a packing for pistons and piston rods, joints, and
pump plungers naturally resulted. Its adaptation for such purposes is fully set forth in a United States patent fo steam engines, obtained by Israel Jennings in 1828. Not withstanding this fact,several existing United States patent have claims for the use of asbestos for packings and joints, while others claimimparting to it a rope form, for packings, which is clearly described by Jennings. Other patents have been granted for the application of asbestos to journals or bearings, notwithstanding the existence of Jennings' patent, and also of an English patent, No. 2,048, of 1853, for a lubricating combination of asbestos, quicksilver, fats, and oils. A combination of asbestos, soapstone,and cotton is described in P. S. Devlan's patent of August 22, 1865. C. A. Steven's in P. S. Devlan's patent of August 22, 1865. C. A. Steven's
patent of March 29, 1870, claims the insertion of a cord in a patent of March 29, 1870 , claims the insertion of a cord in a
rope packing of asbestos to strengthen it; and Morris Botticher's patent of October 4, 1864, refers to the use of the mineral for packing in a loose mass of fiber. A combination of asbestos with plumbago and iron filings is claimed in $P$ J. Kelly's patent of November 8, 1870; and a combination o asbestos and clay in Lanbereau's English patent, No. 213, for the year 1859, where the mixture is shown molded into bricks or forms for lining fire boxes. Combined with felt or pulp, and made into sheets, asbestos has been for some time applied for roofing, under H. W. Johns' patents of 1868 ; in 1866 it was applied to carbureters, as specified in J. A. Bas sett's patent of September 18. William Beschke patented August 14, 1866, its use in lamps, to absorb the oil and pre vent its distribution in case of fracture of the lamp; and the English patent. No. 362, for the year 1865, is based on the insulating property of asbestos,and its use as a non-conduct ing material in electrical apparatus.

## Railroad Accident.

Reeently at North Concord, N. H., two ladies attompted to drive across a railroad track, after the train which had de layed their passage had gone by. They failed to notice a locomotive following closely in the rear of the cars, and consequently were run into and killed. This kind of acci dent, now becoming altogether too common, is chargeable directly to the negligence of railroad companies, and it will probably continue to occur until railroad crossings at grade are prohibited by law. Experience shows that gatekeepers and signal men, however vigilant, do not prevent people from suddenly driving or stepping upon the track. In England a crossing at grade is a rarity; and in this city, public outcry compelled the sinking of the tracks which pass through Fourth avenue.

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## Centennlal notes.

In the English department was exhibited a model of Whitwell's fire brick

## hot blast stov

for raising the temperature in hot blast furnaces. The usual method of building these stoves has been to construct them of cast iron pipes, which, if the temperature were raised to $1,200^{\circ}$ Fah., usually were barned out. In Whitwell's sys tem, the heating surface is constructed entirely of fire brick, which are so laid up that the heated gases are forced through a series of flues, alternately from top to bottom of the stove, until the whole mass of brickwork is raised to a high de gree of heat; the stoves will stand a temperature of $2,000^{\circ}$ Fah., without damage. Three stoves are used with a furnace, two of which are being heated while the third is hav ing the air forced through it into the furnace. The advantages claimed are that the greatest economy of fuel is se cured, nearly the whole heat being utilized, several hundredweights of fuel per tun of iron being saved: that they last a long time with but trifing expense for repairs, and that they are easily cleaned. The estimate of saving in cost of producing iron is 33 per cent.
Among the

## anglish carpets

we noted several magnificent patterns in Wilton and Axmin ster. The difference between these very costly kinds of floo covering is not generally understood. Wiltons are Brussels carpets with the loops cut before the wire is drawn out they are generally closer woven, so the pile, or cut ends, may be packed closer together. The colors of these carpets go clear through to the back, but are only seen there in straight lines. The Axminster carpets, on the contrary show not only the colors but the pattern on the back, though the pile is only on the right side. Nor is there any limit to
the number of colors. Which may be used. They do not nethe number of colors. Which may be used. They do not ne-
cessarily repeat themselves in any regular order, nor are the patterns repeated, either in regular order or at all, except at the will of the manufacturer. Each carpet has an individuality; but to accomplish these reṣults there is less of machine work and more head and hand labor required. The process is a slow one, but the result may be seen in carpets with a pile of five eighths of an inch high, and so close that it cannot be separated to show the warp. Such carpets endure a great deal of hard service, and when the pile has grown uneven it can be brightened up four or five
shaving it with a machine made for that purpose.
Whaving it with a machine made for that purpose
What the color does not and the color does not appear on the back at all. On the surface it would be difficult to tell in what the difference con-
sists. It can be made for a much less cost than the real Axminster, which requires each thread and color to be tied separately by hand to the warp. This is so great a labor that fully three months are required to make a carpet twenty feet square. So great is the difference that the best paten Axminsters can be furnished for much less than half the cheapest real Axminster; yet there seems to be no reason why the patent carpets should not wear as long as the real. A new method of

ARTISTIC POTTERY WORK
is called the pate sur pate, or paste upon paste process. The design is raised in white china clay upon a dark ground, the result being a most perfect imitation of a cameo in onyx or agate. White china clay is reduced to a liquid state; and the design condition, the artist, with a thin brush, pang coat after coat of the liquid china until the desired thickness is obtained in each of the parts. Before burning, the china is opaque, but becomes translucent after burning. The artist, therefore, to properly distribute the light and shade must put on the material thin or thick, and do this, too,
without being able to judge of the effect by the eye; nor can any error of judgment be corrected by subsequent retouch ings, as nothing can be done after the piece has been burned.
A model was exhibited by the Erie Railway Company of the famous

WOODEN BRIDGE
that carried that line over the Genesee river at Portage : a structure so arranged that each piece of timber could be separately removed and replaced by a fresh piece withou disturbing the strength of the work as a whole. The bridge
was further distinguished by the fact that it was the high was further distinguished by the fact that it was the high
est wooden bridge in the world, the rails being 235 feet above the level of the water. It was opened to travel August 2, 1852, and was destroyed by fire on May 6, 1875. Hanging beside the model is a photograph of the iron bridge that has taken its place, an airy structure looking like a spider's web outlined against the sky. Not the least wonderful fact in connection with the new bridge was the rapid ity with which it was erected, the line being reopened for travel on the 31st of the following July. But this was siow
in comparison with what was accomplished (almost simultaneously) by the same company in rebuilding the bridge carrying their metals across the Delaware, three miles above Port Jervis. The bridge comprehended one deck span of 160 feet, three deck spans of 150 feet each, and a span over the Delaware and Hudson canal. The four deck spans were swept away by the ice on the night of March 17, 1875 . On
the 26 th of the following April the new bridge, of iron, double track, was complete and put into service, having been built in just forty days. Another instance of quick work was in the case of the trestle of 780 feet long and 90 feet high, thrown across the Chattahoochie in four and a half days, in August, 1864, by the Construction Corps of the T. S. Military R, R., under the direction of Engineer W. W.

Wright. But in this case the piers were standing-the bridge had been burned by the rebels-and the structure In
In the Tasmanian section a stuffed skin of that wonder ful and incomprehensible creature known as the

PLATYPUS OR ORNITHORHYNCHUS,
was displayed. The platypus is a fur-bearing animal, shaped much like a large duck; it has a duck bill and webbed feet, the web extending over the toes. The male has a spur like a
rooster on his hind feet; back of the spur is a gland filled with pois his hind feet; back of the spur is a gland fled thas the fur and tail of a beaver; small black eyes like mole; a pouch for carrying the young, like a kangaroo; its tongue is split and forked likea snake's. It lives on vegetable matter, and is amphibious, living, like the beaver, in or out of the water. In its anatomy, it has a wishbone, like a hicken, and in swimming the motions are the same as those a a bird in flying. Naturalists have been inclined to call it a bird, or at least oviparous, producing its young by eggs, but, unfortunately, the accounts of finding the eggs are too conflicting. Some men say they have seen the eggs, one man strengthening his assertion by saying he had eaten
them for his breakfast. The young have been seen, evidentthem for his breakfast. The young have been seen, evidently when but a few hours old; but no eggs have been found in the runs or holes near the water, which the platypus lives in, like a musk rat. Further than this, the natives say that this platypus does not lay eggs, and their habits of observation ought to make them good authorities on this point. A naturalist, who had dissected one of these ani mals, claims to have found mammary glands, which would
strengthen the belief that the platypus is a beast. but suffstrengthen the belief that the platypus is a beast. but
cient evidence on this point has not yet been obtained. In the French milling exhibits was a

## burr stone mil

for bolting the flour as it is ground. This'consists of a number of fine wire sieves, arranged like rays on the sur face of the millstone, through which the flour falls as it is ground, its passage being facilitated by means of a revolv ing hammer, which jars each sieve. Some of this flour is
very fine, but a large portion of it very fine, but a large portion of it must be reground. What
is called high grinding is adopted with this style of stone that is, the millstones are more widely separated, the husks and fine flour are removed in the usual way, and a rather coarse middlings is left, which, while possessing the mosi nutritious qualities of the wheat, is too dark and coarse This is afterwards run through another pair of stones, which grind it into fine flour.

THE SALE OF THE BUILDINGS
Twenty-four buildings belonging to the Centennial Board f Finance, besides a dozen structures of varying dimen sions, the property of individuals, were sold at public auc-
tion on November 30 . The Main Building, which cost about tion on November 30. The Main Building, which cost about
$\$ 1,600,000$, was sold to the Permanent Exhibition Company $\$ 1,600,000$, was sold to the Permanent Exhibition Company
for $\$ 250,000$. The other structures brought even a less per centage of their original cost. The principal sums realized were as follows : Two Mineral Annexes, cost $\$ 19,000$, sold for $\$ 1,000$; Carriage Building, cost $\$ 55,000$, selling price $\$ 4,100$; Art Annexe, cost $\$ 110,000$, selling price $\$ 3,500$ Hall, cost $\$ 30,000$, selling price $\$ 1,500$; Shoe and Leather Building, cost $\$ 30,750$, selling price $\$ 3,000$; Agricultural Hall, cost $\$ 275,000$, selling price $\$ 13,100$. The remainder of Hall, cost $\$ 275,000$, selling price $\$ 13,100$. The remainder of
the buildings sold at about similar rates, and the work of removing them will at once begin. The structures left are the Main Building, Machinery and Memorial Halls, German Pavilion, English dwellings, and Horticultural Hall. The Woman's Pavilion, which it was at first proposed to sell, is
now to be reserved as a memorial. The Japanese Building now to be reserved as a memorial. The Japanese Building will be sold, and the future disposition of the United States Building is not yet announced.

## THE OCCUPATIONS AND HEALTH OF THE MERCANTILE CLABSES. classes.

Out of every thousand men engaged in mercantile em ployments, examined by the enrolment surgeons during the fit for militween the states, five hundred and twontshed thousand of professional men, and forty-four less than were got from the same number of skilled mechanics. Rated ac cording to the military capacity of their members, the dif ferent mercantile occupations stand in the following order Tobacconists, furnishing 623 per thousand; clerks, 585 peddlers, 580; bar keepers, 500; liquor dealers, 471; grocers,
451; innkeepers,420 ; agents, 416; merchants, 392; brokers, 451;

Bar keepers we have transferred from the list of unskilled workmen for comparison with liquor dealers and tobacco nists. It is one of the most surprising results of this er spirituous liquors so exceptionally healthy. They not only stand especially well among the mercantile classes, but much better than the members of the higher professions. And curiously, they would seem to be specially free from the disorders of the digestive system and the nervous system which certain popular theories would make inseparable from their employment.
The general health of tobacconists was even better than the foregoing figures would indicate, since 86 per thousand
were rejected for conditions not necessarily connected with disease, chiefly for deficiencies in age and size, and 26 for local injuries and deformities, in which the selective action of a light occupation is apparent. In syphilis their record is bad: 16 per thousand,or twice as many as among the clergy, but only half as many as among bar keepers. Their chief diseases are of the digestive system, causing the rejection of

65 per thousand (almost wholly from loss of teeth and hernia); diseases of the circulatory system 43 (mainly heart disease); lung diseases 34; diseases of eye and ear 30, and of organs of locomotion 41. For diseases of the nervous system, they stand about with regular merchants and clerks. They are comparatively free from obesity, and but little troubled with chronic rheumatism.
Clerks were disabled chiefly by conditions not necessarily connected with disease, 76; local injuries 33 ; diseases of the digestive system (mainly hernia and loss of teeth) 106 diseases of the organs of locomotion 30 ; of the eye and ear 2; of the circulatory system 44; of the lungs 33. Peddler ank next to clerks, and show for the most part disabilities not directly attributable to their work ; for example, 50 per housand rejected for conditions not necessarily associated with disease ; 40 for loss of teeth; 51 for wounds, fractures, tc.; and 33 for diseases of eye and ear. For inguinal hernia attributable in many instances no doubt to lifting heavy packs, 39 in the thousand were rejected; 17 for diseases of the joints, and 7 for spinal curvature, largely due, possibly to the just mentioned cause. Consumption disabled 42 per housand, and diseases of the circulatory system 48.
Bar keepers and liquor dealers stand near together in military efficiency, high compared with the professional lasses, but low as compared with mechanics and laborers. Bar keepers suffer more than liquor dealers from diseases of he digestive system ( 133 to 40 ), but less from disorders of he circulatory system (52 to 129); in consumption and dis orders of the nervous system their record is good, 21 to th housand. Liquor dealers suffer more than any other mer cantile class from chronic rheumatism, and from diseases o the eye and of the organs of locomotion. Grocers fall below the mean of the mercantile classes. Loss of teeth cause the rejection of 86 per thousand, and hernia, 69. For all disorders of the digestive system,the rejections were 190 per housand. Disorders of the circulatory system come next 67 per thousand. For disorders of the nervous system they stand among the worst, 21 per thousand being rejected for his reason; for consumption 35; diseases of the eye and ear 38 ; of the organs of locomotion 52 ; for conditions not ne essarily associated with disease 27; for injuries, etc., 55 . Innkeepers are a grade lower than grocers in general health, and lead the van in obesity, for which ten per thou sand were rejected: the same fault causing the rejection o five grocers and seven agents per thousand, all others of the mercantile class being nearly if not quite free from it. Inn keepers stand universally high also for loss of teeth, 93 , and for hernia 48. For all diseases of the digestive system, 223 per thousand were rejected. For diseases of the nervous ssstem, they stand higher than lawyers, and are exceeded only by agents, watchmen, ostlers, and unclassified "othe occupations." For diseases of the eye and ear they stand third ( 44 per thousand), the ratio for brokers being 50 , and for liquor dealers 57. They also stand next to brokers and above all others for disabilities arising from wounds, frac ares, and malformations.
Agents suffer more than any other mercantile men from ung diseases, 53 per thousand, from diseases of the nervous ystem 29, and insanity 9 ; they are exceeded only by merchant in diseases of the digestive system, 189; and are afflicted more than the average by diseases of the circulatory system, 1. As regards syphilis they rank with clergymen, doctors and public officers. For diseases of the eye and ear, 39 in the thousand were rejected; for diseases of the organs of ocomotion 51; for conditions not necessarily associated with disease 49, and for local injuries and malformations 69 Lowest in military capacity among mercantile men ar merchants and brokers. Their disqualifying disabilities resant some curious contrasts. For instance, more than wice as many brokers as merchants were rejected for wounds, fractures, malformations, and the like ( 120 to 56 ) and nearly fifty per cent more for conditions not necessarily associated with disease (76 to 56 ). On the other hand nearly three times as many merchants as brokers were rejected fo diseases of the organs of locomotion ( 55 to 19). Evidently a larger proportion of men, unfit for severe labor because of injuries, malformations of hands and feet, and deficiencies in size and strength, adopt the broker's calling. More mer chants are disqualified because of hernia and loss of teeth, fewer for disorders of the circulatory system ( 60 to 82 ); more for insanity and nervous derangement (13 to 9); and more for consumption ( 48 to 19). In general health and physical capacity, merchants and brokers rank with physi cians, clergymen, and public officers, and were capable of fornishing for the army only about half as many men pe housand as the mass of unskilled laborers. In disorder of the digestive system, they exceeded all except innkeeper brokers 177, merchants 218). In diseases of the circulatory ystem, the brokers came next to the liquor dealers (82), the merchants next to grocers (60). The brokers stood lowes in consumption,the merchants next the highest. In chronic heumatism, the brokers stood second to liquor dealers, and the merchants come next, on a level with agents.

## Wanted, A Tiger Exterminator

During the year 1872 a census was taken in India of the Dersons who had been killed by wild animals during the years 1868, 1869, and 1870. The total reached 38,218, of which it was found that 25,664 had died through the bites of venomous serpents, while the remaining 12,554 had near ly all been devoured by tigers. So that, for the years men tioned, Her Majesty's dusky subjects were eaten at the rate of about one every two hours. Plenty of such suggestive statistics are at hand. Official reports from Lower Bengal state that 13,400 persons in that section of the country were devoured in six years, and the destruction over the entire
peninsula is estimated at 10,000 people a year. In 1869 one tigress blockaded a road, stopped traffic thereon for several weeks, and slaughtered 127 victims. During two previous years she killed 108 people.
Nor do the feline damages end here. We have further statistics which show that for each person killed sixty head of cattle are destroyed, and this aggregates a money loss of about $\$ 5,000,000$ yearly. The terror produced by a tiger's ravages of ten desolates whole villages. At one time, in one of the Central Indian provinces, thirteen villages and a cultivated area of 250 square miles were simultaneously abandoned, owing to the visitation of a band of tigers.
These facts have been laid before the English House of Lords, and the government has been asked to take speedy measures to check the present rate of carnage. Since the Sepoy rebellion and the consequent disarmament of the natives, it is reported that the tigers have greatly increased in numbers. In localities where they abound, there are bands of hunters who receive a bounty from the government for every tiger killed; but these men never shoot a tiger unless the animal has acquired considerable celebrity by his exploits. They thus pocket a much higher reward, owing to bast according to his age and voracity. Meanwhile the beast, according to his age and voracity. Meanwhile the
English papers are urging immediate action. The Times English papers are urging immediate action. The Times
says that: "It is frightful to think that, in the middle of the says that: " It is frightful to think that, in the middle of the
nineteenth century, with all the improved engines which man has invented to destroy his kind, a considerable numker of the subjects of Her Majesty are exposed, just as if it were a form of natural death, to be devoured on their very thresholds by savage beasts."
Here is a chance now for some enterprising person to undertake the extermination of the Indian tigers by contract. He might contrive an ironclad steam carriage, capable of propelling itself through jungles, and having apparatus for throwing jets of boiling water or hot steam into inaccesthrowing jets of boiling water or hot steam into inacces-
sible places, to dislodge the animals, and a battery of Gatsible places, to dislodge the animals, and a battery of Gat
lingerewith to salute their appearance. Tigers are ling guns wherewith to salute their appearance. Tigers are
not invulnerable; but to engage them, even on elephant not invulnerable; but to engage them, even on elephant
back, is a perilous undertaking. To destroy them from beback, is a perilous undertaking. To destroy them from be-
hind armor with Gatling guns and torpedoes is a much safer hind armor with Gatling guns and torpedoes is a much safer
proceeding ; and as the authorities frequently offer as high proceeding ; and as the authorities frequently offer as high
as $\$ 150$ for a single animal, it might prove a remunerative venture.

Professor Huxley says: " The general notion of an Engishman when he gets rich is to found an estate and benefit his family. The general notion of an American, when fortunate, is to do somerhing for the good of the people and from which benefits shall continue to flow. The latter is the nobler ambition."

A distinguished French scientist has recently died. M. Charles St. Claire-Déville was a chemist and mineralogist of great ability. He discovered amorphous and insoluble sulphur, thus showing, for the first time, a simple body in two conditions, differing not only in physical characteristics, but in essential chemical properties.

Wecent Sumerican aud foreign zextent
NEW WOODWORKING AND HOURE AND CARBIAGE
BULLDING INVENTIONS.
improved neck yoke.
Frank Hannig, Lockhart,Tex.-This consists in proving the neck yoke with a central enlargement, and connecting the tube which slips on the end of the carriage pole with the yoke by means of rings having perforated ears to receive the
mPRROVED AXLE LUBRICATOR.
John J.Wetmore, Shabonier, Ill.-This consists in combining an oil chamber having a close-fitting plunger with a skein having an with the surface of the bearing.
improved hat-box-board cutting machine. William Jenkins, Newark, N. J.-The invention consists of a reciprocating carrier that feeds the block against the adjustable
cuttingknife to cut off the thin boards. The board is pressed in cutting knife to cut off the thin boards. The board is pressed in one direction against the knife by a weighted roller, and lifted by the carrier when sliding in opposite directions to clear the knife. IMPROVED DOOR SHEAVE. George Laauwe, New Yorkcity.-These sheaves for sliding doors
are so constructed that they may be easily adjusted to regulate the door so that it may be plumb, and to enable the wear to be easily taken up. The sheaves are pivoted between the arms of a
V strap, which is inserted in a case; through the top of the latter V strap, which is inserted in a case; through the top of the latter a screw passes, and is so secured to the sheave strap that the
sheave may be raised and lowered to adjust the door.

## EEW AGRICULTURAL INVENTIONS. <br> IMPROVED CHORN.

Elisha A. Hewitt, Groton, Conn.-This consists of a churn with dmitted by a revolving fan with hollow shaft, operated by the driving mechanism.

## IMPROVED CHECK ROWER.

Albert M. Black, Pawnee, Ill.-This check rower is used in connection with a planter, and is readily adjusted on the ground withwith tags, applied at suitable distances, passing over guide pulleys and rollers at the ends of a cross bar of the planter. Thedropper keeps his eye fixed on the end of the pointer, and gives a pull to the drop lever for depositing the required quantity of corn as the field is reached, the dropper takes a tension pin, with spring top hook, and drives it some distance back of the planter into the ground, passing the spring hook over the rope to retain the ten-
sion of the same. The stretching pin at the end is then taken up,
and the planter turned, the rope being again drawn through the
pulleys and staked down at the opposite side of the planter, which pulleys and staked down at the opposite side of the planter, which
is then ready to pass back over the field, dropping the corn in the same manner as before.
improved horse hay rake.
Amos W. Coates, Alliance, 0 .-This invention relates to an improvement in clearers for horse hay rakes, and is more particulary an improvement in that class of clearers which consist of a of them by staples or equivalent devices. According to this improvement, the clearer bar is supported above the rake teeth by means of forks which bear upon but two of the latter, whereby certain advantages are secured in respect to wear and friction, ease of operation of the rake, and independent action of the wire teeth.

IMPROVED HARROW.
Adolphus W. Davis, Dwight, Ill.-This improves the construcion of the harrow for which letters patent were granted to the same inventor, July 13, 1875. By pushing a lever forward and then from the ground, and then, as the upward movement of the lever is continued, the whole section will be raised from the ground. In the same way, by drawing the lever to the rearward, and then
raising its rear end, the section will be raised rear end first. As raising its rear end, the section will be raised rear end first. As
either end is raised, the other end rests upon the ground to do either end is raised,
its required work.

IMPROVED CORN PLANTER.
Ira Houghtling, Houghton, Mich.-This invention consists in providing a corn planter with a cam shaft, disk slide, spring, arm, and spouts; also, in connecting the feeding tube slide and spring
by a link that may be shortened. by a link that may be shortened.

IMPROVED FARM GATE.
Joseph Jennings, Jr., Wilton, Iowa.-By raising the forward end of the gate the rear end of the braces are drawn forward, and a
bolt drops into notches of the bottom bar and thus holds the forward end of the gate securely at the point to which it has been raised. Devices are provided for lowering the forward end of the gate to any desired point.

## NEW MECHANICAL AND ENGINEERING LNVENTIONS. <br> \section*{IMPROVED PRINTING PRESS.}

Willard W. W. Belknapp, Brooklyn, N. Y.-The new feature consists of a swinging platen, in combination with a vertically movable bed, and an oscillating ink-distributing mechanism. The
simplicity of this apparatus renders the press less expensive, and simplicity of this apparatus renders the press less expensive, and
facilitates the rapid and effective working of the same DEEIEs the rapid and effective working of the same.
device for making face plates for drawbars.
John Green, Sunbury, Pa.-This invention relates to an im-
provement in the manufacture of face plates for drawbars of provement in the manufacture of face plates for drawbars of
railway cars, and it consists in a series of tools to be used for the railway cars, and it consists in a series of tools to be used for the
common end of making the said plates, which tools are employ ed common end of making the said plates, which taois a stamping the
for the succesive steps of cutting out the blanks, slot and rivet holes, and bending the stamped plate into curved form: each of the tools being provided with extended han-
dles for their convenient manipulation beneath the hammer, whereby all of the said steps of the operation are conducted under the same heat employed for forging the blank plates.

IMPROVED ROTARY ENGINE. George C. Hale, Kansas City, Mo. The object of this invention
is to effect an improvement in that class of rotary steam engines
whose case or cylinder is made to revolve around a stationary cirwhose case or cylinder is made to revolve around a stationary cir-
cular head or disk to which the pistons are attached. To this end the pistons proper are hinged within a stationary disk having hollow trunnions, and the cylinder revolves around it. The inthe automatic movement of the pistons themselves. Thus the necessity of supplementary steam valves is avoided, the number of working parts reduced to a minimum, and the compactness of this class of engines considerably increased.
improved millstone dress.
Elias N. Roeder, Quakertown, Pa.-This invention consists in dressing both stones exactly alike, with a series of tapering, lead-
ing furrows, wider at the eye than at the skirt, deep on one side ing furrows, wider at the eye than at the skirt, deep on one side
and tapering to a feather edge upon the other, which feather edge is arranged radially with the center of the stones, so as to have no draft in the leading furrows, the necessary draft being
supplied by the quarter furrows, which open into the leading furrows and are formed with an inclined bottom, and of a tapering shape similarly to the leading furrows.

IMPROVED MILL PICK.
Edgar F. Lemoine, Emmerton, Va.-This improvement consists in the particular means for clamping the jaws, in which a screwJaw and holds the shank enters a female thread of the upper jaws from turning on each other. With this means of clamping the jaws the latter do not become loose, and the blades can never ter, from the impact detached, as when a key is used, which lat ,

IMPROVED MIDDLINGS SEPARATOR.
Edwin Slagle and John McClure Graham, Albany, Mo.-This reing cloth provements in the flat, inclined, shaking iour bolt, hav ing cloth arranged in wave-like form, for whicha patent was gran mainly relating to improved mechanical construction, are embodied.

IMPROVED MILLSTONE DRESS.
Henry Grigg and William McElroy, Lockport, N. Y.-This in
vention consists in beveling the inner portion or bosom of a mill stone,from a point about ten inches from the periphery down to the eye, making the space thus formed about one half inch deep
at the eye. It also consists in cutting furrows from the eye at the eye. It also consists in cutting furrows from the eye out
ward, on a radial line from the center of the stone, to the line that ward, on a radalla portion, starting in a line at the eve, and increasing to the required depth at the outer edge of the beveled portion. The grooves, from this point, are tangential to a circle drawn outside of the eye, so that they have an inclination or draf
of from five to eight inches. The object is to provide a millston dress that will increase the quantity of middlings.

## NEW MISCELLANEOUS INVENTIONS.

improved arinding mill.
James Madison Collier, Gadsden, Ala.-The driving belts are led which is so located that the pull of the belts is directly against th crowding of the journals of the runner against the boxes by the grain.

## IMPROVED OILER

Nelson Holmes, Ypeilantl, Mich.-This consists of an annula spring-supported piston on the rear end of the nozzle, so that
when the latter is pushed back, oil is ejected through the spout.

Mron Bernstein,Berlin,Germany.-This fnrnishesa reliable means to instantly detect any false or light gold coin without showing the mode or mechanism by which the same is tested. This object is obtained by allowing the gold coin to fall through a narrow
opening and guide channel on to a balance or tilter, from which it will, if genuine and of full weight, roll at once, by suitable deviating mechanism, into the cash box or receptacle; but if it is not genuine, or is of short weight, it is conducted into a separate open receptacle, so as to indicate directly the lack of genuineness or full weight.

IMPROVED LUBRICATING COMPOUND.
John W. Bartlett, Moline, Il., assignor to himself and Merven Witherell, same place.-This is a lubricating compound for car axles and other friction surfaces, which will not take fire from a
hot journal. It is formed of pulverized blue stone, oil rock, carhot Journal. It hate of potash trated lye, golden machine oil, pure lard oil, salt, tartaric acid, and soft water.

IMPROVED CARTRIDGE-LOADING DEVICE.
Thomas P. Camp, Stoughton, Wis., assignor to himself and G. W. Wise, same place. - This is an improved device for loading the cartridge shells of breech-loading shot guns. It consists, mainly, n the arrangement of a single continuoas slide, having two receive the charge of powder and shot from respective a race, and shot hoppers above, and deliver it to the cartridge shell beow. There is a central plunger and inserting spout for the wads, and cut-ofr brushes in the hoppers, for brushing off and leveling the charge in the slide.

## IMPROVED PESSARY.

Jonathan P. Barnett, Navasota, Tex.-This relates to an im-
provement upon the pessary described in patent No. 163,871 , and provement upon the pessary described in patent No. 163,871, and consists mainly in the arrangement of the wings for supporting the pessary, the arms for adjusting said wings, whereby they are adaptcd to be folded inward, and the adjusting arms to be fol
into slots formed in the tube, to which the wings are hinged.

IMPROVED BALE TIE.
James M. Pollard, New Orleans, La.-The central cross bar of the buckle is provided with a lug or projection on the under side,
and the free end of the band is slotted and held up against the bar so that the lug projects into one of the slats, thereby forming the lock. The other or fast end of the band forms the spring by Which the slotted end is thus held against the bar and engaged with the lug. The disengagement may therefore be readily effected by depressing the spring. The fast end of the band is so bent as to form a shoulder, which prevents the buckle being acci-
dentally detached from the band; but the attachment and dedentally detached from the band; but the attachment and de-
tachment of the buckle may be very easily effected when desired IMPROVED SCISSORS.
Amos W. Coates, Alliance, Ohio.-This is an improvement in sissors, designed particularly to adapt them to the use of little it consists it constructing the two blades with two terminal bulbs or guards which, while permitting the perfect closing and fre cutting action of the scissors, also form a guard, whether the scis sors be open or shut, which prevents accidental injury to the child, and enables her to use the scissors with perfect safety to the eyes and body.

IMPROVED ANIMAL TRAP
Cornelius Koons, York Road, Md.-This invention consists mainly in a drum-shaped two-compartment cage made of wire square tapering inlet formed by inwardly converging pointed wires, having suspended in the center a swinging gate composed of pointed wires which admit the access of the rats, or other animals, but prevent their escape; and it also consists in the particular construction and arrangement of the upper inlet and compart-
ment with a lower compartment having a second inlet to receive and retain the rats caught by the first or upper compartment.
IMPROVED COMPOSITION FOR PRESERVING BOLTING CLOTH John Wayman, of Collinsville, Ill.-This is a compound formed of wormwood, oil of cedar, gall, and tallow, for
will keep insects a way from the bolting cloth.
improved bell toy
John T. Rich, Middle Haddam, Conn., assignor to J. C. Clark \& Co., of same place.-This improves the construction of the toy bell for which letters patent were granted to J. C. Clark, Novem-
ber 2,1875 , in such a way that the vibrations of the bell maybe less ber 2,1875 , in such a way that the vibrations of the bell maybe less obstructed by the mounting. The bell, consisting of aspherical per forated shell, is now secured at one side only to the axle of the forated shell, is now secured at
carriage on which it is supported.

## NEW HOUSEHOLD UNVENTIONS.

IMPROVED WASHING MACHINE.
Benjamin F. Fowler, Eau Claire, Wis.-This improved machine does its work by alternately saturating the clothes and then pressing them, to force out the water and dirt, between an uppe ,

IMPROVED WATER FILTER.
Samuel F. Simes and Charles Tate, Philadelphia, Pa.-This in vention relates to a novel construction of filter for the purifica tion of water or other liquids, which filter is especially designed
for attachment to the nose of a hydrant, but applicable also for for attachment to the nose of a hydrant, but applicable also for mainly in a specially prepared purifying pad formed by embodying powdered charcoal, kaolin, or other purifying material, either singly or combined, with the flber of felt, by blowing it in during the process of the manufacture of the felt. This pad is contamed in a chamber formed by two detachable caps, and is held between
gratings in the same by means of a cam joint which fastens the gratings in the same by means of a cam joint which
caps, which devices also form a part of the invention.
improved steam cooking kettle.
William G. Flanders, West Lebanon, N. H.-This is a doublechambered culinary vessel, made in detachable parts, each pro
vided with a perforated diaphragm. The upper part has a bottom provided with a slide for closing the apertures therein, so as to regulate the admission of steam to the articles to be cooked.

## NEW TEX'IILE MACHINERY.

improved warping machine.
John J. Ashworth and George Ashworth, Pendleton, England.This invention placesial the warp threads perfectly straight on the beam, prevents twisting, facilitates the weaving, simplifies
the machinery, reduces labor, and economizes space in the mill. It mbodies eight novel devices, all of which are of great ingenulty but which are so combined that it is not possible to convey a clea
idea of their working without the aid of drawings. There idea of their working without the aid of drawings. There is a new
registering apparatus which indicates the exact number of revolutions of the beam, while another device shows the tension of the yarn. By these the same length of yarn is wound in the cam number of revolutions upon each of the succeeding sections of the beam as there is upon the first section.

## 

 The Charoefor Ineertim unuer this head so one Dollar a Line for each insertion. If the Notice ex-ceeds Four Unes, One Dolar and a Half per Line
woll be charoed.

Agricultural Implements and Industrial Machin-
ery for Exportand Domestic Use. R.H.Allen \& Co.. N. Y. Pattern Makers can get Metallic Pattern Let-
ters.to letter patterns.of H. W. Knight,Seneca Falls, N. Y-Wanted-A heavy first class Tenoning Machine The world-wide reputation of Asbestos Steam or repairing roofs, etc., has induced unscrupulous per ons to sell and apply worthless articles, represent-
ing them as befng made of Absestos. The use of ABthese and other materials for structural an mechanical purposes 1 patented, and the genuine can be
obtained only of H. W. Johns, 87 Maiden Lane, N. Y. Emery Grinders, Emery Wheels, best \& Cheapest.
Awarded Medal and Diploma by Centennial Commission. Awarded Medal and Diploma by Centennial Commis8ion Shingle, Heading and Stave Machine. See ad-
vertisement of Trevor \& Co., Lockport, N. Y. Chester Steel Castings Co. make castings twice
as strong as malleable iron castings at about the same
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ing Company, 87 and 38 Park Row. New York. M. Shaw, Manufacturer of Insulated Wire for
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Diamond Tooil-J.Diclinison, 44 Naseau St., N. Y.
J. N. P. will find directions for making fric-
tion matches on p. 75, vol. 29.-R. J. will find dition matches on p. 75, vol. 29.-R. J. will find di-
rections for nickel plating on p. 235, vol. 33.-J. N. will find the article on the friction of water in
pipeson p. 48, vol. 29.-C. F. can remove moles from the skin by following the directions on $p$.
347, vol. 32.-C. R. S. Will find on p. 120, vol. 33, directions for making muslin uninflammable--
J. F., M. M., W.G. E., B. P., M.T. B., H. A., and others who ask us to recommend books on indus-
trial and scientifl subjects, should address the trial and scientiftc subjects, should address the
booksellers who advertise in our columns, all of booksellers who advertise in our columns,
whom are trustworthy firms, for catalogues.
(1) R. C. asys: A. asserts that water has
been lifted 33 feet 6 inches with a common lift been lifted 33 feet 6 inches with a common lift
pump. B. asserts that it never has been lifted pump. B. asserts that it never has been lifted
higher than 32 feet. Which is right ? A. Water was once raised 32 feet 11 inches by a lift pump
at the Brooklyn navy yard. This is the greatest result of which we have heard.
(2) E. L. says: I have a small piece of
sylvanite, said to yield $\$ 40$ gold to the lb. I suppose that it also contains tellurium and eilver. I
have used the blowpipe upon it and melted out a
arge percentage of metal having a silvery ap-
pearance. How can I separate the gold from all other metals? A. Sylvanite contains 56 per cent of tellurium, 28 of gold, and 18 of silver. It freAfter complete roasting, dissolve in aqua regia vaporate to dryness. Add a small amount o sulphuric acid, and dissolve as far as possible in
water. From the concentrated solution, precipitate out the gold with a strong solution of green itriol.
(3) A. O. W. says: I want to vulcanize Please give me the formula for it. A. Chloride of sulphur is obtained by passing dry chlorine gas slowly over molten sulphur, and collecting the product in a condenser. The sulphur should be heated until just at the point of volatilization about $600^{\circ}$ Fah. The impure chloride should be distillation. It is a reddish yellow fluid of a dis agreeable odor, and boils at $280^{\circ} \mathrm{Fah}$.
(4) A. C. G. asks : How can I make a com molds that will not dissolve in water? And how
mor can I take impressions or make molds in meta from natural objects ? A. Molds of this charac ter are not absolutely insoluble in water. Use 1
part of the tinest chalk intimately mixed with 3 parts plaster of Paris. Place the object to be cover every part of it with a thin film of olive oil, and then brush over it with a camel's hair pencil a thin crean of the finest plaster with wa-
terin order to exclude all air bubbles: when this is done,pour over it itmmediately, and at one mo tion, the proper quantity of plaster, of a some-
what thicker consistence than that first applied Allow the plaster plenty of time to set, and when perfectly hard, remove it carefully from the object, dry perfectly in an oven, and heat to nearly the fusing point of the metal (type metal), hen pour the metal in immediately. Where the nature of the surface of the object will not al in plaster, a thick solution of glue is sometimes employed; when cold, the glue is very elastic and flexible, and may be removed from almost any
object without danger of breakage. These casts may be reversed in plaster, and the plaster, in urn, in metal.
Minkrals, ftc.-Specimens have been recived from the following correspondents,and examined, with the results stated:
N. V. W.-No. 1 is chlorite schist containing a amounts it would be valuable. No. 2 is chlerite, a hydrous silicate of alumina and magnesia, containing a small percentage of oxide of iron and
sometimes a small amount of oxide of chromium. No. 3 is chlorite schist.-S. D . S.-It is obsidian, or volcanic glass. The ancient inhabitants of Mex making sacriffial knives. It is not employed at present.-A. N. T.-No. 1 is dolomite. No. 2 is
calcite. No. 3 is coccolite. No. 4 is missing. No. is a mixture of calcite with some siliceous roc -too indefinite to admit of separation. No. 6 is arenaceous ilmestone.-T. L.-The coal contains to make it objectionable for the purpose you mention. Itis a very compact variety of bitu-
minous coal of excellent quality. $-\mathbf{F}$. L . L -Th minous coal of excellent quality.-F. L. L.-Th
specimens you send us contain a considerable per centage of nickel, also chalcopyrite and iron py rites.-H. W. S.-It is trap rock containing smal near a lead mine is iron pyrites (sulphide of iron) in indurated clay. The other piece is shale.- E W.-It is clay containing carboniferous matte of no particular value.-E. F. T T The shell is
made artificially of plaster of Paris moistened made artiflicially of plaster of Paris moistened with a strong solution of alum together with the perfume, pressed into molds, and dried. The cam phor cake contains pipe clay, chalk, magnesia, (Fredericktown, O.), G. H. (Windsor Locks, Conn.) C. P. (Marysville, Tenn.), S. N. (Forest Station, Shenandoah county, Va.), send us letters of inquiry as to minerals, but no specimens which we are able to identify. If correspondents will not put their names on the boxes which they send one time) it is very difficult and in some cases im possible to identify the senders.
D. M. asks: What preparation can be used on tenor drums, which wime time stand the beating?-J. B. C. asks Is there any demonstration to the following theo rem? Draw three circles of any unequal diame-

ters, as A, B, C. Produce the tangent lines, as shown, until they meet, from A through B, from A through C, and B through C. It will be found
in all cases that the meeting points are in a straight line, as 1 , 2, and 3 in the straight line, $D$ E. The same result is obtained in whatever position the circles may be placed, or under any variations of theirdiameters, provided they are all

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## The Editor of the Boinsivitio Angrians ac

 riginal papers and contributionsupon the following subjects:On the True Science of Religion. By T. B. McC On Boiler Explosions. By T. J. B. On Cuting Tools. By J. R.
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## HINTS TO CORRESPONDENTS.

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hould repeat them. If not then published, the may conclude that, for good reasons, the: Edito declines them. The address of the writer shoul Enquiries relat
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bility of inventions, assignments, etc., will not b published here. All such questions, when initial only are given, are thrown into the waste basken, as it would fill half of our paper to print them all, but we generally take pleasure in answering briefly
by mail, if the writer's address is given. Hundreds of inquiries analogous to the following
re sent: "Who sells castings for small steam engines? Who sells malleable glass lamp chimneys? Who sells foot power band saws? Who tennial? Whose is the best aneroid barometer? all such personal inquiries are printed, as will b al." which is specially set apart for that purpose, formatio can in this way be expe:utiously obtained

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