

A WEEKLY JOURNAL 0F PRACTICAL INFORIMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

|  | NEW YORK, NOVEMBER 9, 1889. |  |
| :---: | :---: | :---: |

## THE MANCHESTER SHIP CANAL

The approaching completion of the most important parts of the great works from Manchester to the es tuary of the Mersey, and the successful performance, so far, of engineering designs which underwent a prolonged controversy and repeated parliamentary inquiry till three or four years ago, and which the contractor, Mr. T. A. Walker, is carrying into execution by the employment of a vast amount of labor, with the aid of an extraordinary apparatus of machines, must be regarded as a matter of much public interest.

The length of the Manchester ship canal is thirtyfive miles, its depth is 26 feet, and the minimum width five miles, its depth is 26 feet, and the minimum width
at its bottom is 120 feet. This is 48 feet wider than
from Eastham to Runcorn, forms a curved line of having been purchased by the Manchester ship canal twelve miles along the Cheshire shore of the broad will always be accessible, instead of being entered inner expanse of the Mersey estuary, but at Weston only at spring tides as hitherto. The local trade adPoint meeting the estuary of the navigable river vantages here as well as those of the docks at Weston Weaver, which is connected with an extensive system Point, for the Weaver navigation, have already been of canals, it will obtain valuable local traffic, espe- noticed.
cially the shipment of salt. A large trade with Cheshire and the Staffordshire potteries, by the Bridgewater canal, will also reach the ship canal at Runcorn, as well as that of the chemical manufacturers at Widnes. The Shropshire Union canals will feed the traffic at Ellesmere Port, near Eastham.
The Manchester docks formed on both banks of the
The Manchester docks formed on both banks of the
Irwell, chiefly in Salford, but also in Manchester on

The ship canal will be entered from the sea, or rather from the Mersey estuary, about four miles above Birkenhead, by the tidal locks at Eastham, all the gates of which will be open at high tides. The sills of these entrances will be 11 feet lower than the deepest dock sills at Liverpool or Birkenhead, and the channel approaching them will be dredged 3 feet deeper


THE MANCHESTER SHIP CANAL-WORKS OF THE MANCHESTER DOCKS IN PROGRESS-VIEW NEAR THROSTLENEST, ON THE IRWELL.
the bottom of the Suez canal, while the depth is equal, |the site of the Pomona Gardens, Cornbrook, and exso that the largest cargo steamers can pass each other tending to Throstlenest and the Albert Bridge, near in the Manchester ship canal. At several points, near the old Trafford Road, will afford ample accommodathe locks and near the docks, this canal is wide enough tion to the trade of that city. They occupy a space of for such ships to turn. For a length of three miles and a half, approaching Manchester, the width at the bottom is 170 feet, so that ships can lie outside the docks along the wharves on the Salford side. There will also be open side basins, if required, or widenngs at shipbuilding yards, or where cargoes are discharged or loaded, for manufacturing establishments or storehouses adjoining the canal
Five sets of locks-at Eastham, on the Mersey sea estuary, at Latchford, on the Mersey, above Warrington, at Irlam above the junction of the river Irwell with the Mersey, at Barton on the Irwell, and at Man-chester-raise the level of the canal, on the whole, 60 feet above the sea. Of its entire length, twenty-three miles inland from Runcorn to Manchester will have been formed by cutting a straight and deep channel for the rivers Mersey and Irwell. The lower section,
the site of the Pomona Gardens, Cornbrook, and exthe old Trafford Road, will afford ample accommoda-
tion to the trade of that city. They occupy a space of two hundred acres. The water area of the dock basins is sixty-two acres and a half, and the quay frontages are three miles and a half in aggregate length, to which may be added a mile of open wharves along the wide part of the canal just below, and there will be two miles and a half of the canal bank, lower down, available for discharging cargoes into barges and lighters, and putting them ashore. Fifty hydraulic cranes, some of great power, will be provided at the Manchester and Salford docks.
The docks at Warrington, twenty-two acres and a half in extent. are not yet constructed. They will have a railroad connection with the London and Northwestern and the Great Western Rail way, which will bring a large coal and general traffic.
At Runcorn, at the head of the Mersey estuary, the docks belonging to the Bridgewater Canal navigation,

Such will be the Manchester ship canal, omitting or the present a detailed description of the docks at Manchester and Salford. The engineer, Mr. Leader Williams, C.E., and Mr. T. A. Walker, the contractor, have been wonderfully successful in their operations, and there is no doubt of the work being finished before the end of the year 1891, having been commenced in November, 1887. The contract was taken by Mr. Walker for $£ 5,750,000(\$ 28,750,000)$, but we may expect this sum to be considerably exceeded by the total cost of the ship canal,for the purchase of the Bridgewater canal. property has cost $£ 1,750,000$. One of the gteat causes of expense has been the erection or reconstruction of rail way bridges crossing the canal, each at a high elevation, to give a clear headway of 75 feet above the water, and with the approach lines of railway to rise by moderate gradients on each side. The Cheshire Lines railway at Irlam, the Wigan Junction line, the Warrington and Stockport line, the Grand Junction iine at Warringtion, and the London and North western Railway at Runcorn, must be treated with such
costly alterations. The Barton aqueduct of the Bridgewater canal across the Mersey is replaced by an opening swing bridge, which is an iron trough, to be closed at each end when the bridge is to be opened, and to contain the water of the Bridgewater canal, held thus safely above the level of the ship canal. There will be hydraulic lifts by which laden barges can easily be transferred from the one canal to the other. The locks on the ship canal are not single, but each set of locks has receptacles of different sizes for vessels of different classes, to avoid the waste of water in using a lock much larger than the size of the vessel requires. The canal level descends 16 feet at the Trafford locks, near Manchester, 14 feet at the Barton locks, 14 feet at the Irlam locks, again at Latchford, 16 feet more, and finally at Eastham, to the level of the sea. The largest lock at Eastham is 600 feet long and 80 feet wide.
The line of the canal is cut through flat country, marsh meadows chiefly, pretty straight beyond the junction of the Irwell and Mersey, avoiding the many windings of those rivers, which are generally turned into a new artificial channel, somewhat to the south of the old left bank of each river. In a few places only, on the Mersey, where the ground is higher, the cuttings are 50 feet deep, and partly through sandstone, which has been utilized for the construction of walls, and here the sides of the canal, being of rock, are wade more perpendicular than in the softer ground. The whole quantity of earth and stone to be excavated has been computed at forty-eight millions of cubic yards, which is more than the quantity of excavation required for the Panama ship canal, including the Culebra hill cutting, but the undertaking of M. De Lesseps has other difficulties to contend with, in the dam of the river Chagres. Mr. Walker, the contractor for the Manchester ship canal, has set to work as large a number of men, not negroes, but English "navvies," with more numerous and powerful ma-
chines, and with about one-tenth the expenditure of chines, and with about one-tenth the expenditure of money, and he will certainly finish his job within the appointed time. It is stated that nearly 15,000 hand are employed, with eighty steam excavators of four different kinds, pumping engines, steam cranes, and
150 locomotives, for which 200 miles of railway have been laid down, to remove the earth that is dug out. A scene of wonderful activity, with admiral organization and management, and with good provision for the welfare of the industrial army, is now to be witnessed every where between Manchester and Eastham. -The Illustrated London News.

## Dr. Joule, F.R.S.

James Prescott Joule, LL.D., D.C.L., the discoverer of the law of the mechanical equivalent of heat, died at Sale, near Manchester, on Friday night, October 11, after many years of feeble health. Dr. Joule was born at Salford, December 24, 1818, and in his early youth he studied chemistry under the great chemist Dalton. In 1841 and 1842 he was working at the subject which is so indissolubly associated with his name, and in 1843 the earliest form of his great discovery was announced in a paper on "The Calorific Effects of Magneto-Electricity, and on the Mechanical Value of Heat," read at the Cork meeting of the British Association. In 1850 he received the Royal medal of the Royal Society, and in 1870 the Copley medal of the same society. He was the author of a large number of papers published in journals and transactions, and a complete collection of these papers has been published by the Physical Society. In 1880 the Society of Arts awarded the Albert medal to Dr. Joule "for having established, after most laborious research, the true relation between heat, electricity, and mechanical work, thus affording to the engineer a sure guide in the application of science and industrial pursuits."

The International Maritime Exhibition.
On November 4, in Mechanics' Building, Boston, Mass., the above-named exhibition will open. It will remain open until January 4, 1890. It will include everything relating to shipping, from a needle to an anchor. The exhibits will cover so extensive a field that we have not room for their mere enumeration. They are classified in fifteen divisions, including models, unachinery, armament, rigging, life-saving systems, etc.
A facsimile of the Burgess schooner Quickstep is to be one of the most striking features of the grand hall. Due recognition of the exhibition has been taken by the Federal authorities, who will do their part in contributing exhibits and facilitating matters generally. The Smithsonian Institution will send on a very interesting collection of boat models and other objects from their museum.
It is hoped that a naval parade will be held on the opening day, and that the vessels of the North Atlantic squadron will participate. It is evident that the exhibition will be of the highest interest, and we hope it will be the beginning of a series of special exhibitions such as have proved so successful in London.
A journal of the fair called the Kedge Anchor is being issued, which gives items of interest apropos of its mpending opening.

## รstientific ©

ESTABLISHED 1845.
MUNN \& CO., Editors and Proprietors. published weekly at
NO. 361 BROADWAY, NEW YORK.

## O. D. MUNN.

A. E. BEACH.

## TERMS FOR THE SCIENTIFIC AMEIRICAN

 ne copy, one year. for the U. S. or Canada.One copy, six months, for the U. S. or Canada One copy, six months, for the U. S. or Canada................................ 150
S0
One copy, one year, to any foreign country belonging to Postal Union, 400 Remit by postal or express money order.
Australia and New Zealand.
Australia and New Zealand.-Those who desire to receive the
SCIENTIFIC AMERICAN, for a little over one year, may remit \&l in current Colonial bank notes. Address
MUNN \& CO., 361 Broadway, corner of Franklin Street, New York.
The Scientific American Supplement
is a distinct paper from the Scientific Amprican. The SUpplement
is issued weekly. Every number contains 16 octavo pages. uniform in size is issued weekly. Hvery number contains 16 octavo pakes. uniform in size
with ScIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $\$ 5.00$ a year, for U. S. and Canada. $\$ 6.00$ a year to foreign countries belongthroughcut the country.
combined Rates.-The Scientific american and Supplement will be sent fo
seven dollars.
seven dollars.
The safest wa
Australia and New Zealand.-The Scientific American and
SUPPLEMENT will be sent for a little over one year on receipt of 22 cur rent Colonial bank notes.
Address MUNN \& CO.,

NEW YORK, SATURDAY, NOVEMBER 9, 1889.


TABLE OF CONTENTS OF
SCIENTIFIC AMERICAN SUPPLEMENT
NO. 723.
For the Week Ending November 9, 1889.

## Price 10 cents. For eale by all newedealers.

ANTHROPOLOG Y.-Heredity.--Sir William TURNER.-The continuation of the British Association address by the president
of the anthropological section, giving further elucidation of the subject, including the descent of the bleeding family Mampel.... CIVLL ENGINEERING - English and American railways com-pared.-By FDward bates Dorsey.-A concise and able re-
view of English and A merican railway practice, illustrating the advantage of the American system of construction............... The Channel Bridge.-Preliminary Designs.-By Messrs.
Schneider \& Co.-The continuation of this paper, giving full details of the foundation works for the proposed structure, the methods to be adopted in construction and the difficulties to
be coped with in its erection and maintenance.-4 illustrations... . ELECTRICITY.-The Zipernowsky Electrostatic Electromo-tor.-An interesting motor., giving very great speed with high ten-
sion currents, its coustruction and possible uses. -2 illustrations.. sion currents, its construction and possible uses. -2 illustrations. A new attempt to register the speed of moving engines by an ap-
paratus which shall possess the power ot instangly conforming paratus which shall possess the power of instantly conforming
to changes of speed.- 8 illustrations............................
The Standard Axie for 60,000 Pound Cars.-The profile, with di-
mensions of the standard axle for 60,000 pound cars. as adopted by a recent letterballot of the Master Car Builders' Association. -1
illustration. illustration..
MISCELLLANEOUS.-Wonders of Nature-The Poetry of Geo-
logy.-By T. De Witt TALMAGE.-A picturesque and rhetorical logy.-ByT. De WITT TALMAGE.-A picturesque and rhetorical
description of the Valley of the Yosemite. the Yellowstone Geydescription of the Valley of the Yosemite. the Yellowstone Gey-
sers, and the Grand Canon of the Yellowstone, by the celebrated clerggman..
The Paris Exhibition. - Continuation of the list of awards to citizens of the United States, especially compiled for the ScIEN-
TIFIC AMERICAN from theoficial list. tific American from theofficial list.
ed English ship.-The frst example of the British navy.-Description and illustrations of the ship, with disBritish navy.-Description and illustrations of the ship, with dis-
cussion of her peculiarities, merits, and defects. -4 illustrations... Torpedo Boats Crossing the Atlantic.-A trip from England to
Bermuda in torpedo boats.-The first four vessels of this class Bermuda in torpedo boats.-T
that ever crossed the Atlantic.
VII. ORDNANCE.-The Canet Barbette Turret.-A $12 z_{2}$ inch gun
mounted in an improved turret, as now exhibited at the Pris mounted in an im proved turret, as now exhibited at the Paris ex-
position.- Full details of the loading and maneuvering mechanism
for the same.-1 illustration for the same. -1 illustration..
VIII. PHOTOG RAPHY.-On Eikonogen, a New Photographic De-
veloper.-By Prof. G. D. LiveIng.-A practical and scientific pa veloper.-By Prof. G. D. Liveing.-A practical and scientific pa-
per on the new photngraphic developer.-Its composition, advan'tages, and methods of use.-A paper read before the British Asso-SANITATION.-The Amines Procss for Sewage.-A curious pro-
cess of sewage purification, utilzing herring brine as one of the disinfectants.
x. TECCHNOLOGY.-Alumino-Ferric Cake.-A new sizing material
for use in paper manufacture,
for use in paper manufacture.-Its peculiarities, uses, and
Mica-Some of its Uses.-A very interesting paper on the sub-
ject of mica and its uses for many purposes in the arts............. the who is furnished with a means of quickly doing rom居 36,000 to $40,000 \mathrm{ems}$ in ten hours, which may be positor.
A novel gas engine, of English make, specially designed for operating dynamos, is a feature of the mechanical section. It has only one cylinder and one crank, but, by a simple arrangement of link-work, the piston makes four strokes for each revolution of the crank-shaft, so that power is developed at every turn of the fly-wheel. Other gas engines expand the ignited charge to the original volume only; the ex haust valves being opened when there is yet some orty pounds pressure in the cylinder, thus calling for a greater supply of gas. In this gas engine the ex pansion continues until the volume of ignited charge is about doubled, giving, so it would appear, an un usual amount of power with the ordinary charge of gas. When the crank has completed its revolution, the piston is at the end of the exhaust stroke, having driven out the burned gases from the previous working stroke; this in some types of gas engines being considered so important as to warrant the sacrifice of a whole revolution to attain. The engine runs at high or low speed equally well.
The manufacture of cotton seed oil and lard and soap is exhibited in its various stages; first the seeds, then the shelling process, the crude product, and the product of the various stages of refining.
A respirator exhibited looks like a large cup with false bottom held over the mouth and nose by a band passed around the head. It is claimed for it that it will protect the throat and lungs from dust, poisonous gases, etc., and is intended for use by miners or work men in white lead corroding works, glass and blast furnaces, chemical, pulverizing, paint and color works, dry crusting, grinding and polishing works, etc. The air is inhaled through a thin wet sponge, passing out through an automatic valve
The Persian art enameling on glass (so called) is shown on an extensive scale; many beautiful designs being exhibited. The colors used have the appear ance of fine sand, but, after firing, the particles are fused and a smooth, highly polished surface results, a surface so hard that-so the proprietors claim-it can be marked or scratched only by a diamond. The colors are transparent, and show equally well in reverse though laid upon one side only. It is claimed that greater delicacy of design and elaboration of detail are attainable in this enameling than is possible in stained glass work; the unsightly "joins," too, being dis pensed with. There is work in faience with delicately wrought flowers in delightfully natural tints and fig ures of striking naturalness; these in translucent or opaque enamels.
A new screw machine for bench work is designed for very small, quick work, requiring a light, sensitive machine. The turret slide has adjustable stop, and the block can be bound any where along the bed. The cut off slide has two tool posts, with adjustable stop for each. All kinds of small shoulder screws, handles, knobs, washers, collars, pins, etc., can be turned out with rapidity, accuracy, and finish. The wire chuck which acts with the machine in motion is worked by the handle at the end of the head. One stroke of the lever releases the grip of the chuck and allows the
wire to pass in througn tbe hollow spindle, while the return stroke tightens the chuck and binds the wire.
A new liquid meter is especially convenient for selling oils, turpentine, etc. A portable house, that can be readily carried into the woods, will interest sportsmen. Other interesting inventions are a new damper regulator, a seif-cooling furnace door, improved granite roofing, a free-cutting and even-tempered emery wheel.

## Chinese Floating Gardens.

The following description of the manner in which floating fields and gardens are formed in China was condensed for publication in The Garden from an article by Dr. Macgowan, which originally appeared in the China Review: "In the month of April, a bamboo raft, ten to twelve feet long and about half as broad, is prepared. The poles are lashed together with interstices of an inch between each. Over this a layer of straw an inch thick is spread, and then a coating two inches thick of adhesive mud taken from the bottom of a canal or pond, which receives the seed. The raft is moored to the bank in still water, and requires no further attention. The straw soon gives way and the soil also, the roots drawing support from the water alone. In about twenty days the raft becomes covered with the creeper (Ipomaca reptans), and its stems and roots are gathered for cooking. In autumn its small, white petals and yellow stamens, nestling among the round leaves, present a very pretty appearance. In some places marshy land is profitably cultivated in this manner. Besides these floating vegetable gardens there are also floating rice fields. Upon rafts constructed as above weeds and adherent mud were placed as a. flooring, and when the rice shoots were ready for transplanting they were placed in the floating soil, which being adhesive and held in place by weed roots, the plants were maintained in position throughout the season. The rice thus planted ripened in from sixty to seventy, in place of 1.00 days. The rafts are cabled to the shore, floating on lakes, pools, or sluggish streams. These floating fields served to avert famines, whether by drought or flood. When other fields were suimerged and their crops rotten, these floated and flourished; and when a drought prevailed they subsided with the falling water, and while the soil around was arid, advanced to maturity. Agricultural treatises contain plates representing rows of extensive rice fields moored to sturdy trees on the banks of rivers or lakes which existed formerly in the lacustrine regions of the Lower Yangtsze and Yellow Rivers."

The Brain Weight of Man and Woman.
The subject of the comparative weight of the brain of man and woman comes up periodically, and almost always some incorrectness of statement or inadequacy of knowledge is to be observed. Perhaps a certain
feeling of gallantry tempts speakers and writers to feeling of gallantry tempts speakers and writers to
handle tenderly facts apparently in conflict with the handle tenderly facts apparently in conflict with the
view that woman is encephalo-morphologically the equal of man.
The average weight of the male brain is $491-2$ ounces of the female, 44 ounces-a difference of over five ounces. Woman's brain has a higher specific gravity. (Marshall), but woman's brain is larger in proportion to her weight. In 239 Russian brains (Buchstab) the ratio of body weight to brain weight was for the male as 38 to 1 , for the female 35 to 1 . In woman the brain is shorter in the sagittal diameter, being from $62-5$ to $63-5$ inches in man, 6 to $62-5$ inches in woman (Huschka). The transverse and vertical diameters are more nearly equal in the two sexes.
The frontal lobe is better developed in man, the distance from the anterior extremity of this lobe to the upper end of the fissure of Rolando being in males 1529 mm ., in females 140.6 mm . (Buchstab). On the other hand, the occipital lobe is more developed proportionately in woman, the distance from the point of the occipital lobe to the parieto-occipital fissure being in males 48.7 mm ., in females 51.4 mm . This is for Russian brains, which are a little smaller than German and English, a little heavier than Italian and French brains.
The difference between the weight of brain in man and woman increases with civilization, and is most marked in the Caucasian races. In Parisians this difference amounts to 222 grammes, or nearly seven
ounces; in European nations generally, 163 grammes in Hindoos, 120 grammes; in Australians, 103 ; in negroes, 82 ; in Chinese, 15.
The greatest sexual difference as regards brain weight is found at birth, when the female brain weighs 347 grammes, and the male 393 , or about $\frac{1}{6}$ more, while the total weight of the male infant is about $\frac{1}{15}$ more than that of the female. The female brain begins to lose weight after the age of thirty, that of a man not till ten or fifteen years later. The loss in woman is very slight, however, and she keeps up a high brain weight
much later (till seventy) than man, so that in old age the difference in brain weight is reduced to its minithe difference in brain weight is re
mum, or a little over three ounces.
Definite statements cannot be made regarding the
sexual differences in convolutional complexity, or the
thickness of the gray matter, two important points thickness of the gray matter, two important poin
in estimating the intellectual powers of the organ.
Despite much loose talk regarding the unimportance of brain weight as a test of intellectual superiority, it is unquestionably an important factor. What Thurnam calls medium brains range in weight between 40 and $521 / 2$ ounces for men and 35 and $471 / 2$ ounces for women. All brains in size above this are called megalocephalous. Now, the tables of brain weights collected by Bastian and others show that the proportion of great men who are decidedly megalocephalous is twenty-five per cent while the proportion in average men is four per cent to five per cent. The proportion of incipient megalocephaly (i.e., weight above $521 / 2$ ounces) among eminent men is nearly sixty per cent. There can be no doubt that the majority of eminent men have large brains, just as the majority of ordinary men have forty-nine ounce brains. Certain individual cases furnish exceptions, and distinguished talent can coexist with a small brain, but it is not the rule.
When a brain falls to a weight of $371 / 2$ ounces in a man, or $321 / 2$ ounces in a woman, it is called microcephalic, and the rule is that below these limits idiocy exists. There is just five ounces less amount of brain matter, however, needed to keep a woman from idiocy than is needed for a man. Hence we may reasonably suppose that this, which is nearly the average difference in brain weight of the sexes, represents, not tissue necessary for mentality, but corresponds with the smaller muscular mass and shorter stature of woman. -Medical Record.

International Association of Educators
The Lancet reports an international congress re cently held in Paris to promote the cause of free education, education free from dogma, from excessive official control, and absolutely integral. By this very useful French word the idea of completeness is conveyed. It means that everything is to be taught if the pupil is capable of learning. From the public health point of view the doctrines enunciated by this congress were
important. M. Desmoulin, till quite recently Muniimportant. M. Desmoulin, till quite recently Muni-
cipal Councilor of Paris, was in the chair at most of the sittings, but after the opening meeting held at the Hotel de Ville the congress, out of compliment to the foreign nationalities represented, elected Mr. Adolphe Smith (for England) as president and Madame Polousky (for Russia) as vice-president. There were a great many Russian and Polish teachers present, and delegates from Belgium, Italy, Mexico, the United States, and Switzerland. The greater number were
teachers, but I noted also a few medical men, and the teachers, but I noted also a few medical men, and the
women delegates were nearly as numerous as the men. So far as the debates bore on questions connected with public health, the following were the principal points elucidated. First, teaching was to be based exclusively on scientific principles, deductions from actual experiments. Instead of being told, the child was to be made to discover, if possible, that which it is desired to teach. Every natural proclivity was to be en. couraged. A child should never be forced in any direction, and should never be overworked. The classes were to follow each other in such a manner as to provide the greatest possible change, and thus prevent weariness. But, above all, the children were to be fed, and well fed. The delegates were unanimous in denouncing the hardship endured by underfed children, and the impossibility of teaching under such conditions. The Swiss delegate declared that in primary schools of several cantons not only were free meals provided, but even articles of clothing were given away, so that the children of the
not suffer from cold while at their lessons.
For the preservation of the morality of children the For the preservation of the morality of children the
congress was strongly in favor of mixed schools. Just as brothers and sisters were brought up together in the family, so ought boys and girls to work together at school, and they should have both masters and mistresses. Each sex had its special capacities, and the children should profit by both. There was far more decency when the sexes were together. Sometimes a master married one of the schoolmistresses, sometimes even among the children playmates later in life became husband and wife, but there was not that immorality which prevails to so large an extent in both boys' and girls' schools or convents where the sexes are separated. The experience of mixed schools in Switzerland and in Germany helped to confirm, the delegates maintained, these theories. Also there was far more emulation when the sexes were mixed.
Mr . Adolphe Smith introduced a resolution demand ing that, "In view of preserving public health, it should be obligatory to teach in all schools and to both sexes the elementary laws of hygiene, including the principles of drainage, ventilation, and disinfection." He explained how the mortality in different centers of population in England had been reduced by one-third in consequence of the application of sanitary laws. But it was necessary that each person should be sufficiently acquainted with these laws to apply them in
municipal councilmen, vestrymen, and members of Parliament as would promote wise legislation on the subject. For all these reasons it was necessary to teach the good doctrine early, and no better lesson could be given than the object lesson of a school properly built and free from all sanitary defect. In this respect it was fortunate that the congress was international, for the congress would have a great deal to learn from English schools so far as the drainage was concerned, but the English had much to learn from France with respect to the unilateral light and to the ventilation and warming of school rooms, which was more scientifically arranged in France. The Swiss delegate, in supporting the resolution, insisted forcibly on the necessity of building schools in accordance with sanitary laws, as the masters would be placed in an absurd position if they taught pupils principles of hygiene which were not applied in the locale where the lessons are given. A Polish delegate protested that, while most persons talked of hygiene, very few persons knew anything at all about the question. It was time that the science was properly and systematically taught. The congress then unanimously voted in favor of the resolutlon.
A considerable sensation was produced by Madarne Cheliga-Loevy's report on the condition of education in Poland. Everything was done to prevent the free development of thought. The government wanted doctors and engineers, but, on the other hand, looked on education as a danger, as a power that menaced social order. Hence the universities and the upper schools were checked in their development by all manner of prohibitory decrees. In one province, possessing 7,000,000 inhabitants, there were only twenty schools for secondary education. The children of poor parents were by law excluded from the universities, and only those who were very rich and considered favorable to the government were admitted. The want of doctors, engineers, and educated men in Russia would soon assume the proportions of a national calamity. Madame Corradi, a Russian delegate, described the torture of children set to uninteresting tasks of Latin and Greek, taught like parrots, not allowed to think, and so uselessly and stupidly overworked that suicide among school children had become quite epidemic in Russia.

The congress at its last sitting decided to constitute tself into an International Association of Educators, and M. Francolin, 174 Faubourg St. Denis, was elected international secretary. The association will seek to promote in every country the cause of free and scientific education.

## Extralite-Experiments with the New Explosive.

On October 24, in the Croton aqueduct excavations in Central Park, some experiments were performed with extralite. Rudolf Ericsson, the holder of the patent, conducted the operations, which were designed to show the safety of the composition and its effectiveness as a blasting agent. Extralite is a yellowish powder, a mechanical mixture of several constituents, including nitrate of ammonia and naphthalene. The powder used in the experiments was made by the inventor in his own house without any special appliances. A fire was lighted and a quantity of the powder was burned in it; some was poured upon a hot plate of iron and quietly burned. It was hammered between stones, and a pistol ball was fired through a can filled with it, without effect in either case. A detonating cap was exploded when embedded in a cartridge of extralite, also without effect. Finally three holes in the rock were charged and tamped, and fired by detonators. Owing to the confinement in the bore holes, the extralite detonated with immense power, throwing pieces of the rock to a great distance and upheaving a very large mass of material. The explosive in general terms was shown to be one that can only explode when confined, and then possesses immense power. Its adaptation for blasting and for charging percussion shells was apparently very well illustrated.

## The Great Cairo Bridge Opened.

The lllinois Central opened its $\$ 2,500,000$ bridge across the Ohio river at Cario on the 29 th ult. President Fish, Vice-President Harrison, and other officials of the Illinois Central were present at the opening. The bridge proper is 2 miles long, and the approaches 4 miles long. The bridge is 58 feet above high water, and 110 feet above low water. The piers are in pneumatic caissons, and are sunk 50 feet below the bed of the river. An engineering feat was here successfully attempted which reads like a fairy tale. At this depth below the river bed no foundation was reached, and it was impossible to sink the piers further. They were consequently packed with sand, and the immense bridge is really sustained by the friction of the sand on the sides of the piers. The bridge was tested with nine Mogul engines, and was pronounced perfectly satisfactory. It was built by the Union Bridge Company, of Buffalo. The engineers for the Illinois Central are George S. Morison and E. L. Corthell.

AN EXTINCT BIRD (FREGILUPUS VARIUS BODDAERT). The organisms that people the earth, like everything in the world, are subject to continual change. The individual grows up, remains for a time in full possession of its powers, then becomes old and weak, and dies. It is the same with the species-they also have their youth, prime, and old age.

The bodies of many thousand species of animals lie buried in the strata of the earth, species which were once widely spread on the sur face of the earth, but died out very long ago, leaving no descendants. And the same that occurred formeriy is still going on. Even within historic times a whole series of animals have become extinct, and it seems that the days of not a few others are numbered. Even in our own century the great auk inhabited the coasts and islands of the North Ailantic, but because he could not fly and thus escape the pursuit of man, he was stricken out of the book of life.
The sea cow, a phytophagous inhabitant of the sea, which was found off the coast of Kamtchatka and the islands of the Behring Straits, has been completely exterminated during the last twenty-five years. Different kinds of struthious birds lived, formerly, on both islands of New Zealand; they were un disputed lords of the land, which harbored no four-footed beasts of prey, and did not need wings.

Then man appeared on the scene, and with one blow changed everything. Against him the feathered giant could not hold its own, and the race has long been extinct. It wa the same with large birds on other islands one species on the island of Rodriguez died out after the introduction of swine, which ate their eggs, they having been simply de posited on the ground.

On these islands not only the birds which could not fly were exterminated, but also many which had the power of flight. Five or six kinds of parrots lived there when the place was first visited by Europeans, but now they have disappeared; and it is the same with the bird represented in our cut, Fre gilupus varius, which was described by Fla court as early as 1658 , under the name o Tiuouch, but since 1858 no living specimens have been seen. We do not know the history of its extinction, but are sure man had a hand in it.
The bird is about nine inches long, it color is white and bister, with rust red on the back and tail, the beak is long and curved, the wings and tail moderately long, and the head is decorated by a hood of upright white feathers.
Principally on account of this hood the bird has been classed with the hoopoes, but according to Murie it should be classed with the starlings. Our cut is an exact representation of the stuffed specimen in the Kensington Museum.—Illustrirte Zeitung.

## AN IMPROVED DRAG SAW.

A drag saw designed to be conveniently manipulated by one person is illustrated herewith, and has been patented by Mr. Richard Y. Macbeth and Mr. Louis Gourdin, of Monk's Corner, S. C. A frame is employed in which spaced parallel beams extend forward and downward from near the top of the rear standard, a second set of intermediate brace bars extending forward at right angles to the standard, and where the front


MACBETH AND GOURDIN'S DRAG SAW.
ends of these bars meet a head block is secured, with a vertical guide slot adapted to receive the saw blade. The saw has at its inner end a shank to which a weight is attached on each side of the blade, and the rear end of the shank is pivoted to the lowerend of a pendulum rod adjustably journaled in the upper portion of the standard wherebv the saw may be raised or lowered.

A weight is also attached to the pendulum rod near the saw. The saw is reciprocated by means of a handle pivoted at the rear of the blade shank, and extended rearward through the standard. Upon the base of the standard are pins adapted to be driven into the ground to hold the frame in position, and near the outer end of one of the brace bars is pivoted a dog to be driven into the log, the dog being released from the log by


AN EXTINCT BIRD (FREGILUPUS VARIUS BODDAERT).
and lactic and acetic acid, the latter often in large amounts, are produced. Possibly alcohol is sometimes, but never as a first product of the hot material.

## The London Bread Trust

The issue consists of 100,000 shares of $£ 5$ each, for the purpose of acquiring 277 old established London bakery businesses, a freehold bakery, and three steam flour mills. The directors are men of good standing, who are stated to be all practically acquainted with the business. Considered merely as a moderately speculative invest ment, the prospectus was extremely attrac tive. Its proposal to earn profits to the amount of $£ 91,000$ on its capital of half a million is sanguine enough, and perhaps not too sanguine. Yet the proposal involves very serious consequences. During the past forty years, at least, we have been accus tomed, as a nation, to look upon competition as the life and soul of trade; and here, as the result, probably, of unrestricted com petition, monopoly steps in and quietly oc cupies the leading positions. The salt trade the starch trade, the match trade, the thread trade, as well as others, and now the trade in the "staff of life" is made subject to what appears to be an increasing tendency-the tendency toward monopoly. There could be no more serious weapon in the hands of any body of men than monopoly in bread. The hold that such a board of directors might have over the food supply of London is a power capable of being wielded dangerously.
Without questioning for a moment the benevolence of the directors in this particu lar case, it is quite legitimate to speculate upon the possibility of this control being used by the directors as an engine to ma neuver prices or to determine wages by ques tionably legitimate means. The recent strike of the dockers caused immense inconvenience to everybody in business in London; but what should be said of a dispute bet ween the Bread Union and its employes, and the possi ble contingency of the directors refusing to ubmit the matter to arbitration? Ther have been bakers' strikes before, but they have generally been limited in their area and have not involved serious disturbance. But the homogeneity of capital on one side would of necessity compel homogeneity of labor on the other, and thus a strike of bakers simultaneously in three hundred raising to a vertical position, as shown in dotted lines bakeries in London might reduce the city to meas in the illustration, a curved releasing lever pivoted urable distance of famine.-Industries. upon the dog.

In her "Reminiscences of the Herschels," in the Century Magazine, the late Prof. Maria Mitchell says : "One of Sir John Herschel's numerical problems was this: If, at the time of Cheops, or three thousand years ago, one pair of human beings had lived, and war, pestilence, and famine had not existed, and only natural death came to man, and this pair had doubled once in thirty years, and their children had doubled, and so on, how large would the population of the world be at this time-could they stand upon the earth as a plane?
"We were sitting at the breakfast table when he asked the question. We thought they could not. 'But if they stood closely and others stood on their shoulders, man, woman, and child, how many layers would there be?' I said, 'Perhaps three.' 'How many feet of men?' he asked. 'Possibly thirty,' I said. 'Oh, more !' 'Well, we'll say a hundred.' 'Oh, more! Miss Herschel said, 'Enough to reach the moon.' 'To the sun.' 'More, more!' cried Sir John, exulting in our astonishment ; 'bid higher.' 'To Neptune,' said one. 'Now you burn,' he replied. 'Take a hundred times the distance of Neptune, and it is very near That is my way,' said he, 'of whitewashing war, pestilence, and famine.'

## Fermentation of Ensilage.

Prof. Burrill read a paper before the American Association on fermentation of ensilage. He stated that all fermentation of organic matter is now universally admitted to be due to the action of micro-organisms, and he described the phenomena presented in recently stored green fodder, used for cattle food. This material is now placed in bins of large size, where it soon becomes very hot, reaching a temperature of $60^{\circ} \mathrm{C}$. ( $140^{\circ}$ F.). This temperature was sufficiently high to kill, or at least prevent the growth of, nearly all aninal and vegetable species, $50^{\circ} \mathrm{C}$. being the upper limit. Upon proper examination of this hot material one soon finds that a single species of bacteria (Bacillus butyricum) is associated with the fermentation and subsequent rise in temperature. Further tests prove that it is the cause of these changes. Secondary changes are very liable to occur as the heat decreases,

## AN IMPROVED SAWING MACHINE.

The accompanying illustration represents a portable crosscut sawing machine, patented by Mr. John De Graff, in which the saw is reciprocated in a horizontal or slightly inclined plane by means of a crank shaft operated by hand or power. At one end of the main frame of the machine is a buck on which the wood to be sawed is placed, and at the other end of the frame is a shaft carrying a balance wheel, a crank wheel, and a pulley, through which the machine may be run by power. Upon the shaft is mounted a frame, normally upheld by a counterbalancing weight supported by a rearwardly extending arm rigidly connected to the frame, and to one side of the frame is secured a metallic plate serving as a way for a saw frame, the latter frame having recessed brackets to receive the edges of the plate. The saw frame is connected to a pitman, the other end of which is connected to a wrist pin carried by the crank wheel. The frame carrying the plate


DE GRAFF'S SAWING MACHINE.
which serves as a way for the saw frame can be readily raised and lowered by a forwardly extending handle, the saw being held to its work by pressing down on the handle, the frame being raised, or allowed to rise, after each stick is sawed through.
For further information relative to this invention address Mr. F. H. Page, Key, Iowa.

AN AUTOMATIC LAMP EXTINGUISHER.
A device which may be attached to any lamp, and with which, should the lamp be overturned or thrown much out of perpendicular, the flame will be automatically extinguished, is illustrated herewith, and has


MILLER'S LAMP EXTINGUISHER.
been patented by Mr. Joseph Miller, of Olean, N. Y. The collar by which the burner is attached to the lamp body is carried inward and upward to form a flange, upon which is made to rest a dish-shaped disk, with a flanged periphery overlapping the flange upon the collar. A pendulum weight is rigidly secured to the bottom of the disk, and above this disk is a second disk, normally sustained by the first one, the upper disk being connected by a rod with a sleeve that is vertically movable upon the wick tube. In operation, the tilting of the lamp causes the pendulum to swing to one side, as shown in dotted lines in the sectional view. The lower disk, to which the pendulum is rigidly attached, is thus thrown upward, one of the flanged edges of the disk pivoting upon the flange on the collar, and by the contacting of the lower disk upon the upper one the rod connecting the latter with the sleeve upon the wick tube is moved upward, carrying the sleeve over


STONE'S WASHBOARD PROTECTOR.
the end of the wick tube and extinguishing the flame. Another form of construction is provided, in which the pendulum disk is arranged in the lamp pedestal, the connecting rod extending up through a central tube in the lamp body to the sleeve upon the wick tube, and the principle of the invention is likewise applicable to other forms of lamps or other lights, to be extinguished by being thrown out of the perpendicular or tipping to a certain angle. When the device is used with lamps on a railroad train, a similar automatic extinguishing of the lamp is designed to be effected by the very sudden stoppage of the cars, as in case of collision, the shock then throwing the pendulum to one side.

## AN IMPROVED THILL COUPLING

A coupling by means of which the thills may be quickly and conveniently attached to the axle, the coupling being such as may be secured to any axle without difficulty and used with any of the ordinary forms of thills, is illustrated herewith, and has been patented by Mr. Thomas L. Barr, of Plymouth, Ohio.


## barr's thill coupling.

Fig. 1 shows the coupling in position to receive the thill, Fig. 2 showing it holding the thill in place. The base plate of the coupling has at one side an upwardly extending fixed ear, from which projects a pin with beveled and notched end, adapted to engage the thill
iron. Upon the other side of the base plate a laterally movable ear is hinged between two lugs, the central lower portion of the ear through which the pintle passes being recessed to receive a spring coiled around the pintle, one end of this spring being carried upward and forward to enter the notch of the pin and hold the movable ear in position against the thill iron when the latter is engaged by the pin. Near the rear edge of the movable ear, upon its outer face, is formed a stop, consisting of a downwardly extending metal bar, bent at a right angle rearward to form an arm limiting the downward movement of the hinged ear. In attaching a thill, with this coupling, the thill iron is slipped over the pin projecting from the fixed ear, as shown in Fig. 1 , when the hinged ear is carried upward to its vertical position and the arm of the spring brought into engagement with the notch in the outer end of the pin, as shown in Fig. 2. The inner faces of each of the ears at the front lower end are thicker than at the top, and beveled slightly in ward, to better fit the thill iron and prevent the thills from rattling.

Peroxide of Hydrogen in Necrosis of the Jaw. Dr. A. Lohmann, of Cassel, communicates to the Deutsche Medicinische Wochenschrift several interesting cases from his dental practice. The first was that of a woman of thirty-two years, suffering from necrosis of the left lower jaw. A sequestrum with both bicuspids was completely separated, and without trouble or pain removed; the posterior portion, which still contained a molar, was freely movable and full of pus. After several injections of peroxide of hydrogen the discharge of pusentirely disappeared, the gum regained a healthy color, and in about a fortnight the patient was quite cured. The second case was that of a civil engineer, twenty-six years old, whose left upper jaw was diseased. After removal of the sequestrum, which contained the last tooth and a bicuspid, peroxide of hydrogen was injected into the diseased alveolar processes at once and several times during the following days, and in a week the patient was completely cured. The author has even cured a case of alveolar pyorrhœa by this method.

## AN IMPROVED WASHBOARD PROTECTOR.

The accompanying illustration represents an attachment for washboards designed to prevent the water and suds from being splashed upon the clothes of the person rubbing clothes on the board. The device has been patented by Mr. D. G. Stone, of Negaunee, Mich. The protector is preferably made of metal, and consists of an inclined guard plate or shield having a flat base portion riveted to a supporting strip that extends the full width of the washboard, and is bent down at its ends at right angles to form supporting legs. These legs, when the protector is applied to the washboard, fit in sockets secured on the side pieces of the board, the supporting strip or cross piece, with its attached shield and base piece, lying on top of the ordinary cross top piece of the frame of the board. Where the inclined shield joins the base piece is a downwardly projecting flange extending the full width of the washboard, and serving to close the opening between the upper cross piece of the board and the supporting strip of the protector, preventing any water which may be splashed up from passing out at this place. This protector may be readily detached and reversed to adapt it to opposite sides of the washboard when the latter has double or opposite rubbing faces, and, while of cheap construction, it would outwear and might be used on several successive washboards.
For further information relative to this invention address the inventor as above.

## Trade Mark Decision.

The point was recently raised in the Chancery Division of the High Court of Justice (England) whether the word "Monobrut," which had been registered in England as a trade mark for dry champagne, was or was not a valid trade mark. The case came up on an application to have the trade mark removed from the register, the applicant contending that the word was not a " fancy word" within the meaning of the trade marks act. It appeared from the evidence that the word in question was merely a French term for " very dry '" wine. Mr. Justice Kay held (in re Vigner's trade mark) that under the circumstances it must be regarded as a merely descriptive word, and therefore not en titled to registration as a trade mark according to Eng lish law.

## AN IMPROVED SCAFFOLD-SUPPORTING STANDARD.

A readily adjustable standard to support scaffold planks at any required height, and allow the building of a scaffold of any desired area, and one which may be folded into comparatively small space when not in use, is illustrated herewith, and has been patented by Mr. Thomas Sixsmith, No. 102 Duane St., New York City. The scaffold standard preferably consists of an open frame made mainly of one piece of. T-iron, a scaffold plank-supporting block being fitted for vertical adjustment in the frame. The lower ends of the frame side bars
are bent outward to form legs, other legs being pivoted
o a tie bar of the frame, and adapted to swing around in line with the sides of the frame, to facilitate transportation or storage. The sides of the frame have projecting pins or bolts, to serve as foot rests for workmen climbing to the scaffold floor. The plank-supporting block has slots at its sides which receive the ribs of the side bars of the frame, and also has pairs of lugs which engage the edges of the side bars. The block may be adjusted higher or lower on the standard and held in position by any suitable detent or latch, and the block


SIXSMITH'S SCAFFOLD STANDARD.
may have top spurs or pins to enter and steady a plank placed on the block. The block is also preferably pro vided with independent vertical slots or openings, in each of which the end of an ordinary scaffold plank may be sustained edgewise.

## AN IMPROVED EXHAUST PIPE FOR LOCOMOTIVES.

An exhaust pipe designed to reduce back pressure in the cylinders, and at the same time increase the draught in the boiler flues, is illustrated herewith, and has been patented by Mr. John S. Bigelow, of Phillipsburg, N. J. Fig. 1 shows the complete device, the exterior walls being partly broken away to show the interior, Fig. 2 is a bottom plan view of the nozzle, and Fig. 3 represents the exhaust in position in the smoke box. The lower end of the main pipe is secured to the bed plate of the locomotive, so that the exhaust from each cylinder passes in near the bottom, where there is held a wedge-shaped partition, forming two subdivisions of the pipe, each receiving the steam from one cylinder. In the upper end of the pipe, where the nozzle is secured, is held a central post, having on one side an offset connecting the post with the inside of the nozzle, and the lower end of the offset is wedge-shaped, in line with the wedge-shaped partition at the bottom of the pipe. The lower end of the post is formed in the shape of an inverted cone, and it has at its upper end, above the nozzle, a bore or recess. The offset is provided with an opening connected with this recess, and


## BIGELOW'S EXHAUST PIPE FOR LOCOMOTIVES.

in the opening is held a downwardly inclined hood, opening at the bottom toward the front end of the smoke box. The bottom partition in the main pipe directs the steam upward from each cylinder, preventing reaction of the exhaust from one cylinder upon that of the other, and the cone-shaped lower end of the interior post, with its wedge-shaped offset, is intended to present but little resistance to the steam, the upward movement of which is designed to cause a suction in he recess in the post, and consequently in the hood, so that the smoke from the sinoke box $\cdot$ is drawn through the hood into the recess, and thence out with the ex haust steam.

## Photographic Reliefs for Dec $\begin{gathered}\text { mental Use. }\end{gathered}$

The beautiful modeling of a lead mould, such as is used in printing Woodburytypes, is very suggestive of a variety of decorative uses for the photographic relief; and in the course of a few short articles we propose to give instructions in some methods of making such photographic relief pictures as may serve for ornament or decoration, and it may be mentioned that the methods of making these are very easy -much easier than the making of an ordinary Woodburytype mould.
It is well known that a gelatine film which contains any soluble bichromate becomes so altered by exposure to light as to lose its property of swelling in water. If, then, a film of bichromatized gelatine is exposed under a negative until the darkening produced by the action of light has proceeded so far as to impress every gradation of the picture thereon, a device in various tints of brown on a light yellow ground is obtained, but up to this point the surface of the film remains uniform; that is to say, no part stands out in relief. Let the film-which, by the bye, may either be free or attached to a glass plate for support-be now soaked in cold water. The unexposed parts immediately begin to swell, while those which were freely exposed refuse to swell, and those portions which received an intermediate degree of exposure swell to a proportionate extent. In this way there is formed a most delicately modeled and beautiful relief, which faithfully represents all details and gradations of the original negative. The height of the relief depends on the thickness of the gelatinous film, the degree of exposure, the extent to which the film has been soaked, and other circumstances; but it is easy to obtain a relief of the tenth of an inch in ordinary cases. We can readily reproduce these reliefs in plaster of Paris, metal, India rubber, ebonite, type metal, copper, earthenware, gutta-percha, or even wood; and very numerous applications of the solid pictures thus obtained will suggest themselves to practical men. In supplying such productions, the photographer may give an impetus to the business of the bookbinder, the cabinet maker, the die sinker, the potter, and the embosser of leather or other soft material; besides affording collateral aid to many other industries. The operation of making the gelatine relief being rapid, and its reproduction so simple, it is a wonder this kind of work has not been extensively practiced by photographers.
The method of making the gelatine relief which we shall describe in the first instance is that which we should suggest as the best for general use, and one so wake a successful relief after the first trial
Two pieces of stout plate glass of a conve
Two pieces of stout plate glass of a convenient size
are taken, let us suppose of whole plate size ( $81 /$ inche are taken, let us suppose of whole plate size ( $81 / 2$ inches by $61 / 2$ inches), and some of the finest "flour emery" or bath brick is mixed with water and placed between them, and the plates are worked over each other until one surface of each is uniformly ground. The plates, now being carefully cleaned, are finally rubbed with soda solution to remove any trace of grease, rinsed, and put on edge to drain.
We now require to set up two leveling stands in the sink of the dark room, and in the event of no regular leveling stands being available, a convenient substitute may be made by blocking up with wedge-shaped pieces of metal, or, indeed, with small coins. A spirit level is not absolutely essential, as, if water is poured on the plates, it will be seen when the upper surface is horizontal.
To prepare the plates for the sensitive mixture, they are now well flooded, ground side uppermost, with a stream of warm water, beginning with moderately warm, and finishing with water at about $70^{\circ}$ Centigrade, the gradual heating being necessary to avoid fracture of the plates. Before the hot water has dried off, a quantity of the following sensitive mixture is poured on, so as to drive the water well over the edges of the plates :

$$
\begin{aligned}
& \text { Gelatine (Nelson's "Opaque" or "Amber" answers } \\
& \text { well).... .......................................................................... } 100 \text { parts. } \\
& \text { Water.... ....................... }
\end{aligned}
$$

Soak the gelatine, melt in a water bath, and add-

## Liquid ammonia

1
3
part.
Stir till the bichromate is dissolved, allow the mix ture to remain at rest in the water bath till most of the bubbles have risen to the surface, and pour carefully through a piece of muslin (not too fine) stretched ove the top of a warmed beaker or jar.
Before leaving the gelatinous mixture to set on the leveled plates, it is important to see that no veins or streams of water remain-a matter which can be in sured, if care be taken to allow an even flow from the center to the edges; but any plates where the water may seem to lodge can be readily dealt with by draw ing the mixture over with a strip of paper, and, i necessary, pouring on a little more of the gelatinous preparation.
All is now left in position till the gelatine has set, when the plates are put in a warmish place for the
pitted surface-like the "Gold Label" gelatine of Coignet-is unsuitable for our present purpose. As regards the thickness of the film to remain on the plate, it may be mentioned that the colder the plate and the mixture, so much the more will be retained on the glass, and so much thicker will be the film. Before the plates are dry, it is convenient to scrape any gelatine from the backs and wipe them clean, as any lumps may cause fracture in the printing frame. Exposure may be under a negative or a positive, according to the direction in which the relief is to be taken; and it should be continued until the details in the more opaque parts are visible from the back of the plate by the browning of the bichromated gelatine.
The plate is now soaked in cold water until the unexposed parts of the gelatine have swollen sufficiently to give the amount of relief required, and now we proceed to make the plaster cast. A little oil is well dabbed on the face of the relief, and when the excess has been wiped off, strips of wood about an inch high are placed round the plate, and plaster of Paris, mixed with water to the consistency of a thickish cream, is poured into the mould. In order to remove any air bubbles from the face of the relief, a broad camel's hair brush is passed through the liquid plaster and worked to and fro a few times over the gelatine. The plaster being thoroughly set, the border is removed, and the edge of a thin-bladed knife is just introduced along one of the sides between the plate and the plaster. Under these circumstances, a strain will be put upon the plaster cast which will cause it to separate before long from the gelatine. It is well not to hasten the process of separation by the application of any force besides the slight strain set up by the knife blade, but repeated moistening of the back of the plaster cast generally facilitates matters. At any rate, if the whole is left overnight, it will generally be found in the morning that the separation has taken place.
A plaster cast having been made, mouldings in other materials can readily be obtained.-Fhoto. Review.

## THE NAMPA IMAGE.

In a lecture before the Brooklyn Institute, October 31, by Prof. G. Frederick Wright, of Oberlin, Ohio, upon "The Ice Age in North America, and its Relation

the nampa image.
to the Antiquity of Man," a brief account was given at the close of a very remarkable discovery recently made n Idaho. Prof. Wright's attention was called to it in a letter from Charles Francis Adams, president of the Union Pacific Railroad, written the 17 th of September ast.
The letter related to an image found about the 1st of August, by Mr. M. A. Kurtz, of Nampa, Idaho, who was engaged in boring an artesian well at that place. Nampa is a station upon the Oregon Short Line Railroad, about twenty miles from Boise City, and between the Boise and Snake rivers. This region, like much in the vicinity, is covered by extensive lava deposits of post-tertiary or quaternary date. The image in question was described by Mr. Adams " as apparently the figure of a female, one leg and one arm being missing, made of baked clay. It is just such a production as an ingenious boy, with a taste that way, might now produce."
We give an engraving, taken from the specimen itself, and of the full size thereof. The image is about one inch and a half in length, and came up in the sand pump in the ordinary way from a depth of about 320 feet below the surfage. Mr. Cumming, the general
manager of the Union Pacific lines in that district, was manager of the Union Pacific lines in that district, was
at Boise City the day after the discovery. He is a graduate of Harvard College, a thoroughly trained man, and well known in Boston. Mr. Adams and others who know him are ready to take his evidence in the case as conclusive in respect to the facts.
Mr. Kurtz was on the ground watching the progress of the work with much solicitude, and as the sand pump came up, ran the contents through his hand as t was dumped out, and so had the image in his hand before knowing what it was, supposing it was a twig ; but on dipping it into a barrel of water and washing it, saw its character. The only other persons present at the time were Mr. Duffes, a prominent citizen of the
town, and the driller and helper. The drill was not used after passing through the lava deposits, and the sand pump was of ample size for bringing up the image,
the valve being three and one-half inches on the in side.
The following are the different strata bored through as reported by the driller : 60 ft . of soil, 12 to 15 ft . of lava rock, 100 ft . of quicksand, 6 in . of clay, 40 ft . of quicksand, 6 ft . of clay, 30 ft . of quicksand, 12 to 15 ft . of clay, then clay balls mixed with sand, then coarse sand in which the image came up, then vegetable soil, hen the original sandstone
To the suggestion that the image may have fallen into the well, or been thrown in, it is replied that the hole is tubed with a heavy six inch pipe from the top, and any light substance thrown in would have been ground to pieces by the action of the sand pump; furthermore, on subjecting the image to the scrutiny of Professor Putnam of Cambridge and Professor Haynes of Boston, it became evident that it was not a clay image, but had been carved from a light pumice stone, and that the coating of red material enveloping it was a cement of oxide of iron that must slowly have collected upon its surface.
An evidence of its genuineness exists in some parti cles of sand cemented into the crease between the arm and the body, which can be seen in the left-hand side of the front view of the accompanying cut. These could not have been where they are if it had been re cently manufactured. Taking the evidence altoget her, Professor Putnam and Professor Haynes are entirely convinced of its genuineness.
The subsequent questions to be determined relate to its age. A communication to Prof. Wright from Mr. S. F. Emmons, of the United States Geological Survey, expresses it as his opinion that the beds from which the image is supposed to have been derived are probably of far greater antiquity than any deposits in which human implements have heretofore been discovered The occurrence of the beds is readily accounted for by inspection of the region. Through obstructions in the lower part of the valley of Snake River, probably caused by lava overflows, the water was dammed up and a lake formed. Into this lake the Snake River brought a rapid accumulation of material, doubtless from the melting glaciers near its head waters, so that a comparatively short time, a few hundred years perhaps, or a few thousand at most, would be ample for the accumulation of the sediment, when a lava outflow covered over the whole and sealed it up. Doubtless if we could freely excavate the old surface at this great depth, many interesting things would be found.
Before accepting, however, the extreme antiquity which Mr. Emmons is inclined to give to the image, we which Mr. Emmons is inclined to give to the image, we
must wait for more detailed study of the region. It is proper to say, however, that it is in the line of the various discoveries of human remains reported by Prof. Whitney as made in the gold-bearing gravels of California, which, in many instances, are overlaid by extensive lava deposits. The Calaveras skull was one of these.
The discovery of so good a specimen of art as this Nampa image is, adds weight to the evidence which Mr. Whitney has presented, and supports his theory and that of Prof. Putnam, that the human race was much farther developed on the Pacific slope in the earliest times than it was on the Atlantic coast or in Europe, and the discovery will bear with strong weight against those who assume an unvarying and gradual evolution of the human species. It points rather to the degeneration of certain races. Orthodox theologians would be inclined to regard the image as a relic of antediluvian art.

## What Produces Death.

Some one says that few men die of age. Almost all persons die of disappointment, personal, mental, or bodily toil, or accident. The passions kill men sometimes even suddenly. The common expression, "choked with passion," has little exaggeration in it, for even though not suddenly fatal, strong passions shorten life. Strong-bodied men often die young-weak men live longer than the strong, for the strong use their strength, and the weak have none to use. The latter take care of themselves, the former do not. As it is take care of themselves, the former do not. As it is
with the body, so it is with the mind and temper. The strong are apt to break, or, like the candle, run; the weak burn out. The inferior animals, which live temperate lives, have generally their prescribed term of years. The horse lives 25 years, the ox 15 or 20 , the lion about 20 , the hog 10 or 12 , the rabbit 8 , the guineápig 6 or 7. The numbers all bear proportion to the time the animal takes to grow its full size. But man, of all animals, is one that seldom comes up to the average. He ought to live a hundred years, according to the physiological law, for five times twenty are one hundred; but instead of that, he scarcely reaches an average of four times the growing period. The reason is obvious-man is not only the most irregular and most intemperate, but the most laborious and hardworking of all animals. He is always the most irritable of all animals, and there is reascn to believe, though we cannoit tell what an animal secretly feels, that, more than any other animal, man cherishes wrath to keep it warm, and consumes himself with the fire of his own reflections.

## Cotton Mill Life in India

An Englishman now wanaging a cotton mill in India sends the following account of some of his experiences to a British journal :
As regards the mill hands, we have one minder, two creelers, and six piecers to each pair of mules of 700 spindles. The mules run four draws in one minute. We have two piecers to each throstle frame, two each to every slubbing, roving, and intermediate frame, and four to each drawing frame; also one man to every three cards. We have a separate oiler to every department. The minders are paid at the rate of 10 annas for 100 pounds of 20 's, and so on accordingly in proportion to the counts of yarn they spin. They will average from $\$ 3$ to $\$ 4.50$ per month, creelers four rupees per wonth, piecers eight to twelve rupees per month. The rupee has been worth 1s. 6d. British coin, but is now valued at 1s. 4 d
We have an overlooker and assistant overlooker over every separate department, whose average wages are about $\$ 6$ per month. I am now giving an account of our mill only. At some other places they get much partment gets $\$ 9$ per month, the sizing overlooker 25 partment gets $\$ 9$ per month, the sizing over or $\$ 7.50$, per month, the other loom jobbers get 15 rupees, or $\$ 4.50$, per month, and a small bonus on the out-turn. We have six men to two slashing frames. The loom jobbers have 50 looms each. The very good weavers have two looms; others have one. Weavers earn from 10 to 16 rupecs, $\$ 3$ to $\$ 4.80$, per month.
Steel combs and scissors are almost unknown here.
If a weaver has a float or a crack to put back he does it with a piece of old card fillet. There is no twisting of beams here. When a beam is woven, it is redrawn with a reed hook, one end at a time.
The people have some very peculiar caste prejudices and customs. I happened to crush against a man who was carrying his food one day, and it was instantly thrown away defiled.
We have men and women winders, they have sixteen ends each, and men warpers. All the mill hands are allowed to smoke. They have a place especially for the purpose in the yard, and you may see at any time children about twelve or thirteen years old working alongside of their parents. In winter time the engine starts at 6:30 A. M., and runs till 6 P . M., stopping only half an hour for dinner. In summer we start at 5:15 A. M. and stop at 7:45. In fact, we work from sunrise to sunset each day, only stopping on Sundaysoccasionally. There are, however, some fow holidays, Hindoo and Mussulman, during the year. We have Hindoos Afghans, mulattoes, and Mohammedans working at our mill, and very bad indeed they are to manage. At the least provocation they will turn out en masse. They are, as a rule, not very intelligent, though very cun ning, and will make any sort of excuse to stop off work. I noticed that one asked off and got leave to bury his father three times
As the monsoon season is now on, we are very badly off for hands. A great many of them live in the vil lages and outlying districts across the river. As the river is very much swollen, they cannot get across. We
have four boilers here, and burn nothing but wood, principally Cabul and tamarind, as coal is so very ex pensive. We have to lay up a store for the monsoon season, as then the roads are impassable. I have seen as many as 200 bullock gharries coming down to the mill at once, each gharry having four bullocks yoked to it. A very lively scene, I assure you, especially when the drivers are having a heated discussion. It is a very interesting sight at sunrise to watch the people wash and bathe in the river. As our bungalow is
built on the city wall, and the river flows 30 feet beneath, we have a splendid view. We often see from 200 to 300 bathing and washing at once. It would be a treat to an English housewife to see the contrast between her mode of washing and the style they have here. They use a big stick here instead of a dolley or washing machine.
The women, as a rule, are very straight and of graceful carriage, in consequence of being trained from childhood to carry chattels or drinking vessels on their head. They are very expert at this, and very rarely let one fall. You may see women building houses let one fall. You may see women building houses
and factories and mending the roads. They do all the and factories and mending the roads. They do all the
laborious work. Just imagine at home a woman laborlaborious work. Just imagine at home a woman labor-
ing for a man building a factory chimney. It's the case here.

## A New Niethod of Leaf Printing

Mr. Walter Gardiner, M.A. Fellow of Clare College, Cambridge, and lecturer on botany in the University, has discovered a new method of printing photographic negatives, emploving living leaves in place of sensitive paper. Mr. Gardiner read a paper on the subject before the British Association. Before dealing with the immediate subject of his paper, the author described how prints may be obtained from Protococci or the free swimming swarmspores of many green Algox. It is possible to take advantage of their sensitiveness to light. Into one end of a watertight box a thin glass light. Into one end of a watertight box a thin glass
plate is securely fitted. The negative to be printed is
then placed next the glass, film side nearest. The box
is filled with water containing a fairly large quantity is filled with water containing a fairly large quantity is exposed to diffused light. In the case of a strong and well-developed negative, the swarmspores swim toward the most highly illuminated parts, and there in the greatest numbers come to rest, and settle upon the glass, so that, after some four or six hours, on pouring out the water, and removing the negative, a print in green swarmspores can be obtained. The print is dried, fixed with albumen, stained, and varnished. The author then dwelt upon the well-known fact that the whole of the animal life upon the globe depends directly or indirectly upon the wonderful synthetic formation of proteid and protoplasm which takes place in the living tissue of plants containing chlorophyl, $i, e .$, green plants, or, to be more exact, in the green chlorophyl corpuscles.
He stated that whatever is the exact chemical nature of the process, this is at least clear, that the first visible product of the assimilatory activity is starch, which, moreover, is found in the chlorophyl grains. The presence of this starch can be made manifest by treating a decolorized leaf with a water solution of iodine dissolved in potassic iodide. This formation of starch only takes place under the influence of light; the radiant energy of the sun providing the means of executing the profound synthetic chemical change and building up proteid from the carbonic acid of the air, which is laken up by the leaves and the salts and water absorbed by the roots. If a plant (and preferably a plant with thin leaves) be placed in the dark overnight, and then brought out into the light next morning, the desired leaves being covered with a sharp and well-developed negative, starch is formed when light is transmitted, and in greatest quantity in the brightest areas. Thus a positive in starch is produced, which can be developed by suitable treatment with iodine. (A leaf was then developed, and handed round to the audience for inspection.) The author showed that it might be possible to obtain a permanent print by suitable washing and treatment with a soluble silver salt, silver iodide being formed. The author regards this discovery as a most striking illustration of the way in which plants are working for themselves, and so for all living things, and points out that the extraordinary manner in which the green parts of plants-so to speak-catch the radiant energy of the sun, and employ it for easily and clearly demonstrated.

## Japanese Art.

I would like to say a great deal about Japanese art, or rather I wish that I were qualified to do so, because I have been deeply impressed by it. One thing that what I have seen in this country hasconvinced me of is that at home there is an utterly erroneous idea of what art is at all ; the idea held by the vulgar multitude, at any rate-of whom I count myself one-that it consists in picture making, and statue making, and analogous performances, appears to me now to be very absurd.
I conceive that art which is confined to one class of a people, and extends to only one class of subject, is not true art, and that art in a whole people, if it is to be in the least true, must be spontaneous and unconscious, and that it must penetrate into all the works of even the meanest of the people. This is greatly the case in Japan.
The commonest thing that is made or used has a grace and beauty about it that is quite wanting in things for common use at home. I am struck with thus much more in the case of quite cheap things for everyday use than in that of the more elaborate articles that commonly find their way to England.
Among a set of common Japanese cups, saucers, and teapots, the whole lot costing, perhaps, a shilling, English earthenware looks positively barbarous; but a single Japanese cup will not look other than beautiful beside anything, and the same may be said of all the commonest things.
A Sake bottle-the analogue of our decanter-which costs a penny or twopence, would be an ornament anywhere. In the poorest houses, things that we would never dream of using-common, rough bits of wood and stone-are used, and are disposed of in such a manner that shows a true feeling for what is beautiful.
The drawing of the Japanese is notoriously lacking in perspective, and I must admit that I do not vastly admire the more ambitious attempts, but I think the very common drawing that is used for decorating even the poorer houses is often perfect. A few strokesmade with a brush and black color-indicate a flower or a gracefully bending plant, and one could not conceive that a line could be altered by the distance of a hair's breadth and show any improvement. These things are done, not by professed artists, but merely by handicraftsmen.
I believe that all this results greatly from the absence of anything corresponding to
The Japanese are not, as I have already said, a meThe Japanese are not, as I have already said, a me-
chanical people, and have naturally no idea of all the
methods that we have, by division of labor, the use of machinery, and so forth, of turning out a vast number of articles. Every little thing is made, from beginning to end, by one workman, and, as a consequence, it contains, to a certain degree, a reflection of the individuality of the maker, without some of which, I imagine, no beauty is possible.
In a certain sense every workman becomes an artist, and the thing must act and react. He is an artist in the sense of creating something that has some beauty in it; he becomes an artist in unconsciously learning to love that which is beautiful and to hate that which is ugly. $-B r$. Jour. of Photography.

## Note on a New Vehicle for Typewriter's Ink.

iy prof. e. b. Shuttleworth.
Various formulas have been published for the preparation of ink for use in typewriting machines, but as far as I have learned, they have proved more or less unsatisfactory. This has, in great part, arisen from the use of glycerine as one of the prime constituents. The hygroscopic properties of this substance render its use ineligible under varying climatic conditions as to moisture, and the addition of glucose, soap, alcohol, or water does not remove this objection. Vaseline, with or without wax, gives better results in this respect but a good consistence is not easily secured under extremes of temperature.
Some years ago, when specially interested in the study of inks, I made a number of experiments on a compound suitable for typewriters' use. The results were satisfactory in indicating the line of success, and the notes then made were laid aside until more leisur could be secured for their complete elaboration. Somehow or other that time has not arrived, and, lest another seven years should so elapse, I beg to turn over what little information I have to convey to those who are less busy or perhaps more industrious.
Many of the salts of the aniline series are soluble in castor oil ; methyl violet is notably so. I am not prepared to state the limit of solubility, as with a vehicle of such consistence, and with pigments of such intensity this is a difficult point to determine. The amount dis solved is, however, relatively great, and advantage can be taken of this fact for the preparation of an ink of remarkable power, admitting of a large number of copies being taken from the same impression. Other anilines, as some of the blues and greens, may be sub stituted for violet, and the color may be varied, and permanency increased, by the incorporation of a quantity of the finest grade of lampblack. I did not experi ment with nigrosine, but it is possible that it would produce a black of some intensity. .
The incorporation and solution of the aniline colors in the oil may be accomplished, on the small scale, by triturating the previously powdered color with the oil in a mortar. The use of a little alcohol will sometimes be found to facilitate this operation. The ink may be applied to the ribbon by means of a tooth brush, and the ribbon may be of silk or fine muslin. Strips of very fiue "lawn" answer admirably. On a large scale, the grinding and mixing of the color would, of course, be better done by revolving rollers, as in some forms of paint or chocolate mills, and the application of the ink to the ribbon could be easily provided for. Laboratory, Ontario College of Pharmacy, Toronto

## A Gigantic Reservoir.

The present dam of the Bear Valley Reservoir Co. in San Bernardino was constructed in 1885, and is 50 feet high, 16 feet thick at the base, 3 feet at the capstone, and 300 feet in length. It is built into the bed rock at the bottom of the Bear Creek Canyon, and abutted into the solid rock on either side. The body of water confined by this dam covers 1,965 acres to an average depth of 16 feet, and contains $10,000,000,000$ gallons. The engineer of the company. Mr. Frank E. Brown, is now in the East, but upon his return active steps will be commenced to construct a new and larger dam, the work upon which will be begun early next spring. The new dam will be located about 100 feet below the present one, so that the water will be confined by a double dam. It will be built into the bed rock, and be 120 feet in height. The width of its base will be 84 feet and its length 650 feet. The capacity of the reservoir will be increased nearly twentyfold, and will include a body of water 12 miles in length, 3 miles in width, with an average depth of 40 feet. The present dam with its canals cost $\$ 165,000$. The cost of the new one has not been estimated yet, but will probably reach nearly three-quarters of a million, and will store water sufficient to insure irrigating water for 100,000 acres of land for three years.
Professor Davidson recently made a thorough examination of the watershed and catchment area of the reservoir site, and also examined the dam site, and indorsed very highly the feasibility of the new enterprise, stating that he never saw equal facilities for storing so vast a body of water at the same cost.
The Bear Valley reservoir is at present the largest irrigation reservoir in the United States, and the proposed increase in its capacity will make it the, largest of any kind.-Pacific Lumberman.

MODIFIED WIMSHURST MACHINE.*
The Wimshurst electrical machine is the most recent and on some accounts it is the best that has been devised. It is less affected by atmospheric conditions, and may be relied on in all weathers for results of some kind, while the frictional machines and the induction machines of Holtz and Toepler generally fail in a damp atmosphere.

The Wimshurst machine here shown differs from the ordinary type, mainly in having the rotary disks inclosed by a hoop and glass cover disks to exclude dust and moisture, the stationary disks being provided with brushes which are connected electrically by strips of tin foil secured to the inner faces o the outer disks by means of shellac

This machine is shown in perspec tive in Fig. 1. Fig. 2 is a vertical sec tion taken through the center of the disks, and Fig. 3 is an enlarged horizontal section taken on the line of the collectors.

The column supporting the revolv ing disks is provided with a hollow arm in which is journaled a tubular shaft, upon one end of which is mount ed a disk of common window glass be tween two collars, the glass being cen trally apertured to receive the shaft, the outer collar being screwed on.

The opposite end of the tubular shaft is provided with a grooved pulley. A solid shaft placed within the tubular shaft, and projecting beyond the ends thereof, carries upon one end a glass disk, and upon the other a grooved pulley, as in the first case. The glass disks are separated from each other about $1 / 8$ inch. They are both coated with shellac varnish and allowed to dry. To each glass disk near its periphery are secured sixteen radial sector plates of tin foil or thin brass, arranged at. equal angular distances apart. These sectors are coated on one side with shellac varnish and allowed to dry, when they are placed in position on the varnished glass disks, varnished side down, and secured by rubbing each one quickly with a warm, smooth iron.
A drawing should be made of a glass disk with the sectors to be placed underthe disks as a guide in locat ing the sectors. Brass sectors are preferable on account of their superior wearing qualities.
The glass disks are placed on their respective shafts with the sectors cutward. A ring of vulcanite sur rounds the glass disks and is grooved internally to receive the stationary glass disks, which inclose the rotary ones. The vulcanite ring is divided at the top and bottom to allow of applying it to the stationary plates. The rear plate is centrally apertured to admit the tubular support of the shafts. The vulcanite ring is provided, at the top and bottom, where it is divided, with vulcanite dowels, and is supported by attachment at the bottom to the base board, and at the top to a wooden rod projecting from the upper end of the column.
In diametrically opposite sides of the vulcanite ring, and on a level with the axis of the disks, are inserted brass rods, provided on their inner ends with metallic forks, the arms of which extend along the outer surfaces of the rotary disks and are provided with collect ing points, as shown in Fig. 3. The outer ends of the brass rods are furnished with knobs, into which are inserted the supports of the discharge rods or conductors. The latter are provided with vulcanite handles, by


Fig. 3.


Fig. 2.

SECTIONAL VIEWS OF MODIFIED WIMSHURST MACHINE.

## which they may be moved in these supports as may

 be required.The stationary glass disks are each provided on their inner faces at diametrically opposite points with smal * From "Experimental Science," by George M. Hopkins. Munn \& Co. publishers, New York


Fig. 1.-MODIFIED WIMSHURST INDUCTION MACHINES.
metallic sockets, attached to the glass with cement, whether this is the main or primary explanation and containing brushes of tinsel or very fine brass That which I would suggest is as follows:
wire, which touch the rotary disks lightly. The The leaves of the evergreen oaks are entire, and brushes of each pair are connected by a narrow strip small in comparison with those of the English oak of tin foil attached to the glass. The stationary glass $\mid$ During the winter and early spring they are pro disks may be turned in the vulcanite ring to adjust $\left.\right|_{\text {tected by a series of brown scales, inside which the }}$ lie, and with which they form the well known buds which are so familiar to us, and which are both small and short in proportion to the size of the leaves themselves. In cooler and moister regions, on the contrary, there is a tendency for leaves to become larger and deciduous. These influences do not affect the outer scales, which remain as before, without any increase of size. But as the leaves have increased in size and the scales have not, the leaves can no longer retain their original ar rangement in the bud. If, for instance we compare the buds of the oak and of the beech, we see that while the leaf of the oak is longer than that of the beech, the bud of the oakis, on the contrary, shorter than that of the beech.

Under these circumstances, what must happen? The leaf grows and becomes longer than the bud. It is therefore necessarily bent into a curve But an entire leaf, if thus thrown into a curve, would necessarily fall into folds, the number being determined by the number of ribs or veins. For such folds, however, there would be
the brushes at the required angle, which is about 45 with the plane of the collecting forks.
One of the rotary disks is driven by a straight belt, the other by a crossed belt, both belts being carried by a doubly grooved wheel fixed to a shaft journaled in a standard attached to the base. This shaft is fur nished with a crank, by which it is turned.
To secure good results, small Leyden jars or condensers must be connected with the conductors, as


Fig. 5.-DISTRIBUTION OF ELECTRICITY UPON THE PLATES.
shown in Fig. 4. To the bottom of each jar is attached a small chain. These chains are brought into contact when a detonating discharge is desired, and eparated for a silent discharge.
The machine is self-exciting, and yields sparks varying in length from one-fourth to nearly one-half of the adius of the rotary disks, according to the state of he atmosphere and the condition of the machine.
The machine illustrated has 12 inch rotary disks and 4 inch stationary disks.
Mr. Wimshurst has constructed the diagram (Fig. 5) which shows the distribution of the electricity upon the plate surfaces when the machine is fully excited. The inner circle of signs corresponds with the electricity upon the front surface of the disk. The two circles of signs between the two black rings refer to the electricity between the disks, while the outer circle of signs corresponds with the electricity upon the outer surface of the back disk.
The inventor found by experiment that when two disks made of a flexible material were driven in one direction, they close together at the top and the bottom, while in the horizontal diameter they are repelled. When driven in the reverse direction, the opposite action takes place.

## The Shape of oak Leaves.

Sir John Lubbock read a paper before the British Association on "The Shape of the Oak Leaf," which is so unlike that of any other of our forest trees. The three points then which give the oak leaf its peculiar form are :

1. The deep, rounded sinuses. 2. The want of symmetry of the two sides. 3. The oblong or oblanceolate outline. I do not know of any attempt to explain this peculiar form. As regards the sinuses, Kerner suggests that they are intended to permit the passage of light to tween the lobes may be of some advantage in the manner suggested by Kerner, but I greatly doubt
no room within the narrow limits of a bud, or rather perhaps they would be inconvenient, because they leave more or less empty spaces. The sinuses are due, Sir John believes, to the curvature of the leaf, owing to the shortness of the bud in comparison with the length of the leaf. The young leaf is not only curved -it is wrapped round the interior leaves.
The result of this is that one side of the leaf is folded within the other. The one being on the outer side has therefore, more space than the other. The two sides of the leaf are, in fact, differently situated, and this ac counts for the second point-namely, the want of symmetry. The oblong form is an advantage, from the way the leaves diverge from the stalk. In this man ner the interesting peculiarities of the oak leaf may be accounted for.

The Nicaragua Canal Company, after exhaustive preliminary surveys, borings, etc., and the preparation of complete maps and profiles, has now started in on actual work. Improvements are now being made at the harbor of Greytown, on the Atlantic side, and rails and cars for construction lines, telegraph wire to complete the extension of the government wire across the isthmus, and an 8 inch spiral riveted steel pipe to convey a water supply from the Deseado basin to Greytown, have been shipped from New York. The total length of the route, as finally located, is 170 miles; of this length, 121 miles is free navigation of Lake Nicaragua and the San Juan River, requiring only a little dredging and improvement; 21 miles is free navigation of basins formed by the flooding of two valleys, leaving 28 miles only of canal excavation. There will be five locks, two on the eastern, three on the western division. The curves average about 5,000 ft. radius, with maximum curves of $2,528 \mathrm{ft}$., one of these being in the divide cut, and the other in the river ; about twothirds of the route is on tangent. To bring the water in the basins up to the required level, some rockfilled dams or embankments will be built at low points of the sides. The climate is healthy, with a steady trade wind across the isthmus. There will be $23,489,478$ cubic yards of earth dredging, 16,440,-


Fig. 4.-ATTACHMENT OF THE LEYDEN JAR. 368 cubic yards of
earth excavation, $15,008,347$ cubic yards of rock above water. and 575,445 cubic yards of rock under water, also 14,714 cubic yards of excavation for harbor works. The locks will be of concrete, with stone facings. The total cost for construction, exclusive of hospitals, shops, etc., is estimated approximately at $\$ 55,000,000$.

## Mica.

Mica is a mineral that has attracted some attention for the past few years in the Southern States, particu larly in North Carolina, and large mica mines are now being developed in South Carolina.
The principal use to which the mineral has been put heretofore was for stove doors and for decorative purposes, such as bronzing, wall-papering, etc. When properly prepared, it can be used for a variety of purposes, and the discovery of this fact has led inventive genius to supply a process whereby it can be so utilized, and machinery has been brought out for the purpose of handling the mineral.
The new field thus opened to this mineral is as a lubricant for railroad purposes, and its value for this purpose lies in the fact that it is absolutely anti-friction, and it is claimed that with its use hot boxes or journals are simple impossible.
Miea abounds in large quantities in Colorado, and this new process of utilizing it is the invention of Mr . S. W. Kemble, of Denver, who also invented all the machinery used in its manufacture.
A company has been incorporated in that city under the name of the Railroad Mica Lubricating Company, with a capital of $\$ 200,000$, and they have purchased the machinery, together with the process of manufacture, all of which are covered by patents, and employed Mr. Kemble as manager of the business.
A visitor to the factory thus describes operations:
which supply the mixers by a pipe running down on the outside of the hopper, on the end of which is a faucet.
At the south end of the bins there is located a large cylindrical machine four feet in diameter and ten feet high, that is called a dust arrester. Any of the material that is so light and fine that it will not settle is driven into this machine by air currents, which tho roughly separate the mica dust from the air, where it settles in the bottom of the machine and is drawn off as needed.
It is stated that the capacity of all machinery heretofore made for pulverizing mica has been from 300 to 400 pounds a day, and then the material has not been sufficiently fine for lubricating purposes. It is claimed for this new concern that it can pulverize about five tons a day, or in ten hours' running.-A. P. Reyrolds, in Dixie.

## A CALIFORNIA RABBIT DRIVE.

Our illustration represents the result of a rabbit drive in March last at Wildflower, Fresno County, California. The mound of slain at the end of the drive was five feet deep, twenty feet wide, and forty feet long, and contained twelve thousand dead rabbits, the largest and most successful drive ever made in California. These vermin have become so numerous and destructive to the farmers, that the wholesale extermination of them is imperative. It is
would be impossible to determine in thick weather, and the hardiest mariner would be warranted in turning back on his course.

## Wool Raising in the United States.

The first sheep introduced in the United States were taken to Jamestown, Virginia, in 1609. Great efforts were made to encourage the woolen industry, and some years later a law was passed which compelled every family to spin 3 lb . of wool, cotton, or flax per week during 30 weeks of the year. About the same time the first weaver settled in the country and received a grant of 30 acres of valuable land. In 1662 Virginia prohibited the exportation of wool and offered 5 lb . of tobacco as a premium for every yard of woolen tissue produced in the colony. The breed of the sheep at the time in America was, however, inferior, and it was not until the commencement of the present century that the Spanish government consented to sell a flock of fine merino sheep at an exorbitant. price for exportation to America. It is stated that even in 1810 there were only about 5,000 sheep of good breed in the country, but from them sprang the large flocks which are now found in the United States. The first cloth mill worthy of the name was erected in 1788 by several of the inhabitants of Hartford, Connecticut, and its annual production amounted to 5,000 yards. It is stated that the proprietors of this establishment presented Washington with a suit made of their cloth

## A CALIFORNIA RABBIT DRIVE.

The mica comes to the factory in carloads, just as it is taken from the mine. It is fed by boys into two machines, which cut it into fragments about half an inch in size. By a system of pneunatic tubes the mica, so cut, is delivered to the atomizing machines, which grind it into powder.

These machines one must see to fully realize their peculiar action and construction. Each machine consists of two steel shafts three feet long, with a series of gun metal spirally arranged beaters, which revolve in a closed case forming a figure " $\infty$."
When in operation these machines make from 5,000 to 7,000 revolutions a minute. The beaters on the revolving shafts are so arranged that the fingers on one pass between the fingers on the other shaft, so that when the material is passed through the pneumatic tubes from the feeding machine to the atomizers at a velocity of 15,000 feet a minute, the work of atomizing is instantaneous.
The mica, now reduced to atoms, continuesits course at the same velocity through another set of pneumatic tubes to the sitting bins. Here the current is so retarded by the peculiar mechanism that it causes the material to settle in the various compartments, of which there are six, at the same time grading the material according to its fineness. The powdered mica is now settled in the hoppers or bins, immediately over the mixing pans. Here the several grades are drawn into the pans, which are provided with mechanical mixers, and the lubricant is made up by the use of the proper percentage of oils, mica, and such other ingredients as the company uses in the manufacture of the product.
Directly over the hoppers are located the oil tanks
estimated that five rabbits consume as much as one sheep. They are particularly fond of young grape vines, fruit trees, corn and other grain. This drive was made by stretching fine wire netting about three feet high and seveir miles in length, V shaped, terminating at the smaller end in a circular corral into which the animals were driven and readily killed with stout sticks.
The Proposed Bridge across the English Channel.
Under ordinary conditions the English Channel is beset with dangers for the mariner. There is rough water, contending currents, a crowding of ships, and frequent and heavy fogs. Add to these a line of bridge piers in the most frequented part, and the perils of navigation might truly be looked upon as formidable. Let us imagine a sailing ship beating across or standing down channel, riding up and plunging down the heavy seas. Suddenly the look-out, peering through the thickness, descries the grim form of a bridge pier under her lee with the current sweeping her down upon it. Jammed up to the wind as she is, she cannot go a-weather, save to come about, and, unless the discovery is made in time, she is doomed. Indeed, even with sea room she might mis-stay, and her master be unable to wear her round in time.
As every traveler knows, the boats of the channel ferry-stout, powerful boats they are too-sometimes refuse to make the passage, because of heavy weather and thick fogs. But the traffickers between the German Ocean and the Atlantic bave no such alternative and must keep the seas, their greatest peril the chance of collision. Add to this a line of stone piers immediately in their track, the exact position of which it
in 1791. Other works soon arose, and in 1810 there were five mills producing fine woolen tissues, and 19 which manufactured coarser descriptions, their aggregate production being 200,000 yards, and a considerable quantity was also produced on hand looms.
The war in 1812 gave a great impulse to the American woolen trade, but when peace was concluded British tissues were imported in enormous quantities and completely crushed the industries of the States. Congress then found it necessary to protect the American manufacturers, and imposed in 1816 an import duty of 25 per cent $a d$ valorem on woolen tissues, and in 1824 it applied a duty of 15 per cent on raw wool costing less than 10 cents per pound, and of 20 per cent on wool costing more than 30 cents per pound.Draper's Record.

## A Spectroscope without a Lens.

Prof. Philip Braham, F.C.S., said in a paper read at the British Association, Section B: The instrument consists of a taper tube with an adjustable slit $21 / 2$ inches long, similar to a parallel rule at one end and a prism at the other. The length of the tube should allow the slit to be at the distance of distinct vision. Although the spectroscope is without a lens, the eye acts the part, and produces the image on the retina, which image is dispersed by the interposed prism.
Comparison prisms or mirrors can be easily placed before the slit, and the instrument can be easily made by any one with ordinary constructive ability at a small cost, enabling those whose means are limited to experiment, verify facts, and penetrate the charmed circle of brass and glass, to the popularization and advancement of science.

## Central Park Natural History Notes.

Frost has come and nipping airs from the northward ; the tropic animals, instead of taking train and boat for the South, being housed, and the climate of the natural habitat of the birds simulated by the aid of a furnace. The Florida alligators, of which there are fifteen, were not easily moved from their pool, which is just outside the tiger house. It took six men to handle the big ones, Superintendent Conklin taking the precaution to put a strong lashing of rope around their ponderous jaws, and even then the six men had a struggle with each as they lifted it from the ground, for the tail of the alligator is almost as much a weapon of defense as the jaws, having, indeed, enough force to knock a man over or to even break his arm or leg. A curious characteristic of the alligator is that, when in captivity, it will not take food during the winter. In its habitat it buries itself in the bottoms of muddy rivers or stagnant pools at the approach of winter, and does not awaken from its lethargy till warm weather comes. In captivity, cold weather brings drowsiness. For days, sometimes for weeks, it lies motionless, only stirring at times, as though for the noise, moves a few feet along mechanically, its eyes scarcely opened, and then drowses off again. Last winter the park alligators would not taste food, not even their favorite, fish, though the park keepers repeatedly offered it to them. Little trouble was had in moving the hippopotami, though one of the pair weighs $11 / 2$ tons, the keepers opening the gate, surrounding their tank on the lawn, and coaxing them with earrots and other succulents along a temporarily fenced way to their winter quarters in the lion house. The rhinoceros, coming as he does from the warmest part of Africa, is kept housed even in the summer, because of the danger from such cool periods as come from time to time during the summer solstice.
A baby nylgau (Portax tragocamelus), born a few weeks since, is one of the curiosities of the park. Just
now it is only a puny and comical caricature of its now it is only a puny and comical caricature of its the antelope family, its habitat being India, and very rarely breeding in captivity. It recalls our giant moose in more ways than one, though the head, instead of being of the ox pattern, is very similar to that of the horse. The ears are large and well rounded, the body slopes away from the base of the neck, the tail is long and ends in a brush. It loves the forest and, in its native wilds, fe
the Indian maple.
An American lion, or puma (Felis concolor, Linn.), has been given the park by Capt. Burdick, of the Morgan line, a recent steamer bringing it from Mexico. It is but a cub, only about two months old, and, as yet, has not put off its forest manners, being savage and vicious. It is the same species which the pioneers used to call "painter," probably a corruption of panther. Just now it has yellowish spots on a tawny coat. Later on it will be pale reddish brown above, with white on the flanks and lower limbs and grayish white on neck, muzzle, and inside of legs, the whiskers white and set in brownish black, the face and sides striped. It will be about $61 / 2$ feet long from nose to tip of tail. In Central and South America it is a terror to the herdsmen, for its mischief among the flocks. It will
wait for hours upon the bough of a tree near where deer come to drink, dropping down upon them and often killing several before they can escape, so quick bot

The curious axis deer of India (Maculata, Gray), recently born, resembles, in marking, the fallow deer but its horns, when developed, will have no palmations. It is famous in Bengal for the flavor of its flesh.
Another recent arrival is the oaudad, or Barbary wild sheep. It comes from the Atlas mountains of Morocco, and has big horns and long fleece.

A Lady Amherst pheasant (Thaumalea amherstice, hab. Szechuen, China), given the park recently by Mr. Rockefeller, is the first of the kind ever brought hither, and very rare. It has the markings of both gold and silver pheasants, but is more brilliant than either. This order of pheasants was discovered in China only ten years ago, Lord Amherst being then British minister, hence the name. The first one taken to Europe fetched $\$ 2,500$. It has the silver pheasant's tail and the golden pheasant's body, and will cross with other pheasants.

## Wonderful scenes on Jupiter.

Astronomers have of late been waking some exceedingly interesting discoveries about the huge pianet Jupiter, which is now visible in the evening sky. When we are thinking about worlds it is just as well to think of Jupiter, for that is a globe worth pondering over.
Thirteen hundred times as large as this big earth of ours, and illuminated by four obedient moons, Jupiter has uncommon claims to consideration. But it is not so much the gigantic size of that wonderful planet as the extraordinary appearances and occurrences upon its surfa

Most readers know that when Jupiter is looked at with a telescope certain bands, or belts, are seen ex
tending in parallel lines across the disk. We ordinarily see the great planet thus represented in illustrated books of astronomy. It is among these belts of Jupiter that the astronomers have observed some very surprising things. The most conspicuous belts lie on either side of the planet's equator, in what upon the earth we should call the tropical latitudes. Jupiter's equator, however, is so slightly inclined from the plane of its orbit that his tropical circles do not extend as far north and south as the belts lie. The first explanation that naturally occurs to the observer who watches these belts is that they must be enormous bands of cloud encircling the giant planet on each side of its equator. If he has a powerful telescope and a patient mind, he discovers that changes of form and position occur in the belts, which strengthen the probability that they are composed of clouds. The various colors that they show, and in particular the prevailing red tint which characterizes the largest beits, may excite wonder as to the nature and condition of masses of vapor that could present such an appearance, but upon the whole there seems to be nothing to seriously discredit the idea that the greater number of these phenomena really are clouds.
And now we come to the most surprising facts. It is evident that a tremendous current is continually sweeping right around the huge globe of Jupiter over its equatorial regions. The cloud belts are all in motion, but not all with the same velocity. The nearer they are to the equator, the faster they move. The observations of Mr. Stanley Williams and others show that in the north temperate zone there is a broad light band encircling the planet which may possibly be the actual surface of Jupiter's globe. By comparing the actual surface of Jupiter's globe. By comparing the
rate of motion of cloud-like objects seen in this region with that of the adjacent cloud belt, it is found that the latter is moving much more swiftly. The general period of Jupiter's rotation upon its axis, notwithstanding the enormous size of the planet, appears to be a little short of ten hours. But the equatorial clouds go around in about nine hours and fifty minutes, while the clouds $30^{\circ}$ north and south of the equator require five minutes longer to complete a circuit. In require five minutes longer to complete a circuit. appears to be flowing past the regions on either side of it at the rate of some 240 miles an hour! This, as M. Flammarion has remarked, is incomparably faster than the most violent cyclone upon the earth. And this gigantic current of wind, if so it may be called, forms a perpetual hurricane, blowing around Jupiter as unremittingly as our trade winds, but with inconceivable power and energy. The result of the varying velocities with which adjacent portions of the Jovian atmosphere appear to move should naturally be the formation of enormous whirling storms, cyclones, and tornadoes of incredible fury.
It is probable that, looked at in a vertical section, the atmosphere of Jupiter would present an equally remarkable contrast and conflict of motions. There is evidence that the dark-colored spots, or clouds, are at a greater elevation than those of a lighter hue, and it has been observed that the dark spots move more slowly than the bright ones. It follows that the deeper you go into the atmosphere, the faster it is found to be moving, and hence it may be that the actual solid surface of the planet, if any solid surface it has, rotates within its shell of clouds considerably faster than the shell itself turns.
Another very singular phenomenon of the strange and tremendous planet Jupiter is the great red spot which has been seen upon its southern hemisphere ever since the summer of 1878 . Incredible as the thought
seems, and difficult as its explanation upon any analseems, and difficult as its explanation upon any anal-
ogy drawn from terrestrial geology undoubtedly would be, there are certain facts which suggest the possibility that this phenomenon may be an elevated region of the planet thrust up through its environment of clouds. It must be remembered that the so-called red spot, which really appears only as a small oval blotch upon the disk of Jupiter, is in reality some 30,000 miles long and 7,000 broad. Think of a mountain of those dimensions raised above the clouds! Then, to add to the startling' suggestions of the hypothesis, the color of this gigantic elevation or protuberance is a fiery red. Perhaps the strongest reason for regarding the red spot as an elevated mass is the fact that the clouds of the southern cloud belt, close to which it lies, never pass over it, but on the contrary, in passing by it, are
driven out of their course and curve around its southdriven out of their course and curve around its southglide along the shoulders of lofty mountain peaks whose summits rise above their level. It might be urged in behalf of this view that, inasmuch as the force of gravity on Jupiter is nearly two and a half
times as great as on the earth, the major portion of its atmosphere must be pressed close to its surface, and that consequently its clouds do not float at such a height as the gigantic proportions of the planet might
otherwise lead us to expect, so that the elevation of the red spot need not be supposed unduly great in order to place it above the general level of the cloud strata. Then there is the commonly accepted theory that
Jupiter is yet in an early stage of development to sup-
port the hypothesis of the elevation of a large region of its surface in the manner in which parts of the earth's crust were thrust up, folded, and crumpled in the inery ages of its history.
However we look at 1 hem, these strange discoveries on Jupiter indicate that but a very small part of the energies of creation are centered upon our own little globe. Jupiter has winds and storms and clouds and geological convulsions that make the great events of terrestrial existence seem but a miniature representation of planetary life. After all, the man who is said to want the earth doesn't appear to be so very grasping; if he wanted Jupiter, his ambition would be truly gigantic.-N. Y. Sun.

## Notem.

A new use has been found for the carrier pigeon in Russia-carrying negatives taken in a balloon to the photographer's. The Novoe Vremya gives an account of some experiments to this end recently made, in which the Czar's winter palace was photographed in the air, the plates being sealed in paper bags impenetrable to light, tied to a pigeon's foot, and sent to the developer.

The Crescent City, a new stern-wheel boat with a newly devised feathering wheel, tried at Dubuque recently, made 18 miles an hour against the current, the same running at the rate of nearly $21 / 2$ miles an hour. This performance was made with 140 pounds steam pressure, the wheel revolving 23 times per minute. The wheel has only 10 buckets instead of the customary 16, the new type paddles striking and coming out of the water in a vertical position-feathering it is called.

Whales are becoming more and more plentiful on the coast. Last winter four were sighted off the Hamptons, and one off Quogue (Long Island). The Nantucket people reported more whales in sight two winters ago than have been seen since the time when there was an open-boat whale fishery on the island. Prof. True, of the National Museum, who has been studying the subject for years, says that, unless there is more use found for whale products and the industry is revived, they will soon be as thick in the coast waters as they used to be in the old days.
"The Prevention of Colds" was the subject of a recent paper read before the New York County Homeopathic Medical Society. In it the author declared that colds can be prevented by developing the elasticity and vigor of the skin. The skin should be prepared to meet and resist atmospheric cold by systematic and regulated exposures to cold treatment, which is easiest applied in the bath. We should begin, he said, with such a temperature as is easily within the reactive powers already present, when the time of exposure is properly regulated, and increase the demand for reactive effort as the ability to respond becomes greater. It is by a similar system that we develop the muscles. A case in point was that of a Boston man whose lungs, after an attack of pneumonia, were thought to be too much affected to bear another Northern winter. After spending several winters in the South, to the neglect of his business, he was hardened sufficiently for a Northern winter by trunk and spine rubbings twice a day, washing off with water gradually reduced in two weeks' time from $90^{\circ} \mathrm{F}$. to $70^{\circ} \mathrm{F}$., and maintained at this temperature all winter.
The investigation of food products recently set afoot by the Minnesota State Board of Health showed that the laboratory, rather than the field and dairy, is playing a principal part in supplying food. We quote: " Of 25 samples of baking powder, 2 were of phosphate, 4 cream tartar, and 19 alum baking powders. Of 23 samples of cream tartar bought of retail grocers, 2 only were fairly pure, 21 did not contain any traces of cream tartar, being composed of tartaric acid, acid calcium phosphate, and in some instances alum. Of 55 samples sold as cider vinegar, 11 were pure, 13 spurious cider vinegars made from the exhausted pomace from which the cider had been pressed, and 31 were colored lowwine vinegars, containing in some instances a small proportion of apple solids or cider vinegar. Three samples sold as malt vinegar were colored low-wine vinegars, 19 being below the legal limit of acidity. Of 68 samples of lard, 37 were adulterated with cotton-seed oil. Of 10 samples of olive oil, 6 consisted largely or entirely of cotton-seed oil, the other 4 being pure." The report says that all through the State impure goods are being sold for unadulterated goods.

Close observers have remarked at the comparatively rapid fading of blue flowers. H. Molisch, a German chemist, after careful study, declares it attributable to the action of alkalies on anthocyan. "Small quantities of alkalies," he says, "turn the purple anthocyan blue, while larger quantities render it green, yellow, and finally colorless. In nature this result is attained by the readmixture of the anthocyan with the protoplasm of other cells from which it was previously

## recently patented inventions.

## Railway Appliances.

Car Buffer.-Frank S. Way, Mount ernon, Ill, This is a pneumatic buffer in which an air pipe extending under the car and charged with compressed air under the control of the engineer is
connected by a valved branch pipe with the inner end of a cylinder under the car platform, the reciprocating
piston of the cylinder being connected with the buffer piston
Electro-Magnetic Signal. - Daniel S. McElroy, New York City. This invention covers a
combination of a series of electro-magnets arranged combination of a series of electro-magnets arranged
parallel with the track, an alarm device carried by the ocomotive, a chain connected the alarm, and an armature supported by the chain within the influence
of the magnets, with other novel features, whereby an operator at a station will be enabled to signal an engineer or attendant upon a train.
Electro-Magnet for Railway Signaling. - Daniel S. McElroy, New York City. This magnet consists of a series of sections, each coils wound on the side extensions, the ends of the yoke and side extensions projecting beyond the coils, and the several sections bèing united, the magnet having cores greatly extended in one direction to lengthen the field of force to enable it to act upon a
very long armature, or upon a short armature during its very long armature, or upon a short armature during its
passage before the face of a magnet in the direction of passage bef
its length.
Railway Train Signal.-Daniel S. McElroy, New York City. This invention covers signaling system for signaling from one train to an
other, or from a fised point to any train, an insulated other, or from a fised point to any train, an insulated
conductor being suppoited near the track and grounded at each end, a series of induction coils and a relay, a signal box and a generator, being carried on the train, and an electric current generator being arranged at a fixed station, wit
transmitting key
Electrically Operated Switch.Daniel S. McElroy, New York City. A shifting bar connects the switch rails, a spring and electro-magnet
alternately shifting the bar, an additional bar with apertures and spring-actuated bolt for locking it connecting the rails, while an armature is directly secured to the locking bar and a separate magnet directly conbe operated entirely by electric currents.

## Agricultural.

Check Row Corn Planter and Marker.-Franklin L. Menefee, Aurelia, Iowa. This
invention relates especially to means for automatically eciprocating the marking barfromside to side, holding it in extended position when desired for a wire reel, and providing for the revolving of the bar, whereby the nnwinding or taking up of the check wire may be ef
fected, the improvements being also applicable in con fected, the improvements being also
nection with seed-dropping devices.

## Mechanical.

Nut Lock.-Jeremiah G. Leep, Red House Shoals, West Va. This invention covers an improvement in that class of nut locks in which a dog is
pivoted to the nut and its pointed free end held engaged with the thread of the screw bolt, the inventio relating to nut locks in which the nut is locked on the bolt by a dog on the nut locking in a notch or recess in
the bolt. Well Drilling Machine.-John W. Miller, Newton Falls, Ohio. By this invention the
winding drum is peculiarly constructed and arranged, with the means for lifting and dropping the drill rope and a pulley is arranged to carry the rope as it passes
from the drill-operating mechanism to the winding drum, whereby the rope is kept in the proper plane and is fed down as the drill descends into the well.
Drilling Machine. - Valentine Wirick, Rochelle, Ill. This is a machine to be used fo durable in construction and effective in operation, the nvention covering various novel details of parts and combinations thereof.
Pulverizing Machine.-William H. Coward, Bath, Somerset County, England. This ma
chine consists of a revolving drum having an edge roller running therein and provided with means for continuously supplying the material to be crushed and for removing the ground material without interrupting the working of the machine.
Carpet Beating Machine. - Alexrotary carpet-supporting frame, with means for secur lug the carpet to the frame, in combination with rotary shafts having flexible beating arms and brushes mounted on the shaft, the brushes projecting alternately
with the arms from the shaft, by which the carnet may be readily when being beaten and the work thoroughly done
Tinner's Seaming Machines. Peter $W$ Allen, Pueblo, Col. This invention covers an attachment for double-seaming machines, the device
being of novel construction and combined with the being of novel construction and combined with the
presser foot or roller, whereby the bottoms of tea conveniently double-seamed to the body or breast, eve Button Sewing Needle. - A dol f
Mandel, New York City. This needle has a longiMandel, New York city. This needle has a longi-
tudially reduced butt, slotted to form two members with nook-like extremities, whereby the cord or thread may be quickly and flrmly secured to the needle, and a smooth longitudinal surface be maintained from the shank to the point.
Cotton Seed Linter. - Edward J. improvement on a former patented invention of the
same inventor, designed to increase the capacity with out calling for more power to drive the linter, there shaft carrying saws, and agitators within the cotton seed chambers.

## Miscellaneous.

Sign. - Frederick Mitchell, Yonkers, N. Y. This invention provides a background for the
body of the sign whereby letters may be rapidly placed in position to construct words and sentences, and also
ind in position to construct words and sentences, and als
quickly removed or shifted, it being also adapted for the arrangement of the letters horizontally or diagonally or in curves.
Automatic Lamp Extinguisher. Lyman B. Melius, Copake Iron Works, N. Y. By this wick tube and a weighted frame is arranged in with the tion with the hood, whereby the extinguisher will act automatically in case the lamp is unduly inclined from

Sofa Bed. - George H. Skinner Guelph, Ontario, Canada. This invention provides an article of furniture with which, when used as a bed, the entire upper surface will be soft, and the clothes will be free to hang down over the sides and the fett,
and which may be utilized as a right or left armed lounge, or wherein two arms, one at each end, may be mployed, as desired.
Flooring.-Thomas Cantwell, Brookyn, N. Y. By this invention wooden facing strips or in fireproof buildings, the strips or blocks being rigidly eid to place, a series of longitudinally slotted tub foor, while tie bars are arranged for connection with the facing strips or blocks, and fastening devices pass hrough the tie bars and engage the slotted tubes.
Scrub Brush Machine.-Addison M. Cook, Bridgehampton, N. Y. This machine has a
vertically reciprocating cutter under which is a horiertically reciprocating cutter under which is a hont
ontal slide, with a vise and rack engaged by a pawl pivoted to a lever, the latter connected to an operating od, for making scrub brushes in which the splints are tegral with the body or handle of the brush.
Flour Barrel.-Thomas L. Norman, West Point, Ga. This is a barrel or package formed of fabric and having its upper edge turned inward, with separable and removable inner and outer rigid head
sections, between which inturned portions of the fabric sections, between which inturned portions of the fabric
extend, and removable fastenings connecting the extend, and removable fastenings connecting the
head sections together and to the inturned portion, with head sections together and to the inturned portion, wita other novel features, making a light and econo
Obstetrical Appliance. - John P. Turney, Arlington, Oregon. This is a harness to be pplied to the person of a woman when in childbirth, for expulsive strains, the back supported, and a proressive pressure applied to the abdomen.
Carriage to Run on Wire Cables. William Y. Cruikshank, Danville, Pa. This carriage is designed for the transportation of passengers and reight by means of wire cables stretched between two horizontal plane and act as a brake on the down grade of the cables, and as a power
rade to assist in the forward motion.
Coal Separator. - Thomas H. Phillips and John E. Evans, Wilkesbarre Pa The eparating chute has its bottom formed in sections with reverse curves, the convex portion being at the ower end, with an opening adjacent thereto and an adjustable apron hinged bel w the plane of the convex portion and partially closing the opening, for automatically
water.
Fire Place Damper. - Edward O Burrows, Orange, N. J. This is a device designed to e readily inserted in place and especially adapted for rege with open grates, whereby the draught may be of soot upon the damper or its frame will be avoided
Washing Machine. - Joseph Lachance, East Portland, Oregon. In this machine the clothes are beaten by balls and rubbed upon bars or
ods, on the turning of a crank arm, the machine being esigned to quickly and effectually wash the clothes without tearing or injuring them, and with a minimum of labor by the operator.
Skirt Protecting Garment. Elizabeth E. Wood, Topeka, Kansas. A flexible disk rubber cloth, with apertures for the feet and waterproof cloak, straps from the disk passing upward to rings on a waistband, thus protectirg the limbs and
keeping the skirts clean and free from mud and keeping th
moisture.
Inkstand.-Emry Davis, Kane, Pa. In this inkftand there is a check in the ink passage
through the float to prevent the ink from being forced through the float to prevent the ink from being forced In a jet up into the dip funnel, a double-walled cover
forming a chamber to catch and return auy overflow of forming a chamber to catch and return auy overflow of
ink, the construction being designed to avoid almost ank, the construction being desi
Hair Tonic.-Clemens Groos, Riverside, N. J. This tonic is designed to prevent the hair from falling out and promote new growth, thoroughly leaning the skin to permit the hair roots to grow the pine blossom, with spirits and water, combined and pecified.
Glove Fastener.-George W. Jackman, Littleton, N. H. A cord is secured to one side of ide, with a holder adapted to produce friction othe cord, on drawing upon the free end of which the glove closed and held closed, while upon lifting the thum piece the cord is slackened or
permit the opening of the glove.
W.ire Stretcher.-Thomas P. Hick man, Savoy, Texas. This invention provides a device
designed to carry the roll taut a sufficient distance beyond the post to conveniently nail the wire thereto taken up, providing further for drawing together th broken ends of a wire and taking up the slack betwee the posts.
Billiard Register. - Oliver G. Wilson, Franklin, Ky. By this invention duplicat egistering devices are mounted in a suitable casing adapted for attachment to a chandelier or to any con venient place, the devices being such that by turning knob a hand is moved to a proper point on the dial,
bell being rung for each movement of a point, the and being set at 0 at the commencement of the game
Method of Hanging Tobacco. Pleasant B. Farmer, Laurel Grove, Va. A cord i secured to one end of a tobacco stick, then passed side of the stick, and twisted, and passed similarly around a bundle of and twisted, and passed similar ceeding on alternate sides until the stick is filled with bundles and ready to be hung up, the twisting of the cord causing each bundle to be perfectly encircled.
BuckLe. - Charles W. Bassett, Ala

Ala meda, Cal. This is a spring buckle consisting of an formgplate of elastic sheet metal folded on itself to ends, combined with a tlexible tape, the ${ }^{\star}$ device bein especially
bill file.

## SCIENTIFIC AMERICAN

buIldina EDITION.

## NOVEMBER NUMBER.-(No. 49.)

## TABLE OF CONTENTS.

.
$\$ 1,950$. Perspective elevation, floor plans, an details.
2. Plate in colors showing a cottage to cost $\$ 1,300$. Floor plans, perspective elevation, and details.
3. A residence at South Orange, N. J., to cost from $\$ 4,000$ to $\$ 6,000$. Perspective and floor plans. F. W. Beall, architect, New York city.
4. The Cathedral of Seville. Fall of interior portions.

A residence for $\$ 3,800$ recently erected at Chester
Hill, Mount Vernon, N. Y. Floor plans and perHill, Mount V
. Perspective view and floor plans of a colonial house erected at Larchmont Manor, N. Y., at a
. A very attractive cottage for $\$ 1,950$, built at West New Rochelle, N. Y. W.A. Robinson, architec Perspective and floor plans.
8. A cottage for $\$ 2,000$ at West New Rochelle, N. Y Plans and perspective
Drugstore architecture and decorations, with illus
A Colonial house recently erected at Chester Hill, Mount Vernon,
and perspective.
11. A very attractive residence at Chester Hill, Mt Vernon, N. Y., from plans by H. S. Rapely architect,
tive view.
12. Ornamental corner and band for ceiling decoration. By J. Barrett.
13. Christ Church, East Orange, N. J. R. H. Robert on, architect, New York

A cottage for $\$ 5,000$, recently erected on Chest Hill, Mt. Vernon, N. Y. Plans and perspective
view.
15. A residence for $\$ 5,500$ recently erected at Mt . Vernon, N. Y., from plans prepared by J. C
Brown, architect. Perspective view and floor plans.
16. New Post Office and United States Court House Asheville, N. C.
Group of ornamental villas and grounds in Han over, with ground plan.
18. Hall chimney piece, executed by Messrs. Walker \&

A pigeon house with view showing inside and ground plan.
20. Sewage works for large and small towu
21. Miscellaneous Contents: Brown and red sandillone, of Consecticut.-Rabing sape vines, wit Scaffold bracket, with illustrations.-The firs American marble quarry-Wood carving and American marble quarry.- Wood carving and
furniture. - Tlees growing in towers. - Black granite.-Building in Colorado.-Improved road roller, illustrated.-Strength of stone masonry.An interior enamel.-The "Amines" process of architects. - The burning of Rome. - Antique carved furniture and woodwork.-Rock asphan Drives and walks.-Transits for architects and carpenters, illustrated.-Ratchet auger handle illustrated.-The roof.-Mammoth walnut burl. The Scientific American Architects and Builders 25 cents. Forty large $\$ 2.50$ a year. Single copie two hundred ordinary book pages; forming, practi cally, a large and splendid magazine of architecTURE, richly adorned with elegant plates in colors and with fine engravings, illustrating the most interesting
examples of Modern Architectural Construction and examples of M
allied subjects.
The Fullness, Richness, Cheapness, and Conster
The Fullness, Richness, Cheapness, and Convenience of any Architectural publication in the world. Sold by all newsdealers.
$\mathfrak{B u s i n e s s}$ and $\mathfrak{X P}^{\text {Personal. }}$
he charge for Insertion under thes head is One Dollar a linejor each insertion; about eight words to a line. as early as Thursday berning to appearin next issue.

## Mill Property and Powerfor Sale.

Situa the line of the Delaware, miles from New Western Railroad, and a branch of the Central Rail-
ooad, connecting with both railroads immediately the The ro
 amper, beater, etc. There are two distinct water pow-
hat rs, suitable for silk or other factories, three dwellings, hops, offices, etc., in complete repair, and a new stone
am across a branch of the Passaic River, making it one f the most desirable mill sites in the State. Any reasonble amount can remain on mortgage. Terms easy. Apy to William A. Torrey, 6 Wall Street, New York. Wire Rope Tramways for the economical transportaton of ores and other materials. Quarry hoists. Wire N. J. New York office, Cooper, Hewitt \& Co., it Burling For best hoisting Guild \& Garrison Brooklyn, Y, manufatur team pumps, vacuum pumps, vacuum apparatus, air pmps, acid blowers, filter press pumps, etc. For the latest improved diamond prospecting
address the M. C. Bullock Mfk. Co., Chicago, Ill.
Presses \& Dies. Ferracute Mach. Co., Bridgeton, N. J The Holly Manufacturing Co., of Lockport, N. Y., Will send their pamphlet, describing water works ma-
chinery, and containing reports of tests, on application. Tuerk water motors at 12 Cortlandt St., New York. Screw machines, milling machines, and drill presses. Beach's Improved Pat. Thread Cutting and Dianond oint Lathe Tool. Billings \& Spencer Co., Hartford, Ct Rubber Belting, all sizes, $771 / 2$ per cent from regular Buckley, 156 South Street, New York.
For low prices on Irou Pipe, Valves, Gates, Fittinge, Iron and Brass Castings, and Plumbers' Supplies, write
A. \& W. S. Carr Co., 138 and 140 Centre St., New York. Steam Hammers, Improved Hydraulic Jacks, and 'Tube Expanders. R. Dudgeon, 24 Columbia St., New York. FrictionClatch Pulleys. The D. Frisbie Co., N.Y.city. "How to Keep Boilers Clean." Send your address free 96 p. book. Jas. C. Hotchkiss, 120 L Magic Lanterns and Stereopticons of all prices. tc. A proftable business for a man with small capi al. Also lanterns for home amusement. 180 page cataFor steel castings of best quality, write the Buffalo teel Foundry, Buffalo, N. Y.
For the original Bogardus Universal Eccentric Mill, Foot and Power Presses, Drills, Shears, etc., address J.
S. $\&$ G. F. Simpson, 26 to 36 Rodney St., Brooklyn, N. Y. Split Pulleys at low prices, and of same strength and ppearance as Whole Pulleys. Yocom \& Son's Shafting ppearance as Whole Pulleys. Yoco
Works, Drinker St.. Philadelphia, Pa.

Fend for new and complete catalogue of Scientific nd other Books for sale by Mun
New York. Free on application.

NEW BOOKS and pUblications.
a Manual of Machine Construction MECHANICS. Embracing examples, rules, tables. and references. By John Richards $\begin{aligned} & \text { Philadelphia: J. } \\ & \text { preott } \\ & \text { Price } \$ 5 .\end{aligned}$ Company. 1889. $\underset{\text { Lip- }}{\text { Pp. }} 153$. Price $\$ 5$.
Mache nd memoranda are in hrief the summary of this work Every second page is blank, in order to receive th otes of the user. The system of numbering the page and general arrangement of the work is, as stated in the preface, unique. Numerous illustrations are given oook for the student or for preservation of notes in he drawing room of machine construction works.


York: $\quad$ Macmillan $\& ~$
Pp. xvi, 424. $\quad$ Price $\$ 2$.
Professor Lodge has been recognized as an exposito of the modern theory of electricity. In the field so well ccupied by Hertz, his work has been of much impor allustros an independent elucidator, and also as an ributions thereto, he has greatly developed the ethe wave theory of electro-magnetic induction. In the the use of actual models, notably in the discussion in which he treats of the Leyden jar and its discharge ar certainly very interesting. We can confidently recom mend the book to our readers as one that is well worthy the perusal of all who wish to become full a fait in this branch of science. His weakness fo using colloquialisms, which is now one of the prevail-
ing habits in his country, is quite notable in his descriping habits in his country, is
tion of many experiments.
Monnaif, Medailles et Bijoux, Essa
et Controle Des adrahes Paris
This book is somewhat extensive in the ground it
covers, first treating of numismatics, then of modern money systems, bimetallism and monometalism, ex traction of precious metals, refining, mint processes,
and counterfeiting. It also goes over the ground o

The Alternate Current Trans By J. A. Fleming, M.A., D.Sc. (Lon-
don.) Volume I. The induction of electric currents. London : The Electrician Printing and Publishing Com-
pany, limited. 1889. Pp. xi, 487 . pany, himited. 1889 . Pp. Xi, 487 .
This valuable book is published by the Electrician, of London. Its table of contents, which is very full,
gives a good impression of the work. The phenomena of electro-magnetic induction, the theory of simple dynamical theory of current induction, which are the contents of the four chapters following the introduc tory one, gives some idea of the ground covered by it,
It is very clearly and excellently arranged, and the Illustrations given are precisenty such as accord well with the matter of the book. Mathematics are used
throughout and the differential calculus is applied where needed for the elucidation of the theory of the subject siven a place Hdding materially to the researches given a place, adding materially to the value of th
book, and incidentally showing that it is well up to the ime A Mandal of Chemistry for the Use OF MEDICAL STUDENTS. By Bran
dreth Symonds, A.M., M. D. Philadelphia: P. Blakiston,
1889. Pp. 154 . Price $\$ 2$.
This manual is intended for the use of students, bu it gives a very concise and therefore useful summary o
the full ground of chemistry, organic and inorganic Its very shortness and conciseness give it value and make it as useful as convenient for students. In th
way of analysis, a few tests are given, but this portic way of analysis, a few tests are give
is, of course, comparatively meager.
Colcord's System of Preserving Green Forage without Heat or Sermentation by the USE OF THE
Silo Governor. By Samuel $M$ Colcord. Chicago, Ill.: Howard \& Wilson Publishing Co. 1889. Pp
160 Cord 160 .
tempt is made to pre system of ensilage in which a nosphere within the mass of the silo by an apparatus ermed the silo governor. Illustrations and letters from hose who have tried the system are embodied in the interesting subject io we and valuable.
Manual of the Maxim Automatid Mitrailleuse, or Rifle Caliber
Machine Gun. By Hudson Maxim. in this work a description of and short practical di rections for the use or the Hiram Maxim gun are given.
Illustrations of the mechanism and use of the piece, Illustrations of the mechanism and use of the piece,
taken in part from the pages of this journal, are emtaken in part from the pages of this journal, are em
bodicd in it. together with colored illustrations of the loading and discharging mechanisms. It is written and edited by the brother of the inventor, and will form a sine qua non to go with the piece or to be studied by those contemplating its use in regimental practice. To
all interested in the developments of modern macininery ordnance and gunnery, the book cannot b

Monopolies AND The People. By
Charles Whiting Baker, C.E. New York and London: G. P. Putnam' Sons. 1889. Pp. xv, 263. Price $\$ 1.25$ The associate editor of the Engineering News makes his appearance $\varepsilon$ ere in the role of a political economst,
discussing the evils of trusts and monopolies, their different varieties, including those depending on th government, the evils of intense competition, and the
palliatives and remedies for those ill effects. The last chapter is devoted to practical plans for the control of monopolies. Thus in the conclusion the work is ver
appropriately brought into the field of practical use. Hints on House Building. By Robert Grimshaw. New York: Practica
Publishing Company. 1889. Pp. 77 Publishing
Price $\$ 1$.
'These lively little " hints" contain much good sense of the variety generally termed " common sense," and
are very well expressed. Those contemplating house building will do well to peruse the little volume, as they cannot fail to derive therefrom some ideas which
will be valuable for the end they have in view. The will be valuable for the end they have in view. The
author is better known as a writer on mechanical subauthor is better known as a writer on mects, but this book shows that he can unbend to the consideration of everyday matters, and can so
with an unusual "quantum " of quiet humor.
The Evaineme's Hourly Log boor By Robert Grimshaw
York: Practical Pubishing. New pany. Price 50 cents.
to have entered on them hourly data of the running of engines and boilers. The author's idea is, by the use of
such works as this, to cause the engineer to do his work more systematically, and to make engineers preserve and record working data, by which their work will be
rendered more intelligent and be subject to better surendered $m$
pervision.
The Story of the Bacteria and Their Relations to Health and
Disease. By Mitchell Prudden, M . Disease. By Mitchell Prudden, M.
D. New York and London: G. P.
Putnam's Sons. $1889 . \quad$ Pp. 145. Price 75 cents.

## most indefatigable

 aminations of ice and water which he has made have attained considerable notoriety, and he has acquired ahigh reputation from the thoroughness of his investigations. In the present work air, water, ice, and food are considered as soirces of bacterial infection. Bac-
teria in all their relations are here treated, and while it may have an alarmist tendency, it is a book which should certainly be read by all interested in biology or even by those interested in sanitary matters generally.
The style of the work fits it for popular circulation, The style of the work fits it for popular circulation,
and we have no doubt it will attain considerable success in such a circle.

#  

HINTS TO CORRESPONDENTS.

(1454) H. L. H. writes: Has the impression of any figure been transferred to a clear sheet of lass by the agency of a flash of lightning (and under
what circumstances)? A. We doubt it. The instances adduced of such action are not well proved. It is not at all clear how such action would be possible.
(1455) W. G. H. asks: Can you tell me make it retain its brightness when used on the outside a building (covering the roof of a dome, and in orna mental bands)? A. The best you can do is to varnish
it. Gilding may be resorted to where expense is not Gilding
oo great.
(1456) C. H. H. asks : 1. Should a cyliner be hot or cold when you setout the packing rings? It makes little or no difference. Convenience would suggest a cold cylinder, and in making mechanical ad-
justments they are always best executed when condijustments they are always best executed when condi-
tions are most convenient.
$\begin{array}{ll}\text { 2. What will stop foaming }\end{array}$ tions are most convenient. 2. What will stop foaming
in a boiler? A. Clean water. Add a little wasiing oda. This will make the foaming worse; after a few hours more blow out the boiler, wash out the bottom vell, and fill with clean water. 3. Can you give a re-
ceipt for keeping apples through the winter in barrels? A. Bore holes in the bottoms and sides of the barrels, nd store on a dry platform a foot or more high.
(1457) J. G. H. writes : While out to a all one night the violin strıngs broke, and a friend of
mine remarked that the cat's guts that they were made of were no good. I made him a bet that there was no part of a cat's guts entered into the construction of violin
strings. Who wins the bet, and what are they made of strings. Who wins the bet, and what are they made of?
A. The intestines of cats are never used for violin A. The intestines of cats are never used for violin
trings. The favorite material for the gut strings i the intestines of lambs, the ileum, duodenum and jeju num. Silk is sometimes used for the core of the cov-
(1458) F. A. S. says : I have a transparency which hung in a window which was shaded by fir
trees for three years, then the trees were cut down, and then the transparency began to fade out in a place. The place that began to fade is as big as a silver dollar it? A. If the transparency was made on a gelatinowashing after fixing. To check it, simply remove the transparency from the frame and immerse it in chang-
ing water for an hour and a half, then let it dry. Only ing water for an hour and a half, then let it dry. Only be difficult to accomplish. Probably the strong ligh (1459) M
(1459) M. B. asks for any process for crystallizing on plate glass, or, in other words, to make
the glass appear frosted, not ground. A. Glass is treated in a variety of ways to obtain such effects. The sand blast may be used over a pattern. Treatment
with hydrofluoric acid is often used. Sometimes strong solution of a salt, such as chloride of sodium or sul plate is then exposed to the vapors of hydrofluoric acid. expedient, painting may be employed. Sometime glass is heated and cracked by sudden application of
water. Then it is partially fused, so as to be made solid while the marks of the cracks still remain.
(1460) F. B., Naples.-To introduce free fat acids from an oil, it must be decomposed. This
may be done by the use of lead oxide and water or by analogous processes. To clarify an oil, expose to he sun in leaden trays. Often washing with water will Vegetable Fats and Oils," by Brannt, price $\$ 7.50$, whic
(1461) C. ${ }^{-}$E. S.-No. 22 brass weighs $93 / 4$ pounds to a square yard. No. 24 steel, 0.021 of an nch thick, weighs 738 pounds to a equare yard. Ven
thin steel can only be made in narrow strips and is not ordinarily in the market. It would be unfit for covering (1.462) R. H. asks : 1 . Will you tell me is painted with white lead and ionout injuring li? It or chloroform may be used. Or soak the muslin in caustic lye, not too strong, until the paint softens. when
you can wash it out. 2. How do naval builders know the exact dranght of a vessel when they build one? Aleo the weight the vessels will bear after launching?
A. By elaborate calculations of volume of the hull 3. Is there any Scientific American Supplement is made and gas used? A. Many articles are contained on balloons as used by different nations in mili-
(1468) A. M. M. asks : 1. Can I use elecAmerican, October 27, 1888, and December 17, 1887. Can I use unglazed flower pots in place of porous cells in battery? A. Yes, if you plug the holes in the bottom
tightly. 3. Will a 7 inch screw wheel belarge enough
(1464) M. R. asks how skeleton leaves water for some weeks, remove by floating upon a card and very gently remove upper skin with a soft camel's hair brush. Float in waterand catch on a card with and pulp. A stiff brush may be needed, to be used by dabbing. Do not touch with finger. Finally wash well,
(1465) F. W. S. asks : 1. Can I make and sell any of those electric machines, such as dynamo in No. 161, Scientific American Supplement, or plat ing dynamo in Scientific American of October 5
1889, without infringing on anybody's patent? A. Yes 1889, without infringing on anybody's patent? A. Yes
2. Where can I get "Experimental Science," by
M. M. Hopkins, and how much does it cost? 18 , or paper: You refer to it on page 213, Scientific
American of October 5, 1889, at the bottom of the page. A. "Experimental Science," is a book of 740 pages,
published by Munn \& Co. Price $\$ 4$. 3. I have been repubished by Munn $\&$ co. Price $\$ 4$. 3 . 1 have been re-
winding a small medical battery. The secondary coil gives only a very small current. The primary coil, in-
cluding interrupting arrangement, worksall right. The cluding interrupting arrangement, worksall right. The
primary coil consists of two layers No. 25 cotton-covprimary coil consists of two layers No. 25 cotton-cover
ered mire, and is five-sixteenths inch diameter, including a soft iron rod. The secondary coil consist
of a wooden tube, very thin in the center, and has 4 slots cut in it over its entire length. I wound on it 10 layers No. 36 silk-covered magnet wire, each layer covered with a layer of paper soaked in hot paraffine.
The center hole is one-half inch diameter, to take in a The center hole is one-half iach diameter, to take in a
brass tube of the same size, to check the secondary cur brass tube of the same size, to check the secondary cur-
rent. What changes would I have to make? Have you got a paper that treats on this subject? Please let me know the number, so that I can order it. A. Make th
core of your primary coil of fine soft iron wires. It should be larger, say $3 / 8$ inch. Wind it with two layers of No. 18 wire, and use a stronger battery, a plunging bichromate battery for example. 4. Does it make any
difference if cable coils (see question No. 3) are wound in the same direction or not? A. No.
(1466) A. B. C. asks : Will you please the E. M. F. of a bichromate of potash cell (one pint) having one zinc and two carbon plates $3 \times 2 \times 1 / 4$ inch (plunge battery) is? A. About 2 volts.
(1467) F. D. S. writes : 1. What relation A. The larger a battery cell is, the more solution will it contain. A large cell will therefore run longer than a
small one, other things being equal. The larger the small one, other things being equal. The larger the Its amperage will be greater, its voltage will be unchanged. The ratio in general terms is one of simple
proportion. 2 Is the fall of water from a siphon as great as the fall from a vessel placed at the bend of the siphon? A. Except for the additional friction in a pipe, it is the same. We do not understand what battery you
(1468) D. E. O. writes: When the brakes re applied to a running train of 12 coaches, what length of time is there between the action of the first and last
rakebeams, and if the compressor be stopped, what will be the indicated pressure when brakes are released? A. The pressure on the brakes takes place simultane-
usly. The pressure is a matter of regulation, due to he construction of the brake machinery, size of cylinon, the release will depend for time on the leakage.
(1469) H. P. asks : 1. At what temperature does kerosene oil ( $150^{\circ}$ test) vaporize? A. Such
oil will boil at $350^{\circ}$ to $450^{\circ}$ Fah. 2. How manv volumes oil will boil at $350^{\circ}$ to $450^{\circ}$ Fah. 2. How manv volumes
does one volume of oil assume by vaporizing? A. About 130 volumes. 3. Does it leave any residue after
(1470) Constant Reader asks: What mber of the SCIENTIFIC AMERTCAN SUPPLEMBNT
ontains an article relating to the transferring of photoraphs to plates so that they may be printed? A. See Suplement, No. 682.
(1471) H. D. H.-A nail driven into the trunk of a tree would thereafter remain at the same
height from the ground, as the tree does not elongate pwardly by the formation of new tissues beneath, but hrough the formation of term
(1472) F. B. says : In vol. 61, No. 9, of the Scientific American, article on "Transparencies
in Prussian Blue," there is a formula calling for citrate of iron and ammonia $7 \frac{1}{2}$ drachms; is it a compound or is it two articles requiring $71 / 2$ drachms of each? A. Ci-
trate of iron and ammonia is a single salt. 2. Will the ormula mentioned do for sensitizing paper? A. Yes; also see Scientific American Supplement, No. 584,
and Notes and Queries column of Scientific Amerian, October 12, 1889.
(1473) M. B. S. B. asks : What will reThe slab was stained by allowing an iron oven to stand n it. A. We can suggest nothing better than rubbing with ground pumice or sapolio. Any chemical agent
that would attack the iron would injure the marble
(1474) E. writes for the formula for makng the lacquer or paint used in different shades, blue,
yellow, green, etc., by lamp manufacturers and tinware yellow, green, etc., by lamp manufacturers and tinware
manufacturers. A. In general terms an alcoholic soluor of ehellac colored with aniline colors may be used
(1475) D. J. B. asks: 1. How to set an eccentric on the mann shaft of a steam engine before
said shaft is set in place. A. Set the eccentric about $10^{\circ}$ ahead of the crank line in the direction that it runs. the requirements of the valve construction. 2. How is electricity applied to an electric motor in order to make the main shaft revolve? A. See illustrations of electric motors in back numbers of Scientif
Scizntific American Supplimmant,
(1476) L. M. R. asks : Which requires the ost perfect joint to prevent leaking-hot water at $160^{\circ}$ Both require about equally perfect joints, for the water
makes its way through an imperfect joint by capillary (1477) C. De V.-External applications er rarely serviceable in erysipelas, or "St. Anthony's
(1478) S. L. H. asks : 1. Where in this country is infusorial earth mined in large quantities?
. It is mined in Storey County, near Virginia City Jevada, and on the Patuxent River, near Dunkirk, Cal ert County, Md. A. new deposit has recently been worked on Pope's Creek, Md. In 1887 about 3,000 tons
were produced, estimated as worth about $\$ 15,000$. were produced, estimated as worth about $\$ 15,000$. 2 .
What are some,of the principle uses to which it is put? A. For polishing powder (electro-silicon), absorbent base for dynamite, non-conductor for boilers and steam pipes, and filling for soap. 3. Are there any books giving information about this material and its mining? A, tabistics, etc.,., are given in the "Mineral Resources of
he United States,", published by the United States Geoogical Survey, Washington, D. C. 4. Is tripoli mined poli is a variety of infusorial earth formerly imported om the country of that name. We can supply you ith Haswell's Engineer's Pocket Book, by mail for $\$ 4$
(1479) J. S. S. asks if there is a process known to you of photographing on brass so that it can
be etched with acid, direct from the design without ar ping it on with a point or graver? A. Use the regu LIEMENT, Nos. 143, $344,438,587$, and 656.
(1480) Raj writes: Is there any known nethod whereby kerosene oil can be used for heating
vulcanizers for dental or rubber stamp work without soot? Everything is black. I have used several differ nt kerosene oil stoves, but all the same, hat part of my taboratory is all smut, and if I go tha way I get daubed with black. I use it to boil water, heat flasks, soften rubber, and to vulcanize. We do
not have gas or gasoline, but plenty of kerosene oil not have gas or gasoline, but plenty of kerosene oil.
A. There is no trouble in doing this. There are a number of oil stoves on the market that will burn oil without the least smoke. Some management is required. The space above the flame should be as unobstructed as possible. If you place the article to be heated too near the as to obstruct the outlet smoking will occur. The top of the flame shoul
the surface to be heated.
(1481) J. W. N. writes: What articles are used in the manufacture of laundry starch. What quantities of each are used, and what ways and means many vegetable products. Laundry starch is made o a large scale from Indian corn. The grain is ground soaked in water, and the water milky with suspended arch is run off and allowed to settle, depositing starch upon the bottom of the vessels containing it. Various
modifications, involving application of heat or chemi cals have been proposed and introdueed to a consider
(1482) A. W. H.-The mineral sent is galena or sulphide of lead. It is the principal ore of ead, and is often worked for silver as well. If in any
(1483) G. J. L. asks : 1. What is the recipt for serpent's eggs, which when lighted give of coil resembling a snake? A. In our Supplem ent, No curial fumes are unhealthy the following receipt ma be used to make innocuous ones, almost as good as
the regular. Bichromate of potassium 2 parts, nitrate of potash 1 part, white sugar 2 parts. 2. What is th melting point of lead? A. Lead melts at $630^{\circ} \mathrm{F} .3$
Shellac is composed of what? A. Lac is a resin which Shellac is composed of what? A. Lac is a resin which
exudes from the stems of certain plants ( ficus) when pierced by the coccus insect. It is collected and purified by melting, and is pressed into sheets forming shellac . What is cresol? A. Cresol is a coal tar product which several isomers exist. It is a derivative of
benzol, one of the hydrogens of $\mathrm{C}_{6} \mathrm{H}_{0}$ being replace by hydroxyl, and the other by methyl $\mathrm{CH}_{3}$, thus $\mathrm{C}_{6} \mathrm{H}_{4}$, by hydroxyl, and the other by methyl $\mathrm{CH}_{3}$, thus $\mathrm{C}_{6} \mathrm{H}_{4}$,
OH, $\mathrm{CH}_{3}$. It is a liquid boiling at $365^{\circ}$ to $3668^{\circ} \mathrm{F}$. in
its other modification. It is a powerful disinfectant, its other modification.
and is very poisonous.
(1484) A. S. A. asks why water puts out fire? A. Water puts out fire by reducing the temperature. Water has a high specific heat, and cools off
the wood or other combustible to such an extent that neither carbon nor hydrogen can combine with the oxygen of the air. A high temperature is essential for
this to take place with a degree of energy sufficient to produce what we call fire.
(1485) A. L. L. asks : 1. Will you please advise me through the Notes and Queries column of
your paper if the current from a glass plate electrical machine can be used for experiments in chemical elec tricity, such as decomposing water? A. To a very ha
ited extent only. The very small intensity of the cur rent makes it of very little power as regards chemica decomposition. 2. Have you ever given, either in the Scientific American or Supplement, descriptions and illustrations of the different telephones? A. All magneto telephone and microphone. In the columns of the Scientific American and Supplement you will find an immense number of telephones described and
illustrated. Consult our indexes. 3. Can you say the above can procure a receiving telepho in either of The Bell Telephone Company holds the monopoly.
(1486) W. H. M. asks (1) for the best method to shrink woolen goods. A. Two methods may
be given: $a$. After pulling treat the goods on a perforated table with superheated steam. b. Pass through a ated table with superheated steam. o. Pass throngh a
bath of alum $10^{\circ}$ B. for half an hour, wring and dry, wash, soap, wash off and dry. 2. State if there are
woolen goods that cannot be shrunk. A. Almost all
(1487) A. C. F: asks how battery zincs are cast. In what kind of a mould? What can be mixed with it to make it softer? What is best to melt it in, and
about how hot do you have to heat it? A. Zinc can be metred in an in iron pot or lade. It can be cast in sand moulds, ulthough iron moulds are generally used. You should not mix anything with the zinc.
(1488) R. P. J. writes: Would it be practicable to use the eight-light dynamo with a 1 horse
power Shipman engine for lighting dwelling? A. It power Shipman engine for lighting dwelling? A. It could be used for this work.
of about 125 candle power.
(1489) J. A. T.-The window ventilating mills or fans are of no especial value as a means of ven-
tilation. If there is a current of air naturally moving out or in through the hole, the mill moves. A plain opening with a guard to break or spread the direct cur rent answers the same purpose as mills. Sunlight
tends to crystallize the amalgam on mercury-backed tends to
mirrors. mirror

## TO INVENTORS

An experience of forty years, and the preparation of more than one hundred thousand applications for palaws and practice on both continents, and to possess un equaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and al foreign countries may be had on application, and persons
contemplating the securing of patents, either at home or
 which are low, in accordance with the times and our ex tensive facilities for conducting the business. Address
MUNN \& CO.. office ScIENTIFIC AMERICAN, 361 Broadway, New York.

## INDEX OF INVENTIONS

## For which Letters Patent of the

 United States were GrantedOctober 22, 1889,
AND EACH BEARING THAT DATE.
[See note at end or list about copies of these patents.]

## Air brake, T. V. Norris.............

 Alarm. See Thermortatic alarm. Annunciator,,Auger, J. Bailey

## uger attachnent W..... M. M. Dobson

 Anger, post, G. B. Harris.... Baling press, C. G. Wilson ..Banjo thimble, Banjo thimble, S. S.
Bar. See Chain bar
Barrel pitching machine, w. J. Ott
Basin waste and stop, H. J. Gilche
Bating, w. Dieterle..................
sattery compound, galvanic, W. P. Kookogey Bearing, roller, R. W. Hent Beehive, F. E. Merriman.
Belting, machine, G. B. Smith
Bench. See Laundry bench.
Bicycle attachment, J. A. Kirk Billiard register, o. G. Wilson
Bin. See Grain and malt bin
Blackıng kit case, shoe, E. D. Smith
Boats, foot brace for row, W. H. Rice
Boot or shoe buttonhole piece, E. M. Phelps.
Boot or shoe heel, C. A. Strasser
Bottle stopper retaining device,
Box fastening. C. C. Richmond............ Box making machine, Herberger \& Singer .......... 413,32
Brace. See Chain brace.
Brake. See Air brake. Car brake. Locomotive brake. Steam bra
Brick sard cultivator, A.J. Bates
Bridge gate, swinging, e. Girard..
Bridge, suspension, G. N. Clymer...................
Brines, water, etc.., purifying, J. A. Bradbur
et al..........................
Bucket attachment, scrubbing, A. J.
Bucket. coal, W. E. \& E. S. Ludlow... Buckle, c. W. Bassett
Buckle, G. L. Smith
Burner. See Self-generating burner
Button, L. C. H. Mensing
Button for sleeves or other articles, M. Dehayes.
Button hook, T. R. Betzel...................413,314 Button making machines, feeding device for, R . L. Ellery.

Button strip. Haviland \& Mitchell
Cable grip, J. Volk.
calculating, recording, and numbering machi

## Calendar, J. H. Hughe

Calipers, micrometer, C. P. Jennings

## Can. See Fluid c

Can stopper, H. Pearl
Can wiping machine, C. A. Burt
Car brake, A. P. Massey.........
Car brake, E. T. Schoonmaker
Car brake, automatic, J. N. Scarborough
Car coupling, Coble \&
Car coupling, J. H. Eakins
Car coupling, C. C. Hodges
Car coupling, W. J. Ponto
Car coupling, J. J. Sleeper
Car coupling, J. J. Sleeper...
Car draw head. J. Stephens
Car draw head. J. Stephenson......
Car lighting, electric, S. H. Barrett
Car mover, L. B. Gifford.
ar step, railway, A. B. Allen
Cars, contact trolley for Mitchell..
Cars switch
ating device for street, D. J
ard clothing together and to the grinding cylin-
der, mechanism for attaching sheets of, $w$.
Harris.................................

| Carpet beating machine, A. B. Collen........ .. .. 413,387 <br>  |  |
| :---: | :---: |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
| Chair. See Reclining charr. Rocking chair. |  |
|  |  |
| Charcoal, kiln for making, E. W. Rathbun......... 413.306 |  |
|  |  |
| Churn, w. H. Crawford................................ 413,175 Churn dasher. J. W. McClure......................... 413.537 |  |
| hurn dasher, A. D. V an Bibber..................... 413,583 |  |
|  |  |
| ay for ballast, ete, burning, w. \& H. G. Butler., 4r3, |  |
| Clay to make ballast, etet., feeding apparatus foruse in uurning. Davy $\&$ Butler |  |
|  |  |
|  |  |
|  |  |
| Clock, electric pendulum driven, M. L. M. Hussey.. |  |
| Clocks, electric regulator for pendulum, J. H. <br> Gerry....................... ....................... 413,340 |  |
|  |  |
| Gerry................................................. 413.340 413260 Cloth pressing machine, G. |  |
| Clutch, J. Brooks....................................... 418,430 Clutch, power transmitting, W. F. Sherman....... 413,569 |  |
|  |  |
| Coal separator, Phillips \& Evans $\qquad$ <br> Cocks, etc., non-conducting hand wheel for. J. W. <br> Becker 413.313 |  |
|  |  |
| Becker.......................................... 413,313 Coffee mill, W. A. Hance.............43,320, 413.321 |  |
| Coloring matter, production of azo, A. Sarauw.... 413,562 <br> a O. 418250 |  |
|  |  |
|  |  |
| Compass, automatic recording, O. O. Farciot...... 413,250 Compositor's cabinet, Johnson \& Low. .............. 413,449 <br> , |  |
| Conduit, underground, G. H. Warde................. 413.215 Copper and its alloys, mixture for refining, G. G. <br> Mullins |  |
|  |  |
| Copper and its alioss, reening, G. 0. Mullins...... 413,535 |  |
|  |  |
| Corn sheller, shuck, w. s. Reeder.................... 413.515 |  |
| Corset, L. Kraus........................................... 413,191 <br> Coupling. See Car coupling. Pipe coupling. Thill coupling. |  |
|  |  |
| Crate, folding, w. Bruce.............................. 413,492 |  |
| Cross head, A. H. Eddy.................... ......... 413,227 Cuff fastener, H. C. Frank. ........................... 413.441 |  |
|  |  |
| Cultivator, orchard, L. A. Gregg..................... 413,443 Cup. See Oil cup. |  |
|  |  |
| Carrents, obtaining direct from alternating, N. <br> Tesla....... ........................................ 413,353 |  |
| Cutter. See Fingernail cutter. Meat cutter. Tenoning cutter. |  |
|  |  |
| Damper, freplace, E. O. Burrows........ ........... 413,386 Decorative frame, R. Marsh. 41,349 |  |
|  |  |
| Dental plates with gold, lining, E. T. Starr......... 413,376 Desiccation, Houseman \& Sprowles................ 413,232 |  |
| Detector. See Metal detector. <br> Die stock, ? Effinger \& Deweese $\qquad$ 413,317 |  |
|  |  |
| Door lock, T. J. Young........................... 413.333 Dough mixer and kneader, D. . Stone........ 413,17 |  |
| Draught equalizer, A. G. Brown............. ........ 413,167 |  |
|  |  |
| Drier. See Fruit drier. <br> Drill, W. H. Genung. <br> 413,394 |  |
| Drililin maachine, V. Wririck ......................... 413,218 |  |
|  |  |
| 413,337, 413,363 <br> Electric machines, switch for dynamo, W. Hoch- |  |
|  |  |
| Electric reaulatior, w. Hochhausen.............. ${ }^{\text {L }}$ 413,2, |  |
| Electric switch, R. C. Hunl............................Electrical distribution system, Thomson \& Rice, |  |
|  |  |
| Jr. $\qquad$ Elevator lock, H. I. Coe et al $\square$ $\qquad$ |  |
|  |  |
|  |  |
|  |  |
|  |  |
| Eraser, ruber. Q . Dean....................... 413.599 Fabric. See Satin faed fabric. Wire fabric. |  |
|  |  |
|  |  |
| Faucet, J. . B. Jones................................ 413,518 Faucet, beer, H. Koll ................ 413,257 |  |
| Fence ánd insect destroyer, combined, C. B. Hal- |  |
|  |  |
| stead ........ .............................. 413,507 Fence machine, H. M. \& C. O. Tschopp........... 413,420 |  |
|  |  |
|  |  |
| ter................................................ 413,223 Fender. See Fire fender. Vehicle fender. |  |
| Fifth wheel, vehicle, H. Nolty, Jr.... ............... 413,289File cutting machine, A. Goldenberg.............. 413,319 |  |
|  |  |
| Finger rings, machine for enlarging, C. A. Svens- |  |
|  |  |
| son.... ............................................ 413,465 Firearm; magazine, J. M. Marlin .............. 413,196 |  |
|  |  |
|  | Ogsters, apparatus for the cultivation of, I.. |
| , |  |
| Fireproof coverings for walls and ceilings, pro-ducing, C. F. W. Doehring. | Paint, treating prrite cinders for the manufac-ture of, C . Arnois.................. 413,288 |
|  |  |
| Firema's on stocker's shield, N. Weber........... 413,424 |  |
| id can and pump. F. S. Belcher................. 413,6 | Paper bag Paper baz |
| Folding table L. L. L. Ketchum...................... 413.32 Fork puard, A. Copley. |  |
|  |  |
|  |  |
| Frame. See Decorative frame. Harrow frame. <br> Fruit drier, E. White.. ................................ 413,589 | Pattern lifter, J, Pavement, conct |
| Fruit squeezer, D. D. H. Rice...................... ${ }^{413,234}$ | Pen or pencil holder, J. P. Haisilip.................... 413,366 |
|  |  |
|  | Photographic cignetter, A. W. .lark.............. 413,611Pillow sham holder, W.C. Van Cise......... 11,214 |
|  |  |
| Gas, apparatus for the manufacture of, D. H. <br> Knapp.. $\qquad$ | Pills, machine for manufacturing compressed, Smith \& Mulford. |
|  | Pipe. See Locomotive exhaust pipe.Pipe coupling, stoneware, H. B. . Camp ........ 413.170 |
|  |  |
|  | Plane, , . D. Mosher - ......................... 413,300 |
|  |  |
| rodess of and apparatus for the manufacre of, B. Loomis (r).............................. 11,036 |  |
| as washer, C. W. Jarrell.......413,514, 413,51, te. See Bridge gate. End gate. Hatchway gate. Self-closing gate. |  |
|  |  |
| te, C. E. Little. . $\qquad$$\qquad$ 413,527 enerator. See Hydrocarbon generator. Steam generator. |  |
|  | (lanter, corn, W. \& R. L. W. Wooding................ 413.5969 |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |







T픈 KODAK CAMERA
 THE GREAT IMPROVEMENT IN ROOFINC





 witis suppied readid for wes in rolls cotatiandin， 20
 Rooting fre frene inferior imititions of our Asbestos
 H．W．JOHNS MANUFACTURING CO．

H．W．Johns＇Fire and Water－Proof Asbestos
Sheathing，Building Felt，etc．Asbestos Boathing，Building Fett，etc．Asbest
Boiler Covings，Steam Packings， Samples and Descriptive Price List Free by Mail． 87 Maiden Lane，New York． chicago．philadelphia．boston．


PATENTS！
PATE $2=$
 preparation of Patent Drawings，Sepecitcations，and the the
prosecution of Applicatiow for Patent io the United
States，Canada．and Foreign Countries．Messrs Munn \＆


A pamphlet sent free of charge，on application．con－
tianny full information about Patents and how to pro taining rum information about Patents and how to pro－
cure them；directions concerning Labels，Copyrights
Designs，Patents，Appeas．Reisisues．Intringements，Ase
signments，Rejected Cases，Hints on the Sale of Pa－
 patents in all the principal countries of the Forld．



INA TIOMN A
HI工THR
BRIGHT SPARKMING WATER
LARGE SIZES FOR MILLS AND WATER WORKS． NATIONAL WATER PURIFYING CO．，


Cesm MARNTNV＇S SAFES
HAVE MANY PATENTED
NOT FOUND IN MPR MAKES OTHER MAKES THAT WILL WELL REPAY AN INVESTIGATION BY THOSE WHO TO SECURE THE BEST SAFE MARVIN SAFECO． NEW YORK，PHILADELPHIA， LONDON．ENGLAND．
JAMES B．EADS．－AN ACCOUNT OF


## 



PIPE COVERINGS
Absolutely Fire Proof． BRAIDED PACKING，MILL BOARD，SHEATHING，CEMENT，FIBRE AND SPLCIALTIES．

THE GUTTA PERCHA \＆RUBBER MFG．CO． The Largest Manufacturers of Mechanical Rubber Goods in the World．
 Packing，Belting，Hose，Mats，Matting，etc． THE AMERCAN BELL TRE RPHONE CO
 95 MILK ST．，BOSTON，MASS

This Company owns the Letters Patent granted to Alexander Graham Bell，March 7th，1876，No．174，465，and January 30th， 1877，No．186，787．
The transmission of Speech by all known forms of Electric Speaking Telephones in－ fringes the right secured to this Company by the above patents，and renders each individual user of telephones not furnish－ ed by it or its licensees responsible for such thereof，and liable to suit therefor．


EXPLOSIVES．－A VALUABLE AND




A GIFT FOR EACH MEMBER OF THE FAMILY．
THE ITTERNTIONAL CYCLOPEDA $4=$
years ago at the lowest cost consistent with good papēr，good type，good binding，and good editing，and is
better to－day because of careful revision．
No other cyclopedia approaching it in size－ 15 volumes，with $\mathbf{5 0 , 0 0 0}$ titles－is sold at so low and terms of payment easy－if you wish．Correspondence solicited．
Salesmen wanted．Address，SUBSCRIPTION DEPARTMENT，
OOOD，MEAD \＆COMPANY，Publishers， 753 \＆ 755 Broadway，New York．


orlsELEVATORS
 Otis Brothers \＆C C ． 38 Park Row，
New Sandard Bydralic and Steam Passenger and Preight Eleators ROS POP SAFETY VALVE OSB）WATER RELIEF VALVE Qe STEAM ENGINE INDTOATR





## 

15TTPEVRITITR
工式卫
Sicinutific AmpricaM ESTA BLISHED 1846．
The Most Popalar Scientific Paper in the World． Only 83.00 a Year，including Postage．Weekly．
This widely circulnted and splendidly Illustrated
paper is pubistied weekly．Every number contains six－ teen pages of useful information and a large number of
ter original engravings of new inventions and discoveries．
representing Engineering Works，Steam Aachinery， New Inventions．Novelties in Mechanics，Manuf：actures，
Chemistry，Electricity，Telegraphy，Photography．Archi－ tecture，Agriculture．Horticulture，Natural History，etc． Complete List of Patents each week．
Terms of Subscription．－One copy of the SCIEN－ postage prepaid．to any subscriber in the United States or Canada，on receipt of three dollars by the pub－
ishers；six montbs，$\$ 1.50$ ；three months， 81.00 ． Clubs．－Special rates for several names，and to Post Masters．Write for part．culars．
The safest way to remit is by Postal Order．Draft，or xxpress Money Order．Money carefully placed inside
of envelopes，securely sealed，and correctly addressed seldom goes astray，but is at the sender＇s risk．Ad－
dress all letters and make all orders，drafts，etc，puy－
able to MIUINN de
361 Broadway，New York． TEXT
Scientific American Supplement．
This Scienvific American．but is uniform therewith In size，every number containing sixteen large pages full
of engravings，many of which are taken from foreign papers，and accompanied with translated descriptions． The Scientific American Supplemient is published
weekly，and includes a very wide range of contents．It presents the most recent papers by eminent writers in Useful Arts，embracing Biology，Geclogy，Mineralogy， Natural History．Geooraphy，Archæology，Astronomy，
Chemistry，Electricity，Light．Heat，Mechanical Engi－ Chemistry，Electricity，Light．Heat，Mechanical Engi－
neering．Steam and Railway Engineering，Mining． neering．Steam and Railway Engineering，Mining，
Ship Building，Marine Engineering，Photogripny， Technology，Manufacturing Industries，Sanitary En－ $\left\lvert\, \begin{aligned} & \text { gineering，Agriculture，Horticulture，Domestic Econo－} \\ & \text { my，Bigraphe，Med cicine，etc．A A ast amount of fresh } \\ & \text { and valuable information obtainable in no other pub．}\end{aligned}\right.$ and valua
lication．
The most important Engineering Works，Mechanisms，
and Manufactures at home and abroad are illustrated and described in the Suppiement． Canada． 85.10 a year，or one copy of the Scientific Am－ ERICAN and one copy of the SUPPLEMENT，both mailed
for one year for \＄i．0．0．Single copies 10 cents．Address emit by postal order，express money order，or check．
MUNN $\&$ Co．， $\mathbf{3 6 1}$ Broadway，N．Y．， Buildino Edition．

The Scientific American architects＇and Single copies， 25 cents．Forty large quarto pages，equal
to about two bundred ordinary book pages forming to about two hundred ordinary book pages；forming a
large and splendid Magazine of A rchitecture，rich－ ly adorned with elegant plates in colors，and with other
fne engraving；illustrating the most interesting ex－ amples of modern Architectural Construction and
allied subjects． allied subjects．
A special featu
of a variety of the latest and best plans for private resi－ dences，city and country，including those of very mod－ perspective and in color are expensive．Drawings in
pether with full The elegance and cheapness of this inagnificent work have won for it．the Largest Circulation of any
Architecural publication in the world．Sold by all MUN N \＆CO．，Publishers，

361 Broadway，New York．
PRTRTNTNG TNTKG1


