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THE GREAT SUSPENSION BRIDGES OF THE UNITED STATES.-[See page 33\%.]

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## DESIGN PATENTS.

The following is the text of the principal part of the ex isting law in relation to patents for designs:
"Any person who, by his own industry, genius, efforts, and expense, has invented and produced any new and origi nal design for a manufacture, bust, statue, alto-rilievo, or bass-relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics; any new and original impression, ornament, pattern, print, or picture to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture; or any new, useful, and original shape or configuration of any article of manufacture, the same not having been known or used by others before his invention or production thereof, or patented or described in any printed publication, may upon payment of the fee pre scribed, and other due proceedings, had the same as in c of inventions or discoveries, obtain a patent therefor.
" Patents for designs may be granted for the term of three years and six months, or for seven years, or for four
years, as the applicant may, in his application, elect."
ears, as the applicant may, in his application, elect."
The government fee for a design patent of $31 / 2$ years is $\$ 10$; for $\uparrow$ years, $\$ 15$; for 14 years, $\$ 30$
The interpretation and practice of the Patent Office in respect to that portion of the above law which we have italicized, has varied from time to time according to the particular views of the individual who happened to occupy the chair of the Commissioner of Patents. For several years past, however, the Patent Office has held the words italicized to mean that the new shape or configuration of the article must be ornamental, otherwise no patent could issue. Accordingly it has been the custom for the Patent Office to re ject all applications for design patents for new forms of articles, unless such forms were ornamental.
We are glad to observe that the present Commissioner of Patents, General Paine, has set aside this old practice, and adopted a more liberal and evidently more correct interpretation of the law, whereby design patents will hereafter issue for any new, useful, and original shape or configuration of any article of manufacture, as stated in the law.
Commissioner Paine's decision to the above purport was announced in the recent appeal case of Shoeninger. The Commissioner says: "The examiner's objection in this case
is, not that the design is for a shape or configuration wholly useful, but that it is not for a shape or configuration wholly ornamental. He thinks the presence of utility as one of the qualities of the design renders it unpatentable, notwithstanding the simultaneous presence of beauty as another quality. But I think that if the design is new and original, and also useful, it is patentable under the law, whether it be or be his action in the case to the foregoing opinion."

We think that this decision of Commissioner Paine will be generally received with satisfaction and that it will be upheld as correct by the courts. We regard it as a decision of considerable importance and far reaching in its scope
Not only may inventors obtain patents in the usual manner
for improvements of every kind; but they may further fortify themselves by taking design patents upon original forms or shapes of any of their articles. It is oftentimes the
shape given to any article of manufacture that determine shape given to any article of manufacture that determines one who can produce a new design for the shape of a plow a fence, a chair, a dish, a garment, or other useful article, a fence, a chair, a dish, a garment, or other useful article,
would appear to be entitled to a design patent for such novel would appear this enting of the Commissioner; and such
shape, under this ruling shape, under this ruling of the Commis
patents may prove to be of intrinsic value.
For several years past there has been regularly introduced in Congress, but always defeated, a bill to so amend the patent law as to make it an offence for anybody to use a casting as a pattern for making other castings, except by consent of the maker of the original pattern. We have always felt constrained to oppose the enactment of thaw cases to pattern makers to have their unpatented designs appropriated by others, still it is one of the conditions of trade Whatever is good and popular others will, of course, desire to imitate; but it would be iniquitous, as was intended by the proposed law, to empower the owner of a wooden pat tern of an old stair plate, for example, costing him perhaps a dollar, to collect hundreds of dollars in damages of any
poor fellow simply because he used one of the plates for poor fellow simply because he used one of the plates for moulding.
In discu
In discussing this proposed pattern law we showed that the design patent law as it stands, if properly interpreted, would be adequate to protect the owners of original and use ful patterns; and we are glad that the Patent Office now adopts substantially the same view.
Pattern makers have no further occasion to grumble or seek for special legislation. The Patent Office, as we understand it, is now ready to grant proper claims for anything that is original and useful in the shape of any article. This is a broad, liberal, and encouraging view of the law; and is likely to give a renewed stimulus to the art of designing, not only in decorative applications, but in the proportioning of patterns, goods, and manufactured articles of every description.

## THE IMPATIENCE OF YOUTH.

Not long since the Scientific American ventured to sug gest that in the matter of education a late beginning was bet ter than none, and that not a few men whose early advan tages had been small had by diligence and earnest applica tion in maturer years achieved an enviable degree of scholar ship. A far less hopeful view of the advantages of trying
to make up in later life for opportunities missed in youth is taken by a correspondent, who prints his name in very large letters at the top of his paper, and under it the words "Lecturer and Essayist," but does his writing with a lead pencil. He says:
"True it is, that the young men who regret educational deficiencies are legion. Many make no effort to remedy the evil, and it is little wonder they do not. There is but little encouragement given the young man who does strive to bet er his education. I cite my own experience as an instance I am a young man, and have employed my spare moments, since beginning active life at 16, in the acquisition of know ledge. I apply for a situation requiring a knowledge of one of the branches I have studied and am asked for my 'diplo ma.' I have none, am self-cducated. I am not wanted. A person who has a certificate of ability from some school takes the situation. Is it, then, strange that so many young men cease to strive for knowledge? Especially when they apply, as I have done, for a place at manual labor and-because they are known to be students-are told that 'no dreamer or theorizers are wanted.' And that, too, when they wer strong, active, and willing, when they could have brought o bear on the work a superior muscle, operated by a good intellect. Around me to day I see ignorant men, unable to cad or write, basking in the smiles of Dame Fortune, while with great effort only I keep a crust in my mouth for my pains to cultivate body and mind. Now when such encourage ment as this is given to him who improves spare time, is it strange that many decline to tread the thorny way up the hil of science? '
This is a characteristic plaint of youthful cagerness and impatience. The ambitious stripling, whether self-taught college-taught, or not taught at all, is confident of his ability o fill any position, and marvels that the world does no hasten to set him to work on his own terms. And not un frequently his lofty estimate of his own merit is the sole bar oo his getting a chance to show what stuff there is in him From a purely business point of view we confess that with all our regard for culture, perhaps because of it, we should hesitate to engage for manual labor a young man, however muscular, who wrote " Lecturer and Essayist" after his name. This not from any feeling of disrespect for reading nd writing, but rather the contrary. What right-minded man, for example, would enjoy having a Tyndal or a Tenny son to black his boots, let the work be done by him never so cheaply or skillfully?
That, other things being equal, the man with a diploma will ordinarily be preferred for the work covered by the diploma is very true. In many cases the intending employer has no other means for estimating the fitness of a candidate. Any lack on this score, however, so far from deterring a youth from study, should incite him to study the more, that he may the more speedily overcome the obstacle thus opposed to his progress in life. But our young friend must not think that the self-taught are peculiarly afflicted in having to wait overlong for a public recognition of their deserts Speaking of the conflict between general and special educa tion, a clever writer touches this very grievance as one par ticularly felt by young men fresh from college. He says:
"It has been said that the higher education of the period catters too much-that it gives the aspiring youth much that is of no practical value and little that is. This is not so. There are few graduates of our colleges who cannot take up a specific business as soon as they get their sheepskin, and follow it much more to their own satisfaction than anybody else can, however extended the latter's experience and however great the sacrifice of time and money he has been at to fit himself for that particular branch. The young collegian feels hurt if he is not granted at once all the emoluments which belong to the older person alluded to, and frequently hopes, and says as much in forcible and elegant language, that the time will speedily come when people will appreciate the general education more and the specific less. This shows that he is adapted to everything from the word " go "-if we may be permitted the expression; that there is no limit to his powers in any branch of business or in the professions, from the matter of sawing wood to that of presiding on the bench."
Another phase of the same trouble was noticed in a recent address before a college society by a prominent jurist of thi city, who remarked that "one great obstacle to the advance of young men in political life is the arrogance which too many of them affect in their relation to public affairs. They are too apt to assume that because they are well read and cultivated they may be at once assigned to command without ever carrying a musket in the ranks. From old soldiers, hot, dusty, and begrimed with battle, the bright ness of the new uniforms commands but slight respect"
It matters little whether the aspiring youth acquired his arning in college or in the solitude of his own chamber, $h$ is too apt to overrate its amount and importance, and to fee very much sat down upon by the world when it manifest no urgent desire to furnish him free scope and vantage ground for the exercise of his peculiar talent, which too often exists only in his "own imagination. "Knowledge comes, but wisdom lingers," and it is ever the sore affliction of im patient youth that the world cares most for wisdom. Ten years from now our correspondent, if he does not give ove his efforts to grow in knowledge, will probably smile at the narrowness of his present view, and possibly laugh at the callow foolishness of his fancy that the world offers no en couragement to such as patiently strive to better their intel lectual condition.

## COMMON MISTAKES IN HOUSE BUILDING

A writer in the American Architect and Buidd recently directed attention, with considerable truthfulness, $\begin{aligned} & \text { percha in appearance, but is more friable and brittle }\end{aligned}$ to certain mistakes of plan in house building, which too often occur in this country. These mistakes, he says, have their origin outside of the profession of architecture, and are due to the ignorance of those who build. It is certainly reasonable to expect that a person who is about to build should know such simple matters as the number and character of the rooms he will have; yet this is just what many people do not know, and here is where the first mistake is made. People in their ignorance err in wishing too many rooms. Many people, with a desire to imitate the nobleman's mansion, decide to have a jumble of hall, drawing-room, morning-room, dining-room, library, study, boudoir, billiard-room, break-fast-room, music-room, reception-room, and so on; and to these they add others of their own invention, till there is a separate room for the performance of almost every act of daily life. As all this costs, and there is a limit to every man's purse, economy is attained by copying the stone wall of their model in wood and plaster, woodwork in paint, cheapening the foundations, and making thin walls that keep out neither cold nor wet.
A sensible man in building his house proceeds on a differ ent plan. He wants just such accommodation as he needs, and no more. He knows that for the average American family in good circumstances three principal rooms are sufficient: drawing-room, library, and dining-room-these he has use for. He also needs a hall by which to reach the others, and a vestibule or porch, as a shelter to the hall. He omits the "family sitting-room," knowing that the three other rooms will serve that purpose, and that any room too good for daily use has no right to exist. The habit of keeping shut-up par lors for occasional company is so absurd that it is difficult to give people who practice it credit for common sense.
Another common mistake is the small scale of the kitchen and offices as compared with family rooms. A kitchen, if work is to be well done in it, and the dinner to be well cooked, should not be less than the equivalent of 15 feet square, and should be still larger in a house employing many servants. The communication between the kitchen and offices and the family apartments, and the concealment of the former from public view, are matters which are much neglected.
The usual arrangement of placing a butler's pantry between kitchen and dining-room, with doors to both rooms, often directly in line, makes the best possible conveyance for odors from the kitchen to dining-room, and thence to the rest of the house. In the case of a basement kitchen the same result follows from having the basement stairs open instead of inclosed, as they should be. The English manage better they put next the dining-room sometimes the butler's pantry, but oftener a small serving-room, opening not to the kitchen, but to a passage leading thither; and this passage is made the only means of access from the family rooms to the kitchen and offices, which, if not in the basement, are in a wing under a separate ronf from the main building, so that by closing one door (or two at the most) all communication is cut off, and the odors from the kitchen do not annoy the family. A common thing in country houses, though often omitted in the city, is a servants' staircase. People of small means, who can afford but one servant, insist upon the separate stair case for that one, while many a city family with tre
servants gets along perfectly well without it. This hobby servants gets along perfectly well without it. This hobby
with country people amounts almost to fanaticism. The with country people amounts almost to fanaticism. The
second staircase, a great convenience in large houses, is out second staircase, a great convenience in large houses, is out
of place in a small one, there being nowhere to put it; to a of place in a small one, there being nowhere to put it;
small family it is unnecessary, and therefore wasteful.
The place of a veranda may seem a thing of small moment; yet it may prove either a great comfort or a great nuisance, according to its position. Most people seem to suppose it :hould be on the sumny side of a house, where it darkens the rooms, itself being ablaze with light and hot as a furnace. But the olject of a veranda is not to keep the light out of the room, because this can be done better by the window hood or shùters, but to afford a cool, sheltered, shady place out of doors for summer use. Hence it should be on the shady side of the house-on that side that is shady in the afternoon. To prevent the rooms behind it being too much shaded they should, if possible, have one or more windows on the side not covered by the veranda; or, if this cannot be, the windows looking upon it should be made very large, and the veranda itself of light construction and painted as light a color as the rest of the house will admit. No one should worry about too much light in the house; there are many days when there cannot be too much, and when there is, it is easy to shut it out

## CHICLE, OR MEXICAN GUM

The great interest which has for some time past been mani fested by technologists in the search for substitutes for India rubber and $₫$ utta percha has led Drs. Prochazka and Endemann to undertake the examination of a Mexican product, known in the United States for some years under the name of chicle and sapota. The latter name would imply that the product is derived from one of the many species of the order Sapotacer, to which belongs also the tree producing the balata gum. The difference in the manner of obtaining the material is evident from the chemical composition. While balata is an almost pure hydrocarbon, chicle contains, also, the various impurities of the juice from which it is derived. The only description that has been given of this material seems to be that of Mr. J. R. Jackson, who states that it is probably derived from Chrysophyllum glycyplacum, of the

Mexican gum and rubber juice, and that it resembles gutta percha in appearance, but is more friable and brittle.
The material examined was in the shape of recta
The material examined was in the shape of rectangular face owing to atmospheric influences. It crumbled between the fingers, but had a certain degree of softness and tenacity, which was more perceptible after heating. Taken into the mouth it disintegrated, united again after chewing, forming a soft plastic mass. The latter quality has made it a favorite material for "chewing gum." On heating, it first evolved a sweet caramel odor, after the disappearance of which there was perceptible the peculiar smell that is generated when caoutchouc or gutta percha is treated in a like manner. Boiled in dilute acids the substance disintegrated, the brown solution containing oxalic acid and saccharine matters. The residue, subsequently boiled with dilute solutions of caustic alkalies, united again, forming a doughy mass. The author found the following constituents (the figures being approximate): Chicle resin or gum, forming 75 per cent of thie crude material; oxalate of lime (with small quantities of sulphate and phosphate), 9 per cent; arabin, about 10 per cent; sugar, about 5 per cent; salts, soluble in water (chloride and sulphate of magnesia, small quantity of potash salts), 0.5 per cent.
As the results of their investigations (which was the subject of a paper read bef ore a recent meeting of the American Chemical Society, of this city) the authors draw the conclusion that chicle is merely the product of direct evaporation of the juice, without attempt at separation, as practiced in the case of gutta percha and India rubber. They have no doubt that by proper treatment of the raw juice a far more valuable product can be obtained than the chicle gum now found in the market. Whether the product, then obtained will be one similar to gutta percha, balata, or India rubber, must be left to future examination of the raw juice, which, so far, they have been unable to obtain.

## THE CAUSE OF CONSUMPTION.

Dr. Rollin R. Gregg, of Buffalo, New York, is confident that he has solved the mystery of consumption. Regular phy sicians will be apt to say that he has mistaken a condition for a cause; nevertheless we are inclined to think that good may come from the emphasis he lays upon that condition, since it seems calculated to work a beneficial change in the customary treatment of the disease.
Dr. Gregg argues that as the loss of albumen from the blood through the mucous membrane of the kidneys in Bright's disease, rapidly and fatally depletes the system, much more must the more rapid loss of albumen through the mucous membranes of the lungs be serious in all its stages and speedily fatal in its results, if proper measures are not taken to stop such waste before fatal conditions have arisen. The expectorations of consumptives, and all their other catarrhal or mucous discharges from whatever organ, are mostly albumen and a direct loss of so much of this con stituent from the blood. It is this wastage which causes the great emaciation characteristic of consumption, and not, he thinks, any failure of the system to assimilate food. And this loss of albumen does mischief not only in robbing the constituents of the blood into disproportion. The loss of one ounce of albumen destroys nearly a pound of blood for all purposes of healthy nutrition, and leaves in the blood a relative excess of 514 ounces of water, 7 ounces of blood cor-
puscles, 9 grains of fatty matter, 15 grains of fibrin, and 41 grains of salts. These elements in excess act the same as foreign matters in the blood, and disturb the entire economy of the system. Night sweats and dropsy are the result of
the excess of water. The blood corpuscles left in excess are decolorized by the too watery blood, and are deposited in the capillaries or smallest blood vessels, where they shrivel and become tuberculous corpuscles, so called; the fatty matter in excess cause the fatty livers and other fatty degeneration attending the disease; the excess of fibrin causes the adhe sion of the pleura to the inner surface of the ribs, the heart or to each other, often among the most serious of the complications of consumption; and, finally, the excess of salts causes calculi, enlargement of the joints, ossifications, and similar morbid developments.
In such cases of consumption as are characterized in their earlier stages by an absence of profuse expectoration, Dr. Gregg would attribute the beginning of the disease to a loss of albumen through some other organ or organs, the shriveled blood corpuscles lodging in the lungs, starting tuber cules there and setting up a dry cough, with the resultant irritation of the mucous membrane and outpouring of mucus From this point of view, there is but one source of hope to the consumptive in any stage of the disease, and that is
through the healing of the mucous membranes and the stopthrough the healing of the mucous membranes and the stop-
ping of the waste of albumen. By this means, in the earlier stages of the disease-with all who have not inherited the most feeble constitutions-there is much to hope from judicious treatment.
Whatever may be the primary cause of consumption, it is pretty evident that the mucous discharge which attends the disease and finds relief in expectoration is to be repressed rather than encouraged; and to do this must radically change the usual treatment of the disease, at least in its early stages.
Fumigating Paper.-Apply to bibulous paper a strong ethereal or alcoholic solution of benzoin, tolu, storax, oli-
banum or labdanum. To burn well the paper should first be impregnated with an aqueous solution of niter and dried.

## AMERICAN INDUSTRIES.-NO. 14.

 suspension bridges.We present our readers with engravings of four of the reat suspension bridges of the United States, and give a his tory of each as furnished by the eminent engineers and contructors, the John A. Roebling's Sons Company, of Trenton, N. J. The fact that this establishment is the largest of its kind in this country, and probably the largest in the world adds interest and weight to the particulars given below.

## the niagara bridge.

This bridge was constructed by John A. Roebling between he years 1852 and 1865.
It has a span of 821 feet 4 inches between centers of towers. It has two floors, an upper and a lower one, suspended separately to separate cables, but connected with each other by two longitudinal trusses. The railroad track, which is ver the roadway, is 245 feet above the river.
The base of the tower at the level of the lower floor meas res 60 feet by 20 feet, and is pierced by an arch 19 feet in width, which forms the entrance to the lower bridge. Above the level of the railroad track each tower forms a single col umn, 60 feet high, which is 15 feet square at the base and 8 feet square at the top.
This bridge has four cables, each 10 inches in diameter composed of 3,640 wires, No. 9 gauge. The suspenders, 624 in number, are placed 5 feet apart. The floor is further sup ported by 64 diagonal stays, and there are 56 under floo stays, fastened to the rocks underneath the bridge.
the covington and cincinnati bridge.
Work on the Cincinnati Bridge was commenced in Sep-作, 1856. The financial crisis of 1857 stopped the work, nd owing to the civil war which soon followed work wa ot resumed again until 1863, and the bridge was completed in 1867. Since January 1st of that year it has formed the great public highway between Covington and Cincinnati It cost one and a half million of dollars.
This bridge has a single span of 1,057 feet from center to enter of towers, and two half spans of 281 feet each. Th total length of the bridge, including its approaches, is 2,252 eet. Its height is 103 feet above low water.
The floor of the bridge is composed of a strong wrough ron frame, overlaid with several thicknesses of plank and fastened to the cables by means of suspenders. The suspenders are arranged between the roadway and the sidewalks. The roadway is 20 feet wide, the sidewalks 7 feet each. The hole width of the floor is 36 feet.
The towers rest on timber platforms, 110 feet long, 75 feet wide, and 12 feet high. These platforms are composed of 12 curses of timber. The excavations for the platforms wer carried 12 feet below extreme low water mark, where a bed of gravel and coarse sand afforded a good foundation. The bases of the towers are 82 feet long and 52 feet wide. Above he floor of the bridge the tower is divided in two solid shafts. con nected above by a semicircular arch. The total elevation of the towers is 230 feet above low water mark. Each towe contains about 400,000 cubic feet of masonry, mostly sand stone from the Buena Vista quarries. The base and upper ornice are of limestone.
The floor is supported by two cables, $12 \frac{1}{3}$ inches in diame er, containing 5,180 No. 9 wires. The cables at a medium emperature have a deflection of 89 feet. The total quantity of wire worked into these cables, including the wrapping amounts to 1,050,183 pounds.
The principal vertical rigidity of the flcor is obtained from he two trusses which separate the roadway from the sidewalks. They are 10 feet high, and are formed of top and bottom chords, connected by vertical posts and diagonal ties. Each chord consists of two 9 inch channel bars, separated by the upright 7 inch I-posts. The flat bars which form the digonals are 3 inches wide and $\frac{2}{3}$ of an inch thick.
The flooring of the roadway consists of three thicknesses of plank, making a total average thickness of 8 inches. The eneral appearance of the floor is that of an casy curved arch having its apex in the center of the main span. The grade is from 3 to 4 feet in 100 feet.
tife allegheny bridge
This bridge was begun in the year 1858 and finished in the year 1860 .
The length of the bridge is 1,037 feet 5 inches, divided into wo main spans of 344 feet each, one half span of 117 feet nehes, and another half span of 171 feet.
It was built for heavy road travel. The width of the plat form is 40 feet, divided into a roadway 20 feet wide, and two sidewalks each 10 feet wide.
It is supported by four cables, of which the two outer one incline outward from the towers, and the two inner ones incline toward each other, giving lateral stability to the structure. The outer cables, which support the sidewalks, ar $41 / 2$ inches in diameter, and composed of 666 wires, No. gauge. The inner cables are $71 / 2$ inches in diameter, and con$\operatorname{tain} 1,926$ wires, No. 9 gauge. The deflection of the cables is 30 feet.
The towers are 45 feet high. They are composed of four nclined cast iron columns, braced together by latticed castngs, and crowned with an ornamental cap
The bridge has two longitudinal iron lattice girders which give it stiffness.
the east river bridge.
The bridge now in process of construction connecting the cities of New York and Brooklyn will have the longest sin-
gle span of any bridge in the world. The main span will be 1,595 feet 6 inches, and the land spans 930 feet each.

This bridge was designed in 1867 by John A. Roebling, but he died in 1869, before any work on it had begun, and it has been built entirely under the guidance of Washington A. Roebling, the present Chief Engineer.

The bridge extends from the junction of Sands and Fulton streets, in Brooklyn, to Chatham street, in New York-a total length of 5,989 feet, the Brooklyn approach being 971 feet, the suspended part 3,4551/ feet, and the New York approach $1,5021 / 2$ feet.

The approaches will consist of a series of brick and granite arches, which, when finished, will be ornaments to the two cities. It has taken nine years to complete the towers and anchorages, construct the cables, and get everything ready for the suspension of the floor.
Preparing the foundations for the towers was one of the most difficult parts of the work. Huge timber caissons, each 170 feet long, 102 feet wide, and 25 feet high, containing over $1,600,000$ feet of timber, were sunk below the bed of the river until they rested on rock or on an equally firm stratum. On the Brooklyn side this was reached at a depth of 45 feet below high water; but it was necessary to go 78 feet below high water on the New York side. The pneumatic method of sinking caissons is not new, but the operations here surpassed by their immensity everything of this kind that had ever been done before.
The towers are 278 feet high. The anchorages are 129 feet by 119 feet at the base, 117 feet by 104 feet at the top, and 89 feet high.

The total quantity of granite and limestone in the towers and anchorages is about 145,000 cubic yards, and it required the continuous work for four years of over 20 quarries in Maine, Massachusetts, Rhode Island, and New York to furnish the necessary supply. In the summer of 1876 the masonry was completed.
On the 29th of May, 1877, the first wire for the cables was stretched across the river. There are four cables, each consisting of 19 strands, each strand containing 280 galvanized cast steel wires, No. 8 gauge. These cables are $153 / 4$ inches in diameter. For wrapping the cables galvanized annealed iron wire was used. March 1, 1879, the four cables were completed just 21 months after they were commenced.
The platform of the bridge, which is 5 feet wider than Broadway, is sustained by the iron cross beams, and stiffened by six longitudinal trusses. It is divided into five parts, two outer ones intended for horse-cars and general vehicle traffic, two intermediate divisions intended to accommodate the rapid transit passenger cars, and a central promenade, a little above the level of the main floor, and intended for pedestrians. The stiffening trusses will be of iron, six in number, the two outer ones $91 / 2$ feet high, the other four 16 feet each in height. The total weight of the bridge will be 13,300 tons. It is proposed to move the cars on this bridge by means of wire ropes and stationary engines. This method is considered preferable to the use of locomotives on account of the steep grade of the bridge.
It is estimated that the bridge, when completed, will have cost $\$ 13,500,000$, of which $\$ 9,500,000$ will be spent on the bridge itself, and $\$ 4,000,000$ in acquiring the necessary real estate. It is hoped that in 1881 the bridge will be open to the public.

All of the twisted cables, stays, and suspenders used in the construction of these four bridges were manufactured at the John A. Roebling's Sons Company's works, at Trenton, N J. Some of the stays are so large that special machinery has been built for the purpose of making them, and no other establishment possesses the facilities for doing such heavy work properly.

## Education in China.

We have been apt to con sider China as a heathen coun try, and such it is from our Christion standpoint but it Christian standpoint, but it far from an ignorant land It has, without doubt, accord
ing to Barnes' Educational ing to Barnes' Educational
Monthly, over $400,000,000$ people, of which vast num ber there is scarcely one who cannot read and write. It has 2,000 colleges, and their libraries outnumber ours ten to one. There are in that land of pigtailed Mont land of pig-tailed Mongol $2,000,000$ highly educate men, while there is hardly a woman who is educated o all the vast number of its people, and not one who is thought to have a soul. Edu cation is principally a discipline of the memory, and their schools are based upon an entirely different idea from ours. A live Yankee schoolmaster would find little employment in China, even though he understood the Chinese language and literature perfectly.

The Water Commissioners of Troy, N. Y., have awarded the contract for the extension of the water works of that city to the Holly Manufacturing Company, of Lockport, N. Y., for the sum of $\$ 235,000$.

Pendulum for Showing the Rotation of the Earth
To the Editor of the Scientific American
The following description of a simple device for indicatin the rotation of the earth on its axis may be of interest to

some of your readers. I secure a large permanent magnet to the ceiling of a room or a steady tripod, and from it sus pend a wooden pendulum rod of any length, having at the top a cone-shaped tip of soft iron, which is turned to a smooth round point to allow it to swing freely in any direction. To the lower end of the rod is hung a ball of one half the weight required to pull the rod from the magnet. This pendulum, once set in motion, will swing in the same plane for 30 hours. By placing a dial under the pendulum the apparent change in the plane of oscillation of the pendu lum may be observed. However, this change of position is


## PLATTENBURG'S MOTOR

Employment and Labor in Massachusetts.
Discussing the present condition and the future prospects of labor, with reference to past and possible Congressional action, the Boston Journal of Commerce remarks that since the date of resumption, January 1, the leading industries in that State have continued to show improvement in many in stances and to hold their own in all. In all the great manu facturing centers there is an increased activity and a conse quent improved demand for labor. In Massachusetts the improvement has become remarkably conspicuous. The Lowell factories are all busy, and several are on extra time the Essex county mills are, with one or two exceptions, kept fully employed on orders; and throughout the shoe town there is, late as it is in the season, plenty of employment for willing hands. The great paper mills of Western Massachu setts experience so active a demand for their goods as to sti mulate new enterprises in this line, which we may be assure have not been undertaken without a mature survey of the field of operations. In a word, manufacturing help is well em pioyed, at prices which, if not up to the highrates prevailing a few years ago, are far preferable to the wages of idleness

## Manufacture of Tin Plates in New York

The Monitor Tin Plate Company of New York occupies building in Horatio street, where the tinning is done; bu the iron is rolled at a mill in Pittsburg. The tinning hous is 100 fect square, fitted with every modern appliance. The sheets are rolled in the ordinary way then cut or sheared to size, and immersed in a pickling bath. They are then cold rolled again, annealed and pickled, and put into baths of Russian tallow or palm oil. Then they pass through several baths of tin melted at a high temperature, and again through sawdust and bran to cleanse the surface. Finally, they arc polished with lamb's wool buffers, and assorted, ready fo boxing and shipping.

## A NOVEL MOTOR

Our engraving illustrates a simple and manageable motor recently patented by Mr. Joseph Plattenburg, of Allegheny, Pa . It depends for its action upon a series of contractile rubber springs put under tension by an arrangement of pawls, ratchets, pinions, and racks, and the power is conveyed from rubber springs to the machinery to be driven, through a train of gearing, and the motion is controlled by a very simple and ingenious governor
The rubber springs, A, are rigidly secured at one end to the main frame of the machine; their other ends are attached to the ends of the racks, B, which rest upon rollers, C, and mesh into pinions, D, placed loosely on the shaft, E. To one side of each pinion is secured a ratchet wheel, and upon the opposite side there is a pawl which engages a ratchet wheel keyed to the shaft, E. It will be understood that there is one rack, one pinion, and two ratchets to each rub ber spring, and for each set of apparatus of this kind ther is a stout lever, F, fulcrumed on the shaft, E, and carrying a pawl that engages the ratchet fixed to the side of the pinion, D. The lever, F, is connected with a longer hand lever, G, by which, through the agency of the parts just de scribed, the springs are put under tension.
Upon the shaft, E, there is a spur wheel, H, which drives the crank shaft, I, through intermediate whecls and pinion on the shafts, J, K. In the present instance the power is cm ployed for working the pump, L, but the inventor does not confine himself to this appli cation.
As this apparatus, withou some kind of a governor would run with great speed when first set in motion, and with a rapidly diminishing speed toward the end of the work given out by the spring the inventor has devised simple contrivance for con trolling the action of the ma chine with regularity. It consists in elastic rubbe strips, $a$, attached to the fre ends of the racks and con nected with an angled lever $l$, fulcrumed in the mai frame, and carrying at its longerend abrake shoe, which bears upon the friction wheel M, with more or less forc according to the tension of the rubber strins, $a$. Whe the rubber springs, a he rubber springs, A, ar under the greatest tension the strips, $a$, are also under thei greatest tension, and the
in reality in the pendulum, but in the dial, which is moved under the pendulum while the latter preserves its plane of motion. Placed at the poles, this simple instrument would indicate $15^{\circ}$ per hour, which is exactly the rate of the earth's rotation. In this latitude it would indicate an hourly motion of $9^{\circ} 47^{\prime}$. With this simple instrument, which any ordinary mechanic can construct at a small cost, the move ment of the earth may be clearly demonstrated in fifteen minutes.
April 5, 1879.
W. W. Le Grande.
brake exertsitsgreatest press ure on the friction whee and as the springs, A, contract, the brake pressure is di minished while the speed remains unchanged. The in ventor claims that, for running machinery of any kind, this motor is more economical both as to its first cost and main tenance than other motors made for a similar purpose, and he states that it is especially adapted to pumping oil or water and to the performance of other continuous work wher steam is not available.
Further particulars may be obtained from the inventor, or from Mr. F. J. Hoyt, 733 Broadway, New York.

TIIRASHER, STRAW SCALE, AND SHEAF BINDER.
The apparatus shown in the accompanying engraving is combined thrasher, straw scale, and sheaf binder, of French manufacture. The straw, as it is forced out by the teeth of the thrasher is received on the straw scale, which is formed on an axle, and consists of iron wires crossing each other at right angles. On the arms so formed the straw is deposited by the arms of the thrasher. The axle on which the scales are secured is supported by the lever of a steelyard, sufficiently weighted to prevent the axle from turning until the quantity of straw thrown on the arms of the scales has attained the prescribed weight. The rotation of the axle, which is limited to a quarter of a revolution, permits of one set of arms replacing the others. This also imparts motion to the sheaf binder, the arms of the thrasher and those of the scales together compressing the straw to prepare it for the binding. Near the middle of the inclined grate, at the bottom of the apparatus, there is a bobbin of fine wire. As soon as the bundle is prepared, the wire is carried around it after having passed through having passed through the sheaf binding apparatus, and meets the part opposite the bobbin, where it is twisted and cut off.
The bundles follow each other very regularly, without any great trouble, and the services of five or six persons, necessarily ac persons, necessarily accustomed to the binding of straw in sheav are dispensed with.
The thin metallic The thin metallic wire forms a strong band, which, however, is very easily cut by an instrument which also pulls it out of the bundle, so that the catle, may not be in jured.

## Rock Drilling by

Electricity.
In a recently pub lished work of M. Gaston Plante, "Recherches sur l'Electricite," noticed in one of our French exchanges, the French exchanges, the application of electriapplication of electricity which had not been hitherto published by him, and which is of considerable interest.
After describing the process of engraving en glass by electricity, that he made known in 1877, and the account 1877, and the account
of which has been so of which has been so widely copied by scientific papers, M. Planté goes on to say: $\dot{\text { ported, but it could easily be produced from fruits grown in }}$ " We have seen that one of the electrodes conducting an electrical current of a certain tension being brought in contact with glass, in the presence of a saline solution, it acts like a graver or diamond by tracing grooves in the surface of the glass, and even digs into it quite deeply. In spite of its great hardness, rock crystal can also be attacked by the same method; and, if not engraved regularly, it at least.cracks into small fragments, and is finally disintegrated." In view of this, M. Planté suggests that the electric current under conditions analogous to those above described, might be substituted for diamonds in the operation of drilling rocks. He states that electrodes of platinum would not be necessary, for here it is not the metal of the electrode that is affected, but the silicious matter in contact with a saline solution. Metallic points or projections suitably located at the extremity of the drill, isolated on a part of its length and actuated by a rotary movement, would lead the electric current to the surface of the rock to be pulverized, and would thus replace those numerous and expensive diamonds which are set in the head of the drills employed in the present system of rock boring.

## New American Industries.

The recent rapid increase in American chemical manufactures, in many cases from native crude materials, is a very encouraging feature of American trade.
The Grocer notes that six years ago we imported from France cream of tartar to the extent of $6,000,000 \mathrm{lb}$. yearly,
but so successfully has the manufacture of it in this country been carried on, that last year not a single pound was imported. Notwithstanding that the crude materials have at present to be imported, the price of the manufactured ar ticle has been reduced from 32 cents per pound, the rate for the French article here, to 23 and 24 cents per pound for the American production. France and England formerly sent us annually $500,000 \mathrm{lb}$. of tartaric acid, while the impertation for the last fiscal year was 183 lb . England forportation for the last fiscal year was 183 lb . England for-
merly monopolized our market for citric acid to the extent of $250,000 \mathrm{lb}$. annually, at the rate of $\$ 1.30$ per lb., while last year $27,018 \mathrm{lb}$. were imported and sold at the same price as the American article, 57 cents per lb. At present the lime juice from which citric acid is made has to be im- If the lemon and lime growers of the South can be induced to prepare the lime juice, the entire production and manufacture of citric acid will be kept in this country, saving hundreds of thousands of dollars annually and developing another great industry. Borax was formerly brought from England at the rate of from 600,000 to $1,000,000 \mathrm{lb}$. every year. Owing to the development of borax mines in Nevada this importation has largely fallen off, and the report for the last fiscal year showed only $3,492 \mathrm{lb}$., and the price of the refined article, which is now prepared in this city, is only from 8 to 9 cents per lb., when formerly it was 85 cents, England being now among the buyers where she was the principal seller, both of the crude and refined product.

## MISCELLANEOUS INVENTIONS.

An improved canceling stamp, patented by Mr. George W. Stephens, of Denison, Ia., is designed for post offices and business purposes generally. It is simple and rapid in its operation.
Mr. Samuel F. Leach, of Boston, Mass, has devised an improved gas regulator, which is combined with a gas burner, for automatically regulating the gas as it is consumed.
An improved flexible printing film for use in artistic and decorative purposes, and for printing and the preparation and finishing of drawings, has been patented by Mr. Benjamin Day, of West Hoboken, N. J.

An improved bin, or receptacle for flour, sugar, and sim ar articles in bulk, for stores and households, has been pa tented by Mr. Edward S. Bliss, of Richburg, N. Y. It con sists of a bin having a front curved rocker and a curved op, the bin being arranged to tilt in casing so as to render its contents easily accessible.
An evaporating pan, in which the heating pipes alternate, one half being supplied with steam at the center and one half at the circumference, has been patented by Mr. H. O Ames, of New Orleans, La. The object of this peculia arrangement of pipes is to perfectly equalize the heat hroughout the entire mass of boiling sirup.
Mr. G. V. Sheffield, of New York city, has patented an improvement in the manufacture of leather articles, which consists in stretching the raw green hide upon a last or form and subjecting the hide to a tanning proces while on the form Before removing the article from the form it is dressed and co lored
A toy, composed of two or more pieces of veneer, cut and em bossed to imitate an animal or other object and provided with a strengthening backing has been patented by Mr. Charles Schwartz of New York city
Mr. S. C. Buchanan of Camden, Ark., has patented an improved liniment composed of fusel oil, arnica, aco nite, camphor, and sas safras combined in proper proportions. It is designed for the re licf and cure of rheu matism, ncuralgia, and other similar diseases.

An improvement in finishing yarns of wool or soft hair such a camel's hair, such a camd bair, mohair and alpaca, or yarn composed of a mixtur of two or more of these, has been patent ed by Mr. Charles Hast ings, of Bradford, Eng and. The object of the invention is to give the yarns additional strength and to other wise improve their qua wise
lity.

A hot air furnace constructed entirely of refractory bricks or clay, has been patented by Mr. Thos. Crooke of Newark, N. J. I is claimed that this furnace is free from the objections which are urged against cast iron furnaces.
An improved board ported, but it could easily be produced from fruits grown in $\mid$ for ironing shirts has been patented by Mr. John Boger, of Florida, if only sufficient energy were put into the work. Powhatan Point, Ohio, which is so constructed as to give a
swell to the shirt bosom when it is ironed, and it admits of ironing the neck band in an erect position.

A sash tightener, consisting of two shect metal tubes, closed at one end and adapted to slide one within the other the closed end of the inner tube being forced against the sash by means of a coiled spring contained within it, has been patented by Mr. Frederick J. Hoyt, of New York city Mr. Ernest T. Gennert, of New York city, has patented an improvement in processes for extracting saccharine mat ter from vegetable substances. The invention consists in moistening the dried beets or other vegetable substance with a solution of superphosphate of lime just before the water is introduced into the extracting vat.
An improved truss hoop, having a metal strap fitted to the outer side of a wooden body, and extending from the end of the inner lap to or a little beyond the end of the outer lap, has been patented by Mr. John W. Maltby, of Rochester, N. Y.
An improvement in heating pots, patented by Mr. H. J Nelson, of Pentwater, Mich., consists of a water receptacle provided with a central chimney, which rests on the flange of a lamp burner. The water receptacle is provided with suitable supporting legs.
Mr. Thomas M. Righter, of Sandy Run, Pa., has invented an improved sheave for wire ropes or cables. It consists of sector shaped sections of wood, clamped between suitable heads, with the grain running in a radial direction.

## AMATEUR MECHANICS.

rotary cutters. employment of such rotar cutters as maybe profitably used the saw projects more or less the in connection with a foot lathe, can hardly be appreciated by and other kinds of work may be placed on or against the carone who has never attempted to use this class of tools. It riage shown in Fig. 9. is astonishing how much very hard labor may be saved by It is a very simple matter to arrange guiding pieces for means of a small circular saw like that shown in Fig. 1. cutting at any angle, and the saw table may be used for This tool, like many others described in this series of ar- either metal or wood. Thesaws for wood differ from those ticles, can, in most instances, be purchased cheaper than it used for metal; the latter are filed straight, the former diacan be made, and the chances are in favor of its being a more gonally or fleaming. Among the many uses to which metal perfect article. However, it is not so difficult to make as saws may be applied we mention the slitting of sheet metals, one might suppose. A piece of sheet steel may be chucked splitting wires and rods, slotting and grooving, nicking upon the face plate or on a wooden block attached to the face screws, etc. Fig. 10 shows a holder for receiving screws to plate, where it may be bored to fit the saw mandrel, and cut be nicked. It is used in connection with the saw table, and in circular form by means of a suitable hand tool. It may is movedover the saw against the gauge then be placed upon the mandrel and turned true, and it is well enough to make it a little thinner in the middle than at the periphery.
There are several methods of forming the teeth on a circular saw. It may be spaced and filed, or it may be knurled, as shown in Fig. 2, and then filed, leaving every third or fourth tooth formed by the knurl; or it may, for some pur poses, be knurled and not filed at all. Another way of forming the teeth is to employ a hub, something like that used in making chasers, shown in Fig 3. the difference between this bub shown in 3 ; the 1 iff in hub and the other one referred to, is that the threa has one straight side corresponding with the
radial side of the tooth. The blank from which radial side of the tooth. The blank from which
the saw is made is placed on a stud projecting from a handle made specially for the purpose and having a rounded end which supports the edge of the blank, as the teeth are formed by the cutters on the hub.

The saw, after the teeth are formed, may be hardened and tempered by heating it slowly until it attains a cherry red and plunging it straight down edrewise into cool, clean water. On removing it from the water it should be dried, and cleaned with a piece of emery paper, and its temper drawn to a purple, over a Bunsen ga flame, over the flame of an alcohol lamp, or over a hot plate of iron. The small saw shown in Fig. 4 is easily made from a rod of fine steel. It is very useful for slitting shect brass and tubes, slotting small shafts, nicking screws, etc. Being quite small it has the advimtage of having few tecth to keep in order, them, varying in diameter from one eighth to three eighths them, varying in diameter from one eighth to three eighths
of an inch, and varying considerably in thickness, will be of an inch, and varying
found very convenient.
These cutters or saws, with the exception of the smaller one, may be used to the best advantage in connection with a saw table, like that shown in Fig. 8. This is a plane iron table having a longitudinal groove in its face to receive the guiding rib of the carriage, shown in Fig. 9, and a transverse groove ruming half way across, to receive a slitting gauge, as shown in Fig. 8. The table is supported by a


## METAL SHAPING.

 ang screws is illustrated by Fig. 11. A simple lever fulcrumed on a bar held by the tool post, is drilled and tapped in the end to receive the screw. After adjusting the tool all hat is required is to insert the screw and press down the handle so as to bring the screw head into contact with the w.Where a lathe is provided with an engine rest, the cutter shown in Fig. 6, mounted on the mandrel shown in Fig. 5, is very useful; it is used by clamping the work to the slide rest and moving it under the cutter by working the slide rest screw.
To make a cutter of this kind is more difficult than to make a saw, and to do it readily a milling machine would be required; it may be done, however, on a plain foot lathe
method and Naval Constructor Mintonye, commissioned to test and
by employing a V-shaped cutter and using a holder (Fig. 7) having an angular groove for receiving the cylinder on which the cutting edges are formed. The blank can be spaced with sufficient accuracy, by means of a fine pair of dividers and after the first groove is cut there will be no difficulty in getting the rest sufficiently accurate, as a nib inserted in he side of the guide enters the first groove and all of the others in succession and regulates the spacing.
One of the best applications of this tool is shown in the mall engraving. In this case a table similar to the saw table before described is supported in a vertical position nd arranged at right angles with the cutter mandrel. The mandrel is of the same diameter as the cutter, and serves a guide to the pattern which carrics the work to be operated upon. The principal use of this contrivance is to shape the edges of curved or irregular metal work. The casting to be finished is fastened-by cement if small, and by clamps if large-to a pattern having exactly the shape required in the finished work.
By moving the pattern in contact with the table and the mandrel, while the latter revolves, the edges of the work will be shaped and finished at the same time. By substituting a conical cutter for the cylindrical one, the work may be beveled; by using both, the edge may be made smooth and square, while the corner beveled.
The tool shown in Fig. 12 might properly be called a barrel saw. It is made by drilling in the end of a steel rod and forming the teeth with a file. To avoid cracking in tempering small hole should be drilled through the side near the bottom of the larger hole. To insure the free working of the tool it should be turned so that its cutting edge will be rather thicke than the portion behind it. This tool should be made in various sizes.
Tools for gear cutting and also cutters for wood have not been mentioned in this paper, a they are proper subjects for separate treat ment. $\qquad$
The ventilation of Ships at Sea
The Board of Naval Officers, consisting of Commander Beardslee, Medical Inspector Gibos, report upon Dr. Thiers' new apparatus for ventilating ships, have pronounced the principle of this apparatus, in eject ing the air as the only true method for securing perfect ven tilation in ships.
The apparatus consists of a copper cylinder attached to the ship's rudder, extending seven feet below the water line and five above it, to which are connected two sets of valve opening into pipes running to all parts of the ship. Th motion of the ship in rising and falling with the waves pumps the foul air out of the ship. The principle is simple, and the apparatus would seem to be efficient wherever there is much motion to the water. Whether it would work as well in still water, where ventilation is most needed, as in the calms of the tropics, is rather doubtful.


ROTARY CUTTERS

## RAILWAY NOTES.

Since the building of the Mount Washington Railway eight similar roads have been constructed in Austria and Switzerland. The engines for these roads were first built with vertical boilers; next with boilers that were level on an average grade; now they are built with horizontal boilers like ordinary locomotives. Various methods have been devised for enabling the locomotives to work by adhesion of their smooth wheels, as well as by means of their cog-wheel drivers, and by means of either at will. No one of these has been permanently successtul, however, so that tho proper construction of a double engine of this sort is still a matter of experimental inquiry
The Prussian Government railroad management is making great efforts to reduce the expenses of the state railroads. The principal reforms are said to be as follows: First, the construction of tunnels on new roads for a single track only. Hitherto, when a road was built, though with a single track and a very remote prospect of needing another, the tunnels on it were made wide enough for two tracks. Second, the use of stecl rails exclusively, and the adoption of an iron superstructure (the Hilf system) instead of wooden cross-ties. Not much credit is claimed for the adoption of steel, the price being about the same as that of iron, but the iron superstructure is hailed in Germany as a forward step, and also likely to be a good thing for the German iron works. Third, the abandonment of optical signals for sections of the road between stations. This simply makes the Prussian practice like that of the greater part of the rest of the railroad world, in Europe as well as in $\Lambda$ merica. The change is said to have been without any injurious effects, while there has been a considerable saving in the army of road guards who have been accustomed to stand along the roads and salute the trains as they pass-a saving which has been re-enforced by substituting women for men to attend the crossing gates found at short intervals along every road. Fourth, the introduction of central interlocking switch and signal apparatus, of the Saxby \& Farmer or similar patterns. Not only, it is said, has this resulted in greater safety, but also, by substituting a mechanical apparatus worked by one man to set a large number of switches and signals, the number of switchmen has been considerably reduced, even at small stations. Fifth, the introduction of continuous brakes. These have been put since 1878 on nearly all the passenger trains of the government roads, pretty much all kinds being used-the Westinghouse, Smith (vacuum), Heberlein, and Steele. Experiments have been made with the Heberlein brake on freight trains, and it is said with prospects of success in economizing the number of brakemen as well as increasing safety. Sixth, the reduction of the cost of switching service by arranging sorting tracks on inclined planes, where the movement is gencrally made by gravity alone, without the use of an engine. This has been the practice at a few great yards in Germany for a number of years, with very excellent results, it is said. Horses have been used instead of engines in switching cars, also with economy. Seventh, the adoption of regulations for working roads with light traffic without all the precautions and appliances which are made necessary only by frequent, heavy, and fast trains.
An act, introduced by the Minister of Public Works, for the amendment of the Canadian railway act of 1874, as regards rail way bridges and bridges over canals and rivers, provides that, in all bridges hereafter to be erected over railways in Canada, there shall be seven feet clear of space between the lower beams of the bridge and the top of the highest freight cars; and any railway company adopt ng higher cars than those in use at the time of building any bridge shall be compelled to raise such bridge at their own cost and charges. It is also provided that no railway shall be allowed to pass over any navigable river or canal without first having built such proper flooring under and on both sides of the track as shall be deemed sufficient by the Minister of Public Works to prevent anything falling from the railway into such river or canal, upon boats or vessels navigating it.
The Springfield Republican reports that the new 42 inch railroad car wheel is disappointing the confident expectations it awakened. Out of 80 tested on the Boston and Albany road, 22 have broken, and the expenses of the fast train which runs on them are greater than last year, when the old 33 inch wheel was used. The 42 inch wheel weighs 850 pounds, and the 33 inch wheel 450 pounds. Vice-President Reed, of the Southern road, does not think favorably of the big wheel. Possibly if the manner of manufacture could be altered, there would be less brcakage. At all events, says the Republican, the idea will not probably be given up without further trial of at least six months.
The Sacramento (Cal.) Bee reports that in the shops of the Pacific road in that city 25 new style sleeping cars for emi. grants are being fitted up. The new cars are provided with upper and lower berths, somewhat after the manner of caboose cars. The upper berth swings freely on iron rods, and when not in use can be hung up on the roof of the car, where it is not in the way. The lower berths are formed from the seats, which are made up after the manner of the present sleepers, by turning down the backs, etc. Slats are then placed crosswise, and when laid out the berths are exceedingly neat and comfortable. This will be a great convenience to persons traveling third-class, as heretofore they have been compelled to sit up or make shift as best they could.
Touching the recent steel rail controversy, Mr. Wm. A.
Sweet, an American steel manufacturer, asserts that the
steel rails made in England and rolled on two high rains are better for wear-the chemical constituents of the steel being the same-than the rails made in this country and rolled on a three high train; not because the train is a three high or a two high train, but because the rail, when it is finished, is colder, and is left in a more condensed condition, and therefore better prepared to receive the wear of wheels. In other words, it is stronger and tougher. Mr. Sweet claims to be able to prove the correctness of this assertion, and that any steelmaker can test it or himself in a few hours. He claims also that if the American rail is rolled until the scale is set, the rail will be better than the English
The Journal of the German Railroad Union gives a list of the European railroads on which the Pintsch system of gas ighting is used, and the numbers of cars on each to which it is applied. The total shows 22 roads in Germany, 1 in Austria, 3 in Russia, and 2 in England, besides a sleeping car company, 2 imperial court trains (German and Russian), and 2 cars for the Crown Prince of Germany. In all, application has been made to 3,600 cars and ordered for 705 more. There are 42 locomotives that have been provided with the appa ratus. It was first introduced ten years ago on the Lowe Silesia and Märk road.
The Railroad Gazette finds a statement of some of the long distance grain rates from Russia and Austria to Germany in a complaint that the rates from Russia are so excessively low that the Austrian producers have no fair chance to compete The rates are for a car load of grain $(22,040 \mathrm{lb} .=367$ bushels of wheat) from the Russian station Brody to Leipsic, a distance of 658 miles, $\$ 99.40$, which is at the rate of 45 cents per 100 lb .; from the Austrian station of Debreczin to Leipsic, 654 miles, the rate is $\$ 116$, or $52 \cdot 6$ cents per 100 lb . It is years since the rate from Chicago to New York, nearly one half further ( 911 to 980 miles, according to route) has been as high as 45 cents on grain, and for two or three years it has probably not averaged more than 25 cents, going at times on few shipments as low as 15 cents. The roads west of Chicago, which are often charged with "extortion" and which do usually make a profit on their grain traffic, do not get anything like the Russo-German rates. From Kansas City to Chicago, about 500 miles, the highest winter rate has been 25 cents for wheat and 20 cents for corn. On the basis of the Brody-Leipsic rate they would be about 34 cents. The Chicago-New York rate on that basis would be, by the short est route, $61 \frac{1}{2}$ cents per 100 lb .
At the regular monthly meeting of the Enginecrs' Club, of Philadelplia, March 15, C. E. Buzby exhibited a model of Travers' iron railroad tie, which is being tried on the Philadelphia and Baltimore Central road, near Lamokin. The device dispenses with all spikes, bolts, nuts, or fish plates and drilling or punching the rails, avoiding fractures from such causes. The iron tie, it is claimed, will outlast twelve renewals of the ordinary tie at one half the cost to keep in repair. Each tie is recessed under its rails, and along the bottom of the recess wedge-shaped pieces are cast transversely. At the sides of each recess are creosoted blocks, which form a cushion and fulcrum for two clamps, which grasp the flange and web of the rail above, bearing upon op posite faces of the wedge below. The weight of the train forces the clamps upon the wedge, spreads them at the bot-
tom, and grips the rail. The first cost is somewhat greater tom, and grips the rail. The first cost is somewhat greater
than the wooden tie, but it is said to offsct this in dura bility.

Discussing the wearing qualities of stecl rails at the meeting of the American Institute of Mining Engineers in Baltimore, Mr. R. W. Hunt said: "I am convinced that more rails have been broken by the treatment which they received before leaving the rolling mill than from any other cause. allude to the injury inflicted upon them in the cold straight ening press, where each blow of the gag forms a wedge of the particles of steel pressing upon the surrounding ones, and thus serving to rend the rail asunder. I am certain that of all the broken steel rails that I have seen, fully 75 per cent have been ruptured at the gag mark. So well recognized is this cause of breakage that the Troy Works and others have spent large sums in introducing machinery to moreperfectly hot straighten the rails, and thus leave less work for the cold press. While I admit that Dr. Dudley's physical analyses show a difference in the broken and crushed and the unbroken and uncrushed rails, I am not prepared to accept these results as coming entirely from the chemical properties of the metal. If I mistake not, 7 of the 25 samples are from crushed rails. May not these failures have been caused by mechanically imperfect bars, piped ingots, or some other me chanical defect? Then, again, the possibility of the steel having been overheated in the rail rolling mill must not be ignored. For it is well known that the same steel worked at different temperatures will afterward yield widely differing physical results. We, who have to encounter the difficulties of manufacture, know how many and vexatious they are in their physical as well as chemical forms."
Interlocking switch and signal apparatus is becoming the rule rather than the exception on many English roads, being used not at important points only, but elsewhere. The London and Northwestern has apparatus at 2,888 places, and has between 17,000 and 18,000 levers. The Chairman, Mr Richard Moon, at a recent half yearly meeting, said that the total expenditure for interlocking and the block system had been between $£ 800,000$ and $£ 900,000$-say something more than $\$ 4,000,000$.
Discussing the practical superiority of the American loco-
motive for the rough and ready requirements of ordinary railways, a writer in Harper's Magazine says

It is to the American we must turn to learn what are the requirements of the modern rail way, and to get some sugges tion of its future. More than this, the moment the English locomotive is taken from its island line it exhibits defects and a certain want of pliability that completely unfit it for a Con tinental railway. But if the English road and the English engine are the best in the world, why are they not the best for the world? Simply because they do not pay. There can be no higher reason than this. Anything that does not pay is useless, because it does not meet a human want. The cost of any operation is the measure of its value to human beings and if the road does not pay, of what good is it? Now a a railway, to be cheap, must follow the face of the country; that is, the line must goup and down hill, pass around abrupt curves, according to the lay of the land, and without much attempt at a straight line or level bed. It is upon this idea that American railroads have been built, and all Continental lines are likely to be built in the future. If a railroad can thus follow the face of the country, it will not cost so much, there being no high bridges, deep cuts, and tunnels. Of course there is a limit in this direction, and even the Ameri can engine cannot climb up the side of a house, or turn a right angle in its own rength; but within certain broad limits it may be said that the future locomotive must follow lines that run up hill and down dale, and get around very remarkable corners. This being the case, what of the English locomotive? Can it travel in safety over crooked lines that wander in astonishing freedom over hill and dale through all the sinuous lines of a winding river valley? There is no need to say it ought, or it may, for it never did. It has been tried again and again, and the end of it all is, the engine is in the ditch, and the unlucky stockholders are clamoring for A meri can engines, or at least engines built on American plans."
A time schedule of the special train ordered by the National Democratic Committee to bring Hon. John Whitaker, Congressman-elect from San Francisco, to Washington, in time to take part in the organization of the House, shows that the whole distance was made in 4 days 14 hours and 30 minutes actual running time. The speed of the train averaged thirty-one miles per hour between San Francisco and Ogden, and fifty-one miles per hour between Cheyenne and Sydney. The whole time is the quickest ever made between the Pacific and Atlantic.

The World's Product of Iron and Steel.
In his report on the iron and steel display at Paris, Commissioner Morrell gives the following statement of the present annual production, based on the latest statistics

| Country | Cast and Pig Iron. |  |  | Steel. |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Year. | $\begin{aligned} & \text { Production. } \\ & \text { Tons } \\ & \text { of } 2,240 \mathrm{lb} . \end{aligned}$ | $\begin{gathered} \text { Per oct. } \\ \text { of ofal. } \end{gathered}$ | Year | $\left\|\begin{array}{c} \text { Production. } \\ \text { of } \\ \text { Tone } 240 \end{array}\right\|$ | $\begin{gathered} \text { Per et. } \\ \text { of } \\ \text { Total. } \end{gathered}$ |
| Great Britain | ${ }_{1878}^{187}$ | 6,300, | ${ }^{4563}$ | 1888 | 1,100,000 | 3970 |
| Germany, includ- |  | 2,301,2 | 16.67 | 1878 | 735,000 | 26.53 |
| Linemburg... | 1876 | 1,81 |  | 1876 | 384, | ${ }^{13887}$ |
| France.... | ${ }_{1876}^{1878}$ | ${ }^{1,462,0836}$ | ${ }_{\substack{1026 \\ 407}}$ | ${ }_{1877}^{188}$ | 281,801 | ${ }^{17}$ |
| Austria and |  |  |  |  |  |  |
| Russia | ${ }_{185}^{1876}$ |  |  | 1878 |  |  |
| Sweden.... | ${ }_{1877}^{1876}$ | - 3 30,9,000 | - | ${ }_{1877}^{1876}$ |  | $\begin{array}{r}86 \\ \hline 8 \\ \hline 8\end{array}$ |
| Other countries. |  |  |  |  |  |  |
| Total |  | 13,807,72 | 1000 |  | 2,770, |  |

Mr. Morrell observes that a significant fact illustrated at Paris was that (owing to the marvelous increase in the production of Bessemer steel) the manganiferous and non-phos phoriferous ones of Spain, Algeria, and Italy have been largely drawn upon for supplies to Bessemer works in countries rich in other varieties of ores. Of still greater significince was the large and varied collection of Bessemer products exhi bited. The revolution which the Bessemer process has wrought in the iron trade was made strikingly manifest in a survey of the contributions of European countries, bat to an American who remembered the wonderful development of the Bessemer industry in his own country, which sent no Bessemer products to Paris, these contributions were mor impressive and more suggestive than they could be to any European. The Paris Exhibition showed that the progress made during the past two or three years in the manufacture of Bessemer and open hearth steel is so great that statistics fail to give any proper conception of its magnitude. The London Times remarks that " the Bessemer process has ruined the manufactured iron trade." Mr. Morrell says: "It has done more than this-it has distributed among many countries the manufacture of Bessemer steel, and thus enabled them to supply more fully their own metallurgical wants, and the metallurgical wants of other countries, in lieu of their own previous partial dependence upon Great Britain for both iron and steel products. It has thus aided not only to ruin the manufactured iron trade of all countries, but to ruin that of Great Britain particularly, and it has placed a limit upon the Bessemer stecl industry of Great Britain itself. Here is a new revolution, or a new revelation, in connection with the world's iron industry which was reserved for Paris to make clearly maniifest through the abundant proofs there furnished of the wide distribution of the Bessemer proces and the wide substitution of Bessemer products for those of iron and other steel processes. And what has been said of the Bessemer process and of the injury it has inflicted upon the British iron trade is applicable also in a large degree to the Siemens-Martin process and its modifications.'

## new steam beiler.

We illustrate one of the most recent improvements in steam engineering, the larger engraving representing a stationary boiler, and the smaller one a portable boiler, both made under a patent recently granted to Mr. Guy D. Daly of Flatbush, N. Y. In devising this boiler the inventor claims to have effected a greatsaving in first cost, in repairs, in the use of fuel, and to have diminished the danger of ex plosion. The boiler is certainly very compact, and the water plosion. The boiler is certainly very compact, and ae watcr
appears to be exposed to the best advantage to the action of the fire. There are two systems of pipes starting from opposite sides of the water reservoir, A, near the bottom. By tracing the course of the first pipe, B, the entire arrangement will be at once understood. It passes from the reservoir, A, outward through the brickwork which supports the reservoir, thence down ward to a point just above the fire, where it turns inward and passes from one side to the other of the fire arch, forming the coil, D, and finally terminates in the steam drum, F. The pipes, starting from the opposite side of the drum, are arranged in exactly the same way, but run in the opposite direction, and discharge into the steam drum, F , on the opposite side of the arch. In the pipes that leave the boiler there are check valves C, and in the upper terminal of each coil there is a check valve, E. These valves insure a complete circulation and facilitate the gencration of steam. The drums, F, are connected by pipes, $G$, with a single pipe, which discharges downwardly into the reservoir, A . The coils, D, being subjected to the intense heat of the fire, rapidly converts the water entering through the clicek valves, C, into steam, which is discharged through the check valves, E. into the drums, F, whence it finds its way through the pipes, G, to the reservoir, A . Whatever spray or moistura is carried along with the steam remains in the reservoir, while the steam is delivered in a dry state to the engine.
The boiler shown in the smaller engraving is similar in construction to the one already described, the difference be ing that the brickwork is dispensed with, and a portion of the coils is used to form the side of the fireplace, and the entire series of pipes is covered with a smoke jacket of cast or sleet iron.
The reservoir, which, in the stationary boiler, virtually forms the crown sheet, is so distant from the fire that it cannot become injured by heit, and the pipes which form the coils have such a surplus of strength that it would be almost coils have such a surplus of strength that if not quite impossible to burst them.
Even if one should, from any cause, give out, it caunot harm the other portions of the boiler, and it may be very readily replaced.

## ENGINEERING INVENTIONS

An improved cut-off, especially adapted to beam engines, has been patented by Mr. Thomas E. L. Collins, of Fall River Mass. It can be adjusted without stopping the engine or changing the position of the lifter, the latter being provided with a movable lower part pivoted to the fixed upper part.
An improved road ditcher, patented by Mr. Isaac Karsner, of Florida, O., is designed for opening ditches along the sides of roads and in fields, and it is capable of forming ditches on inclined surfaces.
Mr. John Witsil, of Bridgeborough, N. J., has patented an improved car coupling. The principal feature of the invention consists in using the car platform as a draw head.

An improved lubricator for steam cy linders, patented by Messrs. John H. Tay lor and Richard W. Miller, of New Haven, Conn., is arranged with a view to supplying a measured quantity of oil to the cylinder at each stroke by a forced injection.
Mr. James W. Brown, of Mayfield, Ky. has invented an improved propeller for vessels, consisting in a series of paddles of peculiar construction, which are thrust backward from the stern of the vessel
An improved water wheel, to be used in streams where there is little or no head, has been patented by Mr. John Ebersole, of Chambersburg, Pa. It is designed to be run by the current, and is not retarded by still or back water
Mr. Andrew J. Hopewell, of Edinburgh, Va., has patented an improved turbine water wheel, in which water is admitted through laterally opening chutes or wate ways. The chutes are controlled by a cor responding series of gates having a rotary adjustment.

An improved coupling for railway freight cars has been patented by Mr. Washington L. Harvey, of Danville, Va. The cars are coupled automatically, and may be uncoupled by a person standing on the top of the car
Mr. Daniel Abrey, of Greenville, Mich., has patented an improved rotary engine. The improvement relates principally to a cut-off, and to a novel movement for the abut ments.
An improved device for attachment to locomotive en $\begin{aligned} & \text { ines }\end{aligned}$


## DALY'S PORTABLE BOILER.

from entering the cars, has been patented by Mr. T B. Taylor, of Mount Mcigs, Ala. It consists in an inclined or diagonal plate placed so as to deflect the cinders and smoke from the path of the train.
An improved car coupling, designed to automatically couple cars without the necessity of going between the cars, and which also permits the cars to become automatically disengaged in case of accident, has been patented by Mr. James D. Martin, of Johnson City, Tenn., assignor of one half his right to Mr. James R. Meek, of Carter's Depot, Tenn, to whom communications should be addressed
An improvement in stock cars has been patented by Mr rankin B. Hall, of Palatine Bridge, N. Y. This inventio is desigued
portation.


DALY'S IMPROVED STEAM BOILER.

## Dangers of Wall street.

A New York correspondent to one of our contemporaries hinks there is not a better place in the United States to stay way from than Wall Street in this metropolis, with the ex eption, perhaps, of Memphis or New Orleans in a yellow ever season. I know five men, says the writer, who wen here to try their luck about a year ago. One was a confidential clerk in a foreign house that operated largely in the sreet. He was in a good position to get "points," and th understanding was that the others should operate upon them letting him in for a share of the profits in consideration of the information he should furnish. 'These five formed a little ring wilh a cash capital of about $\$ 50,000$. They hadn't the slightest doubt about doubling it in six months. They were to be on equal ground with the biggest operators so far as "points" were concerned, and no such word as fail could be found in the lexicon of their calculations.
Where are they now? Well, the con fidential clerk is in a lunatic asylum One of the others is a street-car conductor at $\$ 1.75$ a day. A second is clerk in an insurance office at ten dollars al week. A third made his way West toward the Black Hills, and has not since been heard from The last of the party of five still hangs around the street, watching the indica tions, but unable to put up even five dollars in a bucket shop. Their whole capi tal melted away in three months, and they were left without a dollar.
Here is another case: A retired business man of my acquaintance considered him self too smart to be beaten at any game He lived in fine style, kept horses and carriage, and was well known in society The Wall Street fever struck him and he began to speculate He made out pretty well at the start and that led him into larger operations. In less than six months from the day he put up his first $\$ 10,000$ margin, he was an insolvent debtor with suits against him by the brokers through whose hand all his money had passed! He now manages to scrape up a cheap living as an insurance agent, but he is hard pressed half his time for his board.
Scores of such warnings against tempting the goddess of the Stock Exchange might be given, but so long as her snares are set, men will walk straight into them, with their eyes open, and the notes of warning will be raised in vain.

## New Apparatus for Testing petroleum.

The uncertain and irregular results obtained by the flash test of petroleum in different hands has led to much dissatisfaction on the part of consumers, especially abroad. To get a uniform test, Mr. Holly, of the firm o Lockwood Brothers \& Holly, of New York city, has devised a testing machine which was exhibited before a committee of the New York Produce Exchange, May 1, giving very promising results. By this method the poles of a galvanic battery are brought within three eighths of an incl of the surface of the oil, which is mean time being slowly heated by a lamp placed beneath a small retort. A thermometer attached gives the temperature of the oil, and at each degree of heat attained above, say, $90^{\circ}$, a discharge of electricity is applied, the spark at last producing an ex plosive flash in the gaseous fumes rising on the surface of the oil. These dis charges are continued with the rising temperature of the oil until the flash extends into a flame, and the surface of the oil be gins to burn.
A sample of oil, marked as flashing under the old test at $95^{\circ}$, flashed at $93^{\circ}$ under the new test; and Mr. Holly stated that this test would always produce the flash on this sample of oil at a variation of not more than $2^{\circ}$ from that point. The sample flashed at $93^{\circ}, 94^{\circ}, 99^{\circ}, 104^{\circ}, 108^{\circ}, 112^{\circ}$, and $114^{\circ}$, and, finally, burned at $115^{\circ}$

Subsequent experiments made by gen tlemen present produced substantially similar results. All that is claimed by Mr. Holly for the machine is that it secures uniformity in the method by which the standard of the oil is determined

The Block Island Breakwater.
The Block Island breakwater, begun nearly nine years ago, is at last completed. The enterprise has been attended with almost insurmountable difficulties, by reason of the severe storms which prevail at this place during all seasons of the year. The breakwater now affords a safe shelter fo hundreds of mariners, and is a secure re fuge for vessels. It extends almost due north from the steamboat landing, on the
east side of the island, a distance of 1,250 feet. The first work was done in October, 1870.
The main breakwater reaches at its northern extremity a depth of 18 feet, and contains about 65,000 tons of riprap. A detached pier, about 200 feet from the principal structure, is 300 feet in length, and contains about 28,000 tons of rip-rap. On the main breakwater there is a lighthouse near the 60 foot entrance to the basin. A mammoth basin has also been constructed, in which vessels drawing not more than seven feet of water may ride safely at anchor. There are contained in this structure 320,000 feet of timber (board measure) and 6,000 tons of stone. The total cost of the entire work was $\$ 285,000$.
Block Island is an isolated island in the Atlantic ocean, about midway between Montauk Point, at the Eastern extremity of Long Island, and Point Judith, R. I. It is eight miles long and from two to five miles wide.

## THE EQUINE ANTELOPE.

A young animal of this species, from Nubia, has lately been added to the collection of the Zoological Society, at the gardens in Regent's Park. There was a specimen brought to London some time ago, which unfortunately died within

## A Telephone Concert.

One of the most successful, and, in some of its features, peculiar, telephone concerts ever held, lately took place at the Wesley Chapel, Columbus, Ohio. Mr. Sidney Short deivered, at the church, his lecture on the " telephone." The ecture was illustrated by charts and apparatus. During he lecture demonstration of the practical operation of the telephone was given, which greatly surprised, interested, nd gratified the audience. The arrangements of the appar tus were as follows:
Four Edison transmitters were placed in the Western Union main office, and two Phelps crown receivers at the church, a quarter of a mile distant. The lecture was delivered in the Sunday-school room, which is 50 feet square. The crown receivers were placed at one end of the room, and were provided with paper cones 4 feet long and 10 inches in diameter at the large end. With the apparatus thus arranged, a solo sung in the Western Union office was dis tinctly heard by the audience. After this, Mr. George Makepeace, of the State University, gave a cornet solo. Every note was distinct, yet as sweet and low as though heard from a distance, and coming over still waters on a quiet summer eve. When "Great Deliverer, Come," by the Wesley Chapel quartette, came through the instrument, no
${ }^{\prime}$ lops, were described, and the species characterized. A beautiful specimen of an extinct skate, embedded in shale from Bear river, was exhibited and described. It belonged to a new geuus of the family of trygons. The distinguishing characters are found in the teeth, which are like those of the genus raia, and in the spines of the tail, which are three in number, compressed and with one serrated edge. The name Ziphotrygon acutidens was proposed for the renus and species.
Professor Cope stated in this connection that, contrary to he assertion of Mr. Clarence King, no species of fossil fish was found common to the shales east and west of the Wa satch Range. The name Amyzon beds was given to the deposits west of the range, which were also found in the South Park.
Mr. John A. Ryder described a beautiful little crustacean found for the first time on this continent in the vicinity of Woodbury, N. J., by Mr. Seal, an indefatigable collector of the minute life of his neighborhood. The head is provided with robust claspers and two long, fleshy proboscis-like organs, which are coiled up between the claspers when at rest The little creatures, which are about half an inch in length are provided with eleven exquisitely delicate branchiæ on each side, by means of which they float gracefully on their


## THE EQUINE ANTELOPE.

two or three days of its arrival, from disease contracted before. This one seems to be doing well, like most of the other antelopes in the collection, of which they form an important and interesting feature. The antelope genus of ruminating mammals, distinguished from the ox, the deer, the goat, and the sheep, includes nearly a hundred diverse species, the majority of which are natives of Africa; a few belong to Asia and Europe, while America has scarcely any true antelopes. Among the more conspicuous and familiar instances are the Persian or Arabian gazelle, the Indian nylinstances are the Persian or Arabian gazelle, the Indian nyl-
ghau, the ibex and chamois of the Alps, the eland, the gnu, ghau, the ibex and chamois of the Alps, the eland, the gnu,
the springbok and blessbok, and others, in South Africa.
The equine antelope grows to as large a size as the eland, sometimes measuring as much as $71 / 2$ feet in length and 4 fect in height at the shoulder, or the ordinary stature of a horse. Its color is a reddish-gray, with brown head and a white spot over each eye; the horns are large and heavy, round in shape, and marked with a series of rings, except round in shape, and marked with a series of rings, except
toward the points, which are very sharp; and the entirehorn toward the points, which are very sharp; and the entirehorn
curves backward when fully grown. This species is also found in South Africa, inhabiting the plains of the Transvaal and other elevated parts of the country.
We present an illustration of the individual specimen of the Nubian race which has taken up its abode in London.
only were the tones of different parts distinct, but even the words could be understood in every part of the room. As an encore, "We're Going Home To-morrow," was given. This, also, was clear and sweet. A cornet duet by Messrs. Makepeace and Hyatt, and, in response to an encore, "Old Virginia" was given with equal success. The musical programme was closed by the Doxology. After a short conversation with Mr. Ross, at the Western Union office, Mr. Short, in a glowing tribute to America's work on this, the invention of the age, brought his remarks to a close. Every word spoken or sung at the office was not only distinctly heard by the entire audience, but the voices of the speakers and singers were recognized, and could have been distinctly heard in a hall capable of seating a thousand persons. Journal of the Telegraph.

## Academy Notes.

The Public Ledger report of the recent meeting of the Philadelphia Academy of Natural Sciences, contains the following interesting items:
Professor Edward D. Cope stated that he had in his collection a large number of specimens illustrating the natural history of the extinct rhinoceros from the Loom Fork horizon and elsewhere in the West, where these remains form more than one-half of all the fossils found. Four distinct genera, anchisodon, hyrachodon, aceratherinm, and aphe-
backs in the water. The specimen was named Chirocephalus Holmanii, in honor of Mr. D. S. Holman, the Actuary of the Franklin Institute, from whom the specimen was obtained, in recognition of the services he has rendered in devising methods for studying living objects, both large and small, under the microscope.
Dr. Chapman exhibited and described the placenta of a species of monkey (Macacus cynomolgus) which was remark able in being single, and thus differing from the placenta of the other Old W orld monkeys, except the chimpanzee
Dr. C. N. Pierce called attention to a skeleton of a maori dug out of the sand on the beach of Chatham Island, South Pacific Ocean, and presented to the Academy by Mr. Wm H. Rau. He pointed out the fact that in the lower jaw the third molar was the largest instead of the smallest, as in civilized man, thus approaching the condition in the lowe animals. Other peculiarities of dentition were noticed.

## American Coal at the Mediterranean.

Since referring in our last issue to the fact that anthracite coal was advertised for sale in Geneva, Switzerland, we find the following item in the New York Tribune: The rumor that an Italian firm was negotiating in the United States for an immediate supply of 100,000 tons of coal, in place of obtaining it from England as heretofore, has caused ; uneasiness in London. A cargo of American coal reached
he Mediterranean sixteen months ago, and met with a ready sale, and more than twenty cargoes have been sent over since that time. The Globe apprehends that before long the coal industry of Great Britain will have to encounter determined rivalry on the part of the United States. American coal will not be landed in England, but will be shipped to ports on the Continent which are now dependent upon supplies from the coal fields of the United Kingdom.

Astronomical Notes.
Observatory of Vassar College.
The computations in the following notes are by student of Vassar College. Although only approximate, they will enable the ordinary observer to find the planets.

## Position of planets for june, 1879

Mercury.
On June 1 Mercury rises at 3 h .41 m . A.M., and sets at 5 h 43m. P.M. On June 30 Mercury rises at 5h. 31m. A.M., and sets at 8 h .34 m . P.M.
Mercury should be looked for during the last week in June, nearly in the parallel of the point of sunset; it will be in conjunction with the new moon on the 19th.
venus.
On June 1 Venus rises at 7 h . 22 m . A.M., and sets at 10 h 29 m . P.M. On June 30 Venus rises at 8 h .15 m . A.M., and 29 m . P.M. On June
sets at 10 h .6 m. P.M
Venus passes $4^{\circ}$ south of Pollux on June 2, and $21 / 2^{\circ}$ north of Regulus on June 30.
Venus will be near the crescent moon on the evening of June 23.

On June 1 Saturn rises at 2h. 2m. A.M., and sets at 2 h . $25 \mathrm{~m} . \mathrm{P} . \mathrm{M}$.

On June 13, according to the Nautical Almanac, Saturn will be in ctrnjunction with the moon at 5 h . 31 m . Washing ton time. The planct will therefore rise on the morning of that day, following the crescent moon
On June 30 Mars and Saturn will rise very nearly together, at 0 h .13 m ., and will keep nearly the same path until they set.

On Junc 1. Uranus rises at 10 h .47 m . A.M., and sets at 15 m after midnight. On June 30 Uranus rises at 8 h .58 m . A.M., and sets at 10 h .23 m . P.M.
un Spots.
The sun has been examined daily, since the first of the year, with a glass of 3 inches aperture. As late as May 8 no spot had been found. On May 9 a small spot was seen, which had developed within the previous twenty-four hours. It could not be found with the same glass on the 12th, but the large telescope showed that it had broken up into several minute sections, and was rapidly diminishing.

Mars.
On June 1 Mars rises at 1 h .20 m . A.M., and sets at 51 m . after noon. On June 30 Mars rises at 0h. 13m. A.M., and sets at 39 m . after noon.
Mars will be near the waning moon on June 12. According to the Nautical Almanac Mars will be in conjunction with Saturn at 2 P.M. on the 30th. The two planets will therefore be seen to rise nearly together.

The planets Jupiter, Saturn, and Mars are all best seen in the morning.

On June 1 Jupiter rises at 44m. after midnight.
Mars rises north of Jupiter at 1h. 20m. A.M., and Saturn rises north of Mars at 2 h .2 m . A.M.
On June 30 Jupiter rises at 10 h .50 m . P.M., nearly as Venus sets.
Jupiter is very brilliant. We are coming nearer to it, and its moon can be seen with very little optical aid.

## The Coney Island Pier.

The Ocean Navigation and Pier Company, of which Mr. Jacob Lorillard is president, are erecting off West Brighton, Coney Island, an immense iron pier. The contractors are the Delaware Bridge Company, and the construction is under the supervision of Messrs. Maclay \& Davies, civil engineers. The pier, when completed, is to be 1,000 feet in length, extending outward from high-water mark. Its width is to be 50 feet, with enlargements of 100 feet in width at the shore end the center and the pier head. It is to be double-decked, with iron substructure, the whole supported by wroughtrron tubular piles 9 inches in diameter, made of one-half inch metal. These piles are arranged in rows, at distances of 20 feet longitudinally and 16 feet 8 inches laterally. Each pile has at its base a circular cast-iron disk $21 / 2$ feet in diameter, which, when sunk into the sand, acts as a supporting base, and at the depth of 15 or 20 feet insures a perfect foundation. The piles are driven by the "jet water" system.
Iron capitals are bolted to the tops of the piles, and they support 15 -inch wrought-iron beams, bolted together, upon which the superstructure will rest. The entire structure is to be made more secure by being braced throughout with diagonal rods an inch and a half in diameter, and heavy horizontal struts bolted to the beams transversely. When completed, the entire structure will be supported by 260 iron pillars. The flooring of the lower deck will be well finished and inclosed in a handsome iron railing. The landing stage will be at the lower deck of the pierhead, and will be guarded by massive oak fender pieces.

More than 100 workmen are engaged in pushing forward the work. $\Lambda$ t night two electric lights, one on shore and the other on the movable derrick, are used. The first pile was driven on the 22 d of April. All the material for construction is on the ground, and it is intended to have the last pile in place by the 1st of June. On the upper deck of the pier are to be spacious pavilions and saloons. The whol structure will cost more than $\$ 150,000$. -Iron Age.

## GREEK DRINKING CUP.

The engraving represents the upper face and a diametrical section of an ancient Greek drinking cup which was used

by the soldiers for dipping up the muddy water met with in heir marches. The inwardly turned rim prevented the mud from following the water as it was poured from the vessel This vase or cup is preserved in the Pourtalis collection.

## NEW PROVISION SAFE

The accompanying engraving represents a very useful household article recently patented by Mr. Samuel Inman, of 929 South Asland Ave., Chicago, Ill. It is designed for keeping bread, pastry, meats, milk, and other articles of food which require protection from insects or other vermin. The safe is made in two parts, the upper part being made air-tight, or nearly so, for
containing bread and pastry, containing bread and pastry, and protecting them from the influence of the atmosphere and from insects. The lower portion consists of a light frame having a door in one
side, the whole being covered side, the whole being covered
with wire gauze, which perwith wire gauze, which per-
mits of a free circulation of mits of a free circulation of
air, while it prevents the enair, while it prevents the en-
trance of rats, mice, or insects. The shelves are formed of slats of wood, secured to


Inman's Provision Safe. end cleats. This part of the safe is irtended for receiving meats, butter, milk, and other articles which require a free circulation of air around them. The safe may be set upon the cellar floor or hung up by wires, as may be most convenient.

## Painting Walls-Seasonable Hints.

Of course, says the American Builder, everybody knows, or ought to know, that walls and ceilings are finished with plaster. But everybody may not be aware that plaster has the property of absorbing moisture. This, perhaps, will not take place in rooms where a fire is kept steadily; but in rooms left, as is often the case, for weeks without a fire, the walls will take up a considerable quantity of damp. The effect will be injurious to the health of the inmates. There are few persons who have not suffered from a mysterious cold, caught they know not how, though, perhaps, damp in the plaster had something to do with it
The extent to which damp is absorbed in a plastered wall may be discovered by noticing what so often takes place in rooms where the walls are painted and have become chilled by a season of cold weather. As soon as the temperature becomes warmer the atmosphere is condensed on the walls, and at times in such quantities as to run off in streams. Now, had it not been for the paint, the greater portion of this moisture would have been absorbed by the plastered walls. And as a consequence the quality of the plaster would have been impaired and the room made unwholesome. In view of this defect in plastered walls, it becomes a ques tion well worth considering, whether, in finishing a house, the walls should be papered or painted. If paint is decided on, it is highly necessary that the painting be properly done and good materials employed. White lead, which is the chief ingredient of all paint used, is of late years heavily
adulterated-a reason why some painters can do work so much cheaper than others. There are also dishonest paint ers who will lay on nothing but "whiting" and size for the first coat, and finish off with one coat of oil paint. It is not easy to detect the fraud at the time, but as such paint soon wears off the wall, and attaches itself to the garments of those who rub against it, the customer speedily finds out that he has been cheated. It takes three or four coats of good oil paint honestly laid on to make good work of paint ing plastered walls.
In painting walls there is ample scope for taste, and such colors may be chosen as are most suitable for each apart ment, and in harmony with the furniture. Apartments lighted from the south and west, particularly in a summer residence should be cool in their coloring; but the apartments of a town house ought all to approach toward a warm tone. In a drawing room the coloring should be characterized by vi vacity, gayety, and light cheerfulness; by light tints of bril liant colors with a considerable degree of contrast and gild-ing-the walls being kept in due subordination to the furni ture, though partaking of the general liveliness. The characteristic coloring of dining rooms should be warm, rich and substantial, without vivid contrasts, and gilding should be avoided, unless in small quantities for the sake of relief. Parlors ought to be in a medium style, between that of a drawing room and dining room. Libraries should be solemn, grave, and quiet in color and finish, while bedcham bers should be light, cleanly, and exceedingly cheerful. A greater degree of contrast between the room and its furniture may be admitted in the chamber than in any other apart ment. Stairways, halls, and vestibules should be of a cool tone and simple in their style of coloring, being in that what they are in utility-a link between the exterior simplicity of a house and its interior richness and comfort.

## Mr. Gary has the Last word.

To the Editor of the Scientitic American
As your correspondent " $E$.," in your issue'for May 17, page 304, has made some misstatements, will you allow me to correct him? In referring to a letter written by me and published by you, April 5, he says, " Mr. Gary's knowledge of history is as defective as his knowledge of magnetism and electricity," and he advises me, before I write any more history of science, to be at the pains of studying it a little more carefully.
Allow me to say that all the history I attempted in the letter referred to was the following sentence: "The law of gravitation was not discovered in a laboratory, nor was the power of steam nor electricity." This is all the history that I attempted, and the Scientific American, which your correspondent will acknowledge is good authority, remarked in regard to this, in the same number in which it appeared, that "everybody will agree with what our correspondent says about laboratory discoveries, Newton and the apple, Franklin and the kite string."

Your correspondent E. also holds up before your readers a list of honored and respected names as martyrs to "conceited ignorance, and mutilated and outraged history," and tries to vindicate history and himself by making other misstatements. He says: "Mr. Gary brags that he is ignorant of what others have done." I humbly acknowledge that I do not know it all, but I never brag about it. As to his as sertion that Professor Henry advised me to buy $\$ 50$ worth of books and study up on magnetism before wasting more time, I have to say that Professor Henry never said anything of the kind. Another eminent scientist made a similar remark before he saw my discovery, but after seeing it, he advised me to go ahead.

Let us hope your correspondent's knowledge of history and science is more accurate than his assertions in regard to current events. It is to be feared that " much learning hath made him mad."
W. W. Gary.

Boston, Mass.

## Malleable Nickel and Cobalt.

Fleitmann has succeeded, by a very simple device, in ob taining cast nickel in a malleable and ductile form, even when cold, while cobalt prepared in the same manner pos sessed such hardness when cold that he expects it can be used for cutting instruments, while hot it is both malleable and ductile. His process consists in adding to the fused metal, through a hole in the lid of the crucibles, $1 / 3$ per cent of me tallic magnesium, which possesses a remarkable power of de stroying carbonic oxide. The author is of the opinion that the porous and crystalline character of cast nickel is due to its absorption of carbonic oxide gas while in a molten state. It is not impossible, however, that owing to the great affin ity of magnesium for nitrogen, its action may be due to the destruction of cyanogen in the metal.
Cobalt prepared in this manner possessed none of the reddish color attributed to it in the text-books, but actually ex celled nickel in whiteness and brilliancy
He also welded these metals on to iron and steel at a white heat, and strips thus welded were rolled out to the finest number without separating from each other.-Berichte d.d. ch. Ges.
Soot for Roses.-Collect some soot from a chimney or stove where wood is used for fuel, put into an old pitcher, and pour hot water upon it. When cool, use it to water your plants every few days. The effect upon plants is won derful in producing a rapid growth of thrifty shoots, with large thick leaves and a great number of richly-tinted roses.

Plantains and Bananas.
Of all plants which are the produce of the tropics, none are superior in interest to the plantains and bananas, two closely allied species of the genus Musa. Of the several species of this genus, one has received the specific name of paradisiaca, under the supposition that it was the "tree of life," or the "tree of the knowledge of good and evil," spoken of in the Scriptures. St. Pierre observes that the violet cone at the end of a branch of plantains, with the stigmas pecring through like gleaming eyes, might well have suggested to the guilty imagination of Eve the semblance of a serpent tempting her to pluck the forbidden fruit it bore, as an erect and golden crest. Though some of the species attain a height of 20 to 30 feet, they are herbaceous plants, growing up, flowering, fruiting, and then dying down to give place to other shoots from the same root. The fruit ripens in succession from the base to the apex of the flowering stem, so that on the same plant flowers and ripe fruit will be found associated. One stalk of fruit will attain three feet, and bear from 120 to 150 , even 180 plantains, the entire weight of which would be from 50 to 70 lb . Dried plantains form an article of internal commerce in India, and, in a few instances, have been exported. When deprived of their skin and dried in the sun, they are reduced to meal, in great request in the West Indies for children and invalids. A recent French exchange states that efforts are being made in Venezucla to get up an export trade for meal of this sort, the supply being much greater than the home demand. Professor Johnston states that the fruit approaches most nearly in composition and nutritive value to that of the potato, and the meal to that of rice.
All the species contain a large number of spiral vessels, and afford a strong and valuable fiber, from which cloth and cordage are made. The substance called manila hemp, much employed for cordage in America and Europe, is obtained from one of the species (Musa textilis). Scarcely any parts of these useful plants are devoid of use to man. A limpid fluid issues from wounds in the body of the plant, which is used in medicine, as is also the root. It has been recently stated in a forcign medical journal that the property which these plants possess of keeping the surrounding soil moist (as pointed out by Boussingault) has been taken advantage of to aftord shade and moisture to the coffee plant in Venezucla; and that the cultivation of the latter has therefore been greatly increased.
Still another industrial use has lately been proposed for the fruit in the latter country, this being the distillation of brandy. Banana brandy, even from the first distillation, is said to have a pleasant taste and smell, recalling that of the fruit. It contains 52 per cent of alcohol. As two hundredweight of the fruit produces about ten quarts of alcohol of $96^{\circ}$, banana brandy may yet be destined to play as important a part in economy as the alcohol of the sugar cane.

## Ramie Fiber and its Manufacture.

This fiber, the utilization of which in textile manufactures has for many years engaged the attention of practical men, still continues to command a large amount of notice. It is undoubtedly deserving of all it receives, because if the difficulties that have hitherto stood in the way of its extensive use can be overcome, we shall have at command a fiber that will do much to emancipate manufacturers from dependence upon the American cotton, the Russian flax, and the Italian and Chinese silk crops. Besides the independent position it would take on its own merits, it possesses qualities that would cnable it to be substituted, by means of a little ingenuity, for any of those fibers. If it can be produced sufficiently cheap it may even become a permanent substitute for one or more of them, and to a considerable extent displace them. Whether such an occurrence would be an advantage or otherwise time only could reveal.
During the past month we have had submitted to our notice some specimens of grods manufactured entirely from the rhea plant fiber. The raw material in its dried state, as it is taken in the first process, was shown. This is a pliant, reddish brown, straw-like substance. After passing through the first stage it yields a long, light flaxen-colored fiber, of great strength and fineness, and which appears to be divisible to an extreme degree. The next forms in which it was exhibited were in wet spun and dry spun yarns. In the former it possessed a solidity which gives it a somewhat wiry appearance and great strength; in the second it is almost as soft as wool, and may almost be mistaken for it. These yarns wrought into cloth display similar characteristics. One specimen appears very much like a good brown Hessian, and another a Belfast brown linen. A third had passed through the bleaching process, and showed its capability of being adapted for table linen, napkins, diapers, etc. It bleaches clearly and evenly, coming up of a rich pearly whiteness, with a cool, pleasant feel, but with more fiber on the face of it than a linen article would possess. In each phase of it the distinguishing features are great strength and probabledurability. In another case the fiber had been reduced to its finest condition, spun into a soft, pearly-white hosicry yarn, and worked into an undershirt, possessing all the softness, luster, and beauty of a similar article in silk
So far as the samples allowed us to discover. it would ap pear to be free from the distinguishing fault of China grass, from which creases cannot be removed. The inventor stated that he had numerous other fabrics woven from yarns entirely of this fiber, such as dress goods, ribbons, dyed and printed fabrics, either completed or in process, and which
could be shown when necessary. The specimens exhibited
formed an interesting display, the importance of which, however, depends entirely upon whether, as affirmed, they have ever, depends entirely upon whether, as affirmed, they have
been produced by a process and at a cost that will enable the rhea fiber to take its position in commercial markets as a practically useful article.-Textile Manufacturer.

## THE EDIBLE MUSSEL

The common edible mussel, Mytilus edulis, attracts our special attention on account of its value as an article of diet and commerce.
In the accompanying engraving, Fig. 1 shows the animal laid open to view, the left half of the triangular shell having been removed, while the brim of the mantle has been thrown back a little to allow a better inspection of the inner organs. Both parts of the shell are alike in shape and size. The hinge or lock uniting them is lucated in the smallest


## Fig. 1.-EDIBLE MUSSEL

angle of the triangle formed by the shell, and both of the lat ter end at this point in short conical elevations. At the opposite end there is a small opening in the shell corresponding to the anus of the mussel; and in close proximity runs a short fringed tube connecting with the inner organs of respiration.
The peculiar digital form of the foot and the presence of spinning gland or byssus are characteristic, and both are undoubtedly related to the stationary mode of life of the animal. The hypothenuse of the shell being the face side of the mussel, A is the brim of the mantle of the latter. On both


Fig. 2.-EDIBLE MUSSEL.-(IIytilus Edulis.)
sides of the mouth, F, will be noticed the long, narrow, folded tentacles, $G$; $J$ is the exterior, I the interior respiratory muscle; E and D are muscles controlling the foot, B , under and behind the base of which is situated the byssus or spinning gland. From its cavity a groove extends along the lower side of the foot, and ends at its tip in a transverse cavity containing a small plate, perforated by seven small apertures, used for sucking.
By means of the foot and the byssean gland the animal is floo
enabled to spin a net or barb, C, consisting of numerous thin Mr. James W. Rudolph, of Carmi, Ill., has devised an im object forming its abode. These threads are produced from ing and digging, and is casily adjusted for cither use.
ricultural implement, that is adapted for both hoe
viscid liquid substance secreted in the byssean gland, which is sucked up into the apertures of the end of the foot and drawn out into threads, which become quite firm in a shor time. Once attached to a rock or $\log$ they resist the action of the strongest current and the heaviest gale. Fig. 2 is a correct representation of the mussel as attached to a fixed object.

If the mytilus desires to change its residence it draws itself forward as far as possible, and attaches a few threads as far ahead as the foot reaches. At the same time a few of the old threads are severed. This manipulation is repeated until a suitable site is reached. Although this mode of locomotion is extremely slow, the animal nevertheless manages to traverse considerable distances in this manner.
The edible mussel inhabits, by preference, those portions of the shore which are laid dry at low tide; and in the neigh borhood of the mouths of rivers, where the percentage of salt in the water is low, broad thick bands may be observed covering that particular section and marking it distinctly Sometimes as many as 2,000 individuals have been counted on an area of one square foot.
As above mentioned, the animal prefers water containing only a little salt. It abounds, therefore, especially in those European waters cut off partly from free communication with the Atlantic, as in the German North Sea, the Baltic and the Adriatic. They have also been acclimatized in the Caspian Sea, the water of which is not extremely salt.
In northern waters the edible mussel attains its full size in four to five years, and in the Mediterranean in one to two years. When they propagate each individual produces (they being hermaphrodites) millions of offspring.
Besides being almost indispensable as bait for certain fish they are extensively used as an article of food. They are largely cultivated in all European waters, in so-called 'parks.' In the North Sea these consist of large numbers of trees, from which the smaller branches only have been cut, and which are planted in the bottom of the sea at such a distance from the shore that their upper portion is partially laid bare at low water. After four or five years they are raised, stripped, and replaced by others. In the bay of Kiel, Germany, alone about 1,000 of these trees are annually planted and about 1,000 tons of mussels are brought on the market. Bad seasons occur, however, both with respect to quality and quan tity, owing to various causes. In the Adriatic the mussel are raised on ropes extended between poles rammed into the ground. The ropes are raised and stripped once in cighteen months.

## American Sumac.

Dr. William McMurtrie, Chemist of the Department of Agriculture, has been making elaborate investigations as to the relative amount of tannic acid and coloring matter in American and Sicily sumac. He finds the American pro duct, when properly gathered, to be fully equal to the foreign. Samples of Winchester, Va., sumac were collected in the months of June, July, and August respectively. Of these samples those collected in June and July were mixed varieties, and of the product collected in August we secured samples of the leaves of Rhus glabra and Rhus copallina separately.
In reporting his experiments Dr. McMurtrie states that in some of the tests the precipitates obtained by means of the solution of the June collections of Winchester mixed sumac were perfectly white and very much cleaner than any obtained with the Sicilian product. "The difference in the color of the precipitates obtained from the solution of the June collection and that obtained from solutions of the samples of later collections, was sufficiently marked to prove that the great difficulty in the way of the universal employ ment of the American to the exclusion of the expensive Sicilian product may be obviated by making our collections early in the season-that is, in the month of June. The percentage of tannic acid is not, it is true, quite as high as obtains in July, but it compares favorably with the Sicilian product, which, be it remembered, communicates a slightly yellowish tinge to the gelatine precipitate. The amount of coloring matter found in the July collection is sufficient 10 account for the difference of $\$ 50$ a ton in the market values of the sumac of home and foreign growth, regardless of the proportion of tannic acid. We would therefore advise that for the purpose of tanning white and delicately colored leather, the collection be made in June, while for tanning dark colored leathers, and for dycing and calico printing in dark colors, where the slightly yellow color will have no injurious effect, the collections be made in July. It appears that for all purposes the sumac collected after the 1st of August is inferior in quality. In view of the facts here presented, we cannot dhelp urging upon manufacturers the importance of encouraging the home production-of insist ing that the collections be made early in the season, in order thus to bring about such a change in this matter as to preven the annual expenditure of over $\$ 600,000$ in gold for the sumac of foreign growth."

## NEW AGRICULTURAL INVENTIONS.

An improved trap attachment for corn cribs, patented by Mr. Adam Harper, of Boswell, Ind., consists in combining with the raised and slatted bottom of the corn house a series with the raised and slatted bottom of the corn house a series
of swinging side racks that rest inwardly on a subjacent floor.

A machine for dropping corn and other seed at regular volume on chronology, written in Latin and published at intervals, and also dropping at the same time a regulated Cologne supply of fertilizing material into the hill, has been patented by Mr. Geo. W. Miller, of F'awn Grove, Pa.
An improvement in harrows, patented by Mr. George Lettenmyer, of Little Georgetown, W. Va., consists in an arrangement of yielding teeth, which renders the draught of the implement light, and lessens the chance of breakage.
Mr. Henry M. Keller, of Newark, O., has patented an im proved harrow having teeth of peculiar form, and provided with a clod crusher, that breaks up the clods as the harrow advances.

## GERARD MERCATOR, THE COSMOGRAPHER

Gerard Mercator, the cosmographer, and inventor of the map projection which bears his name, was born on the 5th of March, 1512, in the small town called Rupelmonde, in East Flanders, about eight miles from Antwerp. He was the youngest of six children of a poor shoemaker. Losing both parents at an early age, he was kindly cared for by a great-uncle, to whom he became indebted for the advantage of an education in the best schools of the Netherlands. At the age of eighteen he entered the University of Louvain, where he was eventually matriculated under the faculty of arts, which nearly corresponded with the faculty of philosophy in a modern German university. Remaining at Louvain till his removal to Germany, he at first devoted himself to philosophical studies of such abstruse subjects as the origin, nature, and destination of the physical universe, and became absorbed in the great problems of science and revelation. He found it impossible to reconcile the Mosaic account of creation with the doctrines of Aristotle. Here he began to tread upon dangerous ground, for in Louvain, as at Paris, the authority of Aristotle in the domain of physical philosophy was sacred and supreme. To dispute or question the perfect consistency and harmony of his teachings with those of the church was heresy. Finding no one to sympathize with himin his doubts, Mercator left Louvain and secluded himself for study at Antwerp for several months; but whatever skeptical views he may have had in regard to the divine inspiration of the Scriptures were dispelled before he returned to Louvain.
As Mercator grew older he began to turn his attention to the practical problem as to the best means of carning a livelihood. Having obtained permission from the Faculty of Arts of the University of Louvain to give private instruction in mathematics, he thus began to support himself; and having previously chosen for his vocation the manufacture of mathematical instruments, he was thus enabled to establish a workshop of his own, where he manufactured astro lobes, astronomical rings, globes, etc., of great accuracy.
As a chartographer, Mercator appears to have begun his career by the publication of a map of Palestine, at Louvain, in 1537. Increased interest in religious matters naturally led to an increased demand for such maps. No copy of this has come down to us; but it seems to have been well received, as it was highly praised by his contemporaries. His next work was a map of Flanders, undertaken at the request of certain Flemish merchants. He traveled over the country,
making surveys and measuring heights and distances. It took three years to complete the work, and it was published at Louvain in the year 1540. A masterpiece of his handiwork, at this period of his life, was a large terrestrial globe, which he finished in 1541 . This is now lost, but the original drawings for its exterior surface are still preserved at
Brussels. This became the means of commending him to Brussels. This became the means of commending him to
the favor of Charles V., from whom he received an order for a complete set of mathematical instruments for use on his expeditions. About this time he was maimed. In 1544, there occurred in his life an incident which has been only recently brought to light-he was imprisoned as a heretic. It appears that an imperial edict was issued at Brussels, by Mary, queen dowager of Hungary, condemning
all heretics to death. Under the operation of this edict, fortyall heretics to death. Under the operation of this edict, forty-
three citizens of Louvain, Mercator among the number, were three citizens of Louvain, Mercator among the number, were
accused of participation in what was styled the " Lutheran accused
We have no information as to the cause or circumstances of Mercator's discharge from imprisonment; all is shrouded in mystery; we can only glean from the records of the time that he must have been imprisoned nearly four months. After his release he resided at Louvain seven or eight years. He made a new set of instruments for the Emperor, to replace the former, which had been destroyed; and completed and dedicated to the Bishop of Liege a celestial globe of the same size and style as the terrestrial one which he had before presented to Granville.
In 1552 he removed to Duisburg, in Germany. Here he shortly after completed for the Emperor an astronomical ring and a set of globes elegantly equipped and ornamented. There was a celestial globe of glass or crystal, and on it
were engraved the constellations with a diamond. Inside were engraved the constellations with a diamond. Inside of this was a terrestrial globe of wood. Attached to this set were a compass, an hour circle, a quadrant of altitudes, and other instruments. In 1554 Mercator published at Duisburg a large map of Europe, which, more than any other work of
his, contributed to his fame as a chartographer among his contemporaries. This is now lost, although a reduced copy of it published by his son still exists. In 1564 he published a map of Great Britain; in the same year, a map of Lorraine, based on a trigonometric survey made by himself. In 1569 he made his first appearance, after his removal to Duisburg, as the author of a printed book-a folio

Even after the discoveries of the 15th and 16th centuries, and in the lifetime of Mercator, the works of Ptolemy were still regarded as the groundwork of all geographical know ledge. Mercator was a great admirer, but not an implicit follower, of this author, and in 1578 published a corrected and revised edition of the maps or charts of Agathodæmon which accompanied the work of Ptolemy. Six years later, he re published this collection of charts, twenty-seven in number together with the text of Ptolemy's eight books on geogra phy. This work added greatly to the reputation of Merca tor as a geographer and scholar, and is still held in high estimation by modern authorities.

We now come to the work of Mercator commonly known as his Atlas of Modern Geography, and which he did not live, to complete. The modern application of the word "atlas" we owe to Mercator, and originated with this work. The introductory pages of the book, which was published by his son after his father's death, contain a genealogical tree of he ancestors and descendants of Atlas of Grecian Mythology who, as a punishment for leading the Titans in their war against Jupiter, was condemned to bear the heavens upon his shoulders. As Humboldt has adopted the Greek wor "Kosmos" as a title to the crowning work of his life, so Mercator adopted "Atlas" as the title to the work which he planned and projected as the crowning work of his life. He did not mean to call it an Atlas, or the Atlas, but simply "Atlas." He never intended to give to it the generic sense in which it is now used, as applicable to any and every collection of maps; but as there was no word in the classical or modern languages that had done such service, the title was borrowed incourse of time by other chartographers, until it has gradually lost its special application, and come to designate simply a collection of maps. From the treatment to which two of his works were subjected by the Catholic Church, Mercator has been supposed to have been a Catholic; but this is said to be an error. His posthumous work on the creation was condemned in the Index Expurgatorius because its treatment of the doctrine of original sin bore too close a resemblance to the teachings of Luther; and his chronology was prohibited on account of the extracts contained in it from writings that had been condemned. Mercator, having lost his wife in 1586, married again. His second wife was
the widow of a burgomaster of Duisburg. The issue of his the widow of a burgomaster of Duisburg. The issue of his
first marriage was six children, three sons and three daughters. He died in December, 1594.
The fame of Gerard Mercator rests chiefly upon his achievements in the department of mathematical geography and chartography. He is known to us, principally, as the inventor of the projection which bears his name. The value of what is now known as the "Mercator Projection" was so little appreciated at first that his successors did not deem it of sufficient account to place it in the Atlas of Modern Geo graphy. If it ever occurred to the inventor that this rather than any other of his productions would immortalize him, he probably banished the idea long previous to his death. It seems to have been thrown aside and forgotten, or only remembered as a scientific curiosity. It is unknown exactly
when Mercator's projection was first used; we only know when Mercator's projection was first used; we only know principal emporium for the sale of nautical charts, and that those then sold at that place were mostly on this projection. The practical signification of Mercator's projection is this: He says to the mariner: "If you wish to sailfrom one port to another, here is a chart and a straight line on it, and if you follow this line carefully, you will certainly arrive at your port of destination. The length of the line is not correct, yet it points exactly in the right direction. Consequently, if you follow the line, you may get to your destination sooner than you expect, or you may not get there as soon. But you will certainly get there.
Such are the leading features in the life of one to whom Malte-Brun paid an eloquent and fitting tribute when he said: "Modern geography dates from Mercator." The memory of Mercator has been sadly neglected by the English speaking races, and until the recent paper of Mr. Elial F. Hall before the American Geographical Society, no full account of his life has appeared in our language. We are
indebted to Mr. Hall's paper for the materials of this brief sketch of the celebrated cosmographer.

## DAVID PAGE.

In the death of Professor David Page, LL.D., which oc curred at his residence, Newcastle-on-Tyne, March 9, geology loses one of its most popular expositors and voluminous and practiced writers.
Professor Page was born in Fife, and the earlier years of his life were spent in literary occupations in his native country. Subsequentily he entered the employ of Messrs W. \& R. Chambers, of Edinburgh, and took an active part in the preparation of their large series of educational works. DurIng his connection with this house, the once-celebrated but now half-forgotten "Vestiges of Creation" made its appearance. Although Robert Chambers has always been credited with the greater share of this anonymous volume,
Page is supposed to have lent powerful assistance with his versatile pen. Leaving the service of the Messrs. Chambers, he embarked on the sea of successful authorship, and, following in the wake of Hugh Miller, kept up an interest in geological science, by his voluminous writings, which were
characterized by a graceful and easy style not usually possessed by scientific men. He rewrote his "Introductory

Text-Book of Geology," and prepared an advanced text book on the same science. He also published works on physical geography, and various popular works on geologi cal subjects. Taking up the study originally as an amateur he ultimately devoted himself to it professionally, although he is not credited with much original power as an observer In fact, field work for him was almost impossible, owing to physical infirmity, yet he had a most lucid and pleasing way of presenting the discoveries of others before non-scientific readers. On the establishment of the College of Physical Science, at Newcastle, he was chosen Professor of Geology Here he pursued his vocation with much zeal and success until within a short period of his death. He was in the sixty-fifth year of his age.

## The New Northwest.

In a long review of the condition, prospects, and possibilities of the vast and comparatively undeveloped country lying to the north and west of Minneapolis, Minn., the Northwestern Miller says that the Northern Pacific Railroad passes nearly through the center of the finest wheat region on the face of the earth. Nearly 300 miles further nort another great trans-continental railway is being constructed, and our Canadian neighbors even contemplate building a railroad having its northern terminus on the shores of Hud son's Bay. It will thus be seen that to the north and west of Minneapolis is a vast and productive agricultural region, extending far up into the British possessions on one side, and losing itself in the mountains of Montana on the other It is capable of producing wheat enough to supply the world, and the water powers of Minnesota alone are capabl of converting the larger part of its product into flour. It embraces within its limits immense forests of pine and hard wood, and mines of iron, copper, silver, and gold. Natur has provided in abundance the elements necessary to the support of a great population, and the population is now coming.
It is only within the last few years that a systematic effort has been made to develop this valuable section of the na tional domain. The success of the pioneer settlers has been such as to attract the attention of others seeking homes in the West, and the stream of immigration thus started has suddenly swollen to gigantic proportions. Last ycar the set tlers poured into Western Minnesota and Eastern Dakota by thousands; this year they are coming by tens of thousands As yet only a tithe of the magnificent wheat lands of the western portion of this State are under cultivation, and the sod of the greater part of Dakota's fertile prairie is un broken. There is a steady exodus from the eastern part of this State and from Wisconsin and other States, of young men and old men, to the " promised land," which, if it doc not literally flow with milk and honey, docs promise an abundant harvest and a competence to those who are willing work hard and wait patiently
It cannot be doubted, the Miller remarks in another con nection, that this great accession to the wheat growing ter ritory of the United States will have a marked influence on the milling industry of the country. With an abundant supply of breadstuffs prices must rule low, and the margins in flour manufacturing be small. Every effort of inventive skill will be made to cheapen the manufacture and bette the product. The inevitable result must be that the making of wheat into flour will be done in large mills employing immense capital, and that the class of small combined mer chant and custom mills will become a thing of the past. The present high standing of spring wheat flour, which many have thought and some have hoped would be lost with the exhaustion of the Minnesota wheat fields, will be main tained through the superabundant supply of the choicest kinds of hard wheat from the new fields now being opened.

## scientific Views of Nature.

Who does not see that Galileo, Descartes, Newton, Lavoisier, Laplace, have changed the foundation of human thought in modifying totally the idea of the universe and its laws, in substituting for the infantile imaginings of non-scientific ages the notion of an eternal order, in which caprice and particular will have no thought? Have they diminished the universe as some think? For my part I think the contrary The skies as we see them are far superior to that solid vault spangled with shining dots and upborne some leagues above us by pillars which contented the simpler ages. I do not much regret the little spirits that had wont to guide the planets in their orbits; gravitation does the work much bet ter, and if at times I have a sad remembrance of the nine angelic choirs wheeling round the orbs of the seven planet and for the crystal sea that lay at the feet of the Eternal, I console myself with the thought that the infinite into whic we look is really infinite, and a thousand times more sublime to eyes of true contemplation than all the azure circles of Angelico of Fiesole. M. Thiers rarely allowed a fine night to pass without gazing upon that boundless sea. "It is my mass," he said. In how far do the chemist's profound views upon the atom surpass the vague notions of matter on which the scholastic philosophy was fed!-Renan.

## Clothes Moths.

To keep furs and woolen goods from moths close wrap ping in paper is enough, though a little camphor may be pu into the package to keep off other insects. Any paper will do if there are no holes in it, and no openings are left for the moth to creep in. Of course care must be taken to have the articles free from moths when put away.

## to inventors.

An experience of more than thirty years, and the pre-
paration of not less than one hundred thousand applicaparation of not less than one hundred thousand applica
tions for patents at home and a.broad, enable us to understand the laws and practice on both continents, and
to possess unequaled facilities for procuring patents to possess unequaled facilities for procuring patents
everywhere. In addition to our facilities for preparing drawings and specifications quickly, the applicant can rest assured that his case will be filed in the Patent of-
fice without delay hice without delay. Every application, in which the fees
lave been pald, is sent complete-including the modelhave been pald, is sent complete-including the model-
to the Patent office the same day the papers are signed
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his patent through the scientific American Patent his patent through the Scientific American Patent
Agency. it insures a special notice of the invention in
the ScIENTIFIC AMERICAN, which publication often opens negotiations for the sale of the patent or manu-
facture of the article. A svnopsis of the patent laws in foreign countries may be found on another page, and persons contemplating the securing of patents
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E. \& F. N. Spon.
No. 24, Vol. VII., contains proceedings of meetings eld November 13 and November 27, 1878. At the first pling and Cable Lifting," by A. Jamieson, and "Grapnels for raising Submarine Cables in Deep Water," by Francis Lambert. Both papers are abundantly illustrated, as also is the paper read at the later meeting by
Major C. E. Weber, describing multiple and other teleMajor C. E. Weber, describing multiple and other tele The Flora of Richmond County, New
York: By Arthur Hollick and N. L. York: By Arthur Hollick and N. L.
Britton. 8vo, paper, pp. $36 . \quad$ Price Britton.
50 cents.
Students of botany in and about New York will find his a handy catalogue of the flora of Staten Island will be specially helpful to collectors. The list contains some rare plants, and comprises nearly all those ennsome ra
merated
York.
I
mproved Dwellings for the Laboring
Classes. New York: G. P. Putnam' Sons.
cents.
An uncommonly valuable pamphlet, showing how the and wholesome housing fant the poor can be profitably met. The success of Mr. Alfred T. White in providing such tenements in Brooklyn proves beyond question or the laboring classes in New York will pay thei tary advantages of such buildings to the city, would be tary advanta
ncalculable.
Economic Monographs. New York: G. P. cents.
No. 11 of this series of pamphlets contains the Hon Carl Schurz's address on Honest Money and Labor, de ivered in Boston, last October. It may be read with profit by any one inclined to harbor " inflation " notions.
No. 12 , of kindred spirit, is a discussion of the history No. 12, of kindred spirit, is a discussion of the history,
and merits of the present system of National Banking, y M. L. Scudder, Jr.
No. 13, Hindrances to Prosperity, is a lecture on causes which retard financial and political reforms in the
United States, delivered before the New York Free Trade Club by Simon Sterne.
No. 15 considers International Copyright in some o Mr. George Haven Putnam, puts very forcibly the Ir. George Haven Putnam, puts very forcibly the
ethical and political reasons for making the legal reco nition of brain work as property independent of national
boundaries.

The Art of Scientific Discovery. By G. Gore, LL.D., F.R.S. London: Longmans, Green \& Co. 12mo, pp. 648. Dr. Gore aims to describe the nature of original
scientific research, the chief personal conditions of scientific research, the chief personal conditions of
success in its pursuit, the general methods by which ciscoveries are made in physics and chemistry, and the art and not a science, a method of practical study, not a collection of laws, Dr. Gore endeavors to show how the investigator must proceed if he hopes for success.
Whilst great aptitude for scientific discovery must, he says, like any other rare and peculiar ability, be born in the man, it is certain that it may, like those other natural abilities, be assisted by advice and developed by
experience; and out of the stores of personal experience as an investigator, and a wealth of fact and illustration gathered from the experiences of others, the attempt is made to show how steady thought, self development, in-
dustry, and perseverance, rightly guided, may lead valuable discoveries. The work will prove a useful addition to any student's library. It is well indexed. Coal: its History and Uses. $\begin{gathered}\text { Edited by } \\ \text { Professor Thorpe. London: Macmillan }\end{gathered}$

Professor Thorpe. London: Macmillan
$\&$ Co. 1878. 8vo, pp. 363 . Price $\$ 4$. Ten admirable lectures on coal, by Professors Green, College, England. The geology of coal is treated by College, England. The geology of coal is treated by
Professor Green; the plants and animals of the coal period, by Professor Miall; the chemistry of coal by
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political aspects. Professor Rucker discusses coal as a
a political aspects. Professor Rucker discusses coal as a
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wood cuts, and is well indexed.
Thirty-seventi Annual Report of the
Board of Education, of the City
and County of New York.
The New York Board of Education has now 261 schools and departments under its control, on which about $\$ 3,000,000$ are annually expended. The total number of pupils enrolled is about 240,000 , with an
average attendance of nearly half that number There average attendance of nearly half that number There
are besides 15 corporate schools participating in the school
A Revised List of the Birds of Central New York. By Frank R. Rvo paper pp. 45.
This list is highly commended by Dr. Elliott Coues as worthy of being regarded the leading authority upo he Ornithology of Central New York.
Progressive Japan. By Gen. Chas. W.
Le Gendre. San Francisco: Le Gendre. San Francisco: A. L. Ba
croft \& Co. Croftato.
In this critical study of the political and social need has not failed in his design to throw light,and very clear light, upon the present situation of affairs in the
Mikado's Empire. He has gone further, and by tracing historically the influences involved in the recent and progressive transformation of the social and political
condition in Japan, he has made possible an intelligent orecast of the future of that remarkable people.
Fuel: Its Combustion and Economy. Philadelphia: Henry C
12mo, pp. $394 . \quad \$ 2.25$.
This volume contains an abridgment of c. Wye Williams' treatise on the combustion of coal and the
prevention of smoke; T. Symes Prideaux's work on the "The Economy of Fuel;" and a review by the
cditor, D. Kinnear Clark, of recent practices in the comeditor, D. Kinnear Clark, of recent practices in the com-
bustion and economy of fuel. In the latter part will be found much fresh information touching the use of other uels than coal, and desco the use of gas and powdered fuel in metallurgical and other operations.
Transactions of the Illinois State Hor-
TICULTURAL Society For 1877 . Edited published by the Society.
Contains the proccedings of the twenty-second annual meeting of the Illinois State Horticultural Society; the proceedings of the eleventh annual meeting of the Hor-
ticultural Society of Northern Illinois; and the trans actions of the Warsaw Horticultural Society It braces several important essays and discussion of subjects relating to scientific and practical horticulture; and some valuable descriptions of the State Entomologist,
Professor Cyrus Thompson, and others, of insects afProfessor Cyrus Thompson, and others, of insects af on
fecting horticulture. Professor Thompson's report on insects injurious to the vegetable garden will be found The American Ship:
The American Sliip, published at No. 3 Park Place New York city, terms $\$ 3.00$ per annum, John W Griffiths editor, In the present low state of the shipping in terests of the country our legislators and shipowners will do well to obtain the best light on this subject.
Fromour knowledge of the editor (who is the author of several works on naval architecturc), we believe th
can have their needs supplied in the American Ship.

##  <br> HINTS TO CORRESPONDENTS

No attention will be paid to communications unless
accompanied with the full name and address of the writer.
Names and add
Wiven to inquirers
We renew our request that correspondents, in referring name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries a reasonable time should repeat them
Persons desiring special information which is purely of a personal character, and not of gencral interest,
should remit from $\$ 1$ to $\$ 5$, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.
Any numbers of the Scientific American SuppleMENT referred to in these columns may be had at this
office. Price 10 cents each. ffice. Price 10 cents each.
(1) G. A. H. asks for an explanation of the cause of the rise and fall of the barometer, that is, the cause of changes in the air's pressure. A. The course
of the barometer is generally in the opposite direction to that of the thermometer: that is, that when the temperature rises the barometer falls, and vice versa, which indicates that the barometric variations at any given the air, and therefore by its change in density. If the of the atare were the same throughout the whole extent the atmosphere, no currents would be producea, and where the same. But when any portion of the atmosphere becomes warmer than the neighboring parts, its specific gravity is diminished, and it rises and passes way through the upper regions of the atmosphere, whence it follows that the pressure is diminished and
the barometer falls. If any portion of the atmosphere retains its temperature while the neighboring parts become cooler, the same effect is produced; for in this case, too, the density of the first mentioned portion is ess than that of the others. Hence, also, it usually happens that an extraordinary fall of the barometer at one place is counterbalanced by an extraordinary rise
at a nother place. The daily variations appear to result prom the licaly produced in the atmosphere by the heat of the sun during the rotation of the earth.
(2) A. D. gives the following method of cutting threads on 3 inch wrought iron steam pipe.
After cutting the pipes to the proper lengths square the ends; then cut off a piece of threaded pipe $11 / 4$ inch long, square the end of it, and drive a wooden mandrel through tand into the pipe to be cut until the two ends meet, then center it in the lathe,and chase it with an ordinary chaser. The chaser I made myself without a hub, the
V being cut with a saw file. Not seeing this plan mentioned in your article on chasing and knurling, I give it for the benefit of some of your readers.
(3) "Reader" asks: Will you please inform me through your columns: 1. How I, having a engines, can get the necessary license to rum a little steam launch for my own amusement this summer?
Will a license be necessary? A. You had better apply Will a license be necessary? A. You had better apply
to steamboat inspectors in your vicinity. 2. With a to steamboat inspectors in your vicinity. 2. With a Jaunch having steel boiler, no tank, no condenser, how
far objectionable would it be to run in salt water (feed direct from outside)? Would it merely be better to go from under seats) or would it be very important? Would the fact that boiler is steel make any difference? $\boldsymbol{K}$.
You should have fresh water tanks; steel makes no You should
difference.
(4) M. K. L. asks: 1. What was the right ascension and declination and longitude of the planets
on April 1, 1879? Professor L. Swift gives us the folowing: The longitudes are as follows


. Is the increase of Mercury's velocity from $0^{\circ}$ to $180^{\circ}$ inform, and what is the rate of increase? $\Lambda$. The increase and decrease of velocity of Mercury is not $0^{\circ}$ to
$180^{\circ}$, but from perihelion to aphelion it decreases, and (5)
(5) W. T. H. asks: 1. How many cells of the larger size of "easily made bichromate batteries" mentioned in Scientific american Supllement No.
159 will be required to obtain a good light from the "simple electric light" described in Scientific Americallon jar give four times as much or 12. 2. Would a jallon jar give four times as much electricity as a quart
jar in the above mentioned battery, supposing the other parts to be proportional? $\Lambda$. No. 3. What size wire hould be used in connecting the cells of a battery? A.
No. 14. 4. Do cells of different elements work well when coupled together, as, for instance, cells of gravity,
(6) C. E. R. asks (1) for a receipt for cementing leather to an iron face pulley to make a belt hold better. A. Try equal parts of pitch and gutta percha. Warm the wheel, apply the cement hot, and lap the ends of the leather. 2. What is best to use on belts to keepp
them from slipping? A. Powdered rosin, or a mixture. of powdered rosin and Spanish white, is sometimes used, but it is evertually injurious to the belt.
(7) J. K. writes: I have charge of a circuating library of over 7,000, and have great trouble in backed books. (The leather bindings I have numbered in gold.) Book binder's paste does only for a short time, but the labels afterwards get brittle and drop off. Can you give me information regarding a real good
substitute for that purpose? It will require to be adhesive and at the same time retain its elas-
ticity. A. Four parts by weight of glue are allowed to soften in 15 parts of cold water for some hours, quite clear. Sixty-five parts of boiling water are now added with stirring. In another vessel 30 parts of starch paste are stirred up with 20 parts of cold water, so thas
a thin milky fluid is obtained without lumps. Into this a thin milky fluid is obtained without lumps. Into this
the boiling glue solution is poured, with constant stirre boiling glue solution is pourea, wilh constarature.
rng, and the whole is kept at the boiling temperatur After cooling, a few drops of carbolic acid are added to the paste, which must be kept in closed bottles to pre-
vent evicoration of the water, and will, in this way,
keep good for years. This paste is of extraordinary
adhesive power, and may be nsed for leather, paper o adhesive power, and may be n
cardboard with great success
(8) St. J. asks: 1. Will you please tell me how I can waterproof some straw board, cheaply an quickly, in a small way? A. Either one of the followin may suffice: 1 . Take of whe was oz . mutton syet, 4 oz ; melt in 1 pint of olive oil Beeswax and yellow rosin, 2 oz, each; melt in 1 pin boiled oil. The solution should be applied warm. or these hair dyes wonld be efficient an harmless: Red wine, 2 oz; sulphate of iron, 18 grains?
A. Will probably have no injurious effect. 3. 1 drachm sugar lead; 1 drachm lac sulphur; 1 oz . oil glycerine, anद pint sof water. A. Not to be recommended, as on
()) L B Wites:
(9) H. L. B. writes: In answer to the query of H . L. K ., I will inform him the steamer Mary Bell was built at Metropolis city, on the Ohio River, in 1875. She was 335 feet long, and carried 12.003 bales of
cotton, being the largest boat on the Miesissippi at the time. She was burned at Vicksburg when six months time.
old.
(10) J. A. H. asks: 1. Is there any advan age in what lightning rod men call "circuit" rods-tha such rods put into the ground 8 or 10 feet. ground olerably dry? A. The only advantage in such an a angement is that it affords a better ground surface. I he ground connections terminate in dry earth, the light ing rod will not prove effective. 2. Are horse sho magnets better than common points, or should point 0 advantage in manetic point 3 What is your pinion of tin roofs as a protection against light ning? How should they be connected with the ground A. Tin roofs, if connected with the lightniny rod having ood ground cornections, may prove an additional pro ection. The ground end of the rod should be forke nd buried in earth that is continually moist. The ef ectiveness of the rad may be increased by filling th The ground end of the rod should be bent away from house. 4. Is it safe to put a rod into a well? A Yes.
(11) J. M. asks: 1. What is the best means of fastening rubber on an iron pulley? A. Use a cement composed of equal parts of pitch and gutta perch elt will run to the large. part of a pulley; but if a wide belt is shorter on one side than the other, will the short
side work to the crown of the pulley? A. Yes. 3. What would be the effect if the pulley was flat on the til it is stretched. 4. What is the crown oiler? A. The shect or plate immediately over the grate bars. 5. What work could you recommend for
general information on the use and care of ma chinery, i. e., size and speed of pulleys and their proper place on shaft, where tightencrs should be used, etc.
I want a work for information on the simple principle want a work for information on the simple principle machinery as well as the most scientinc.
(12) F. D. R. asks: What is best to use t clean a person's hands of red color, such as used in
coloring leather-chief ingredients of color, logwood coloring leather-chief ingredients of color,
(13) G. M. A. writes: I have a gun whicl as all the browning off. Not wishing to go to the exI use to protect it from rust? A. Apply a thin coat o hellac varnish.
(14) J. W. B. asks: Can you give me a re ceipt for making fly paper? A
Amprican, pace $171(12)$, vol. 39 .
(15) A. I. II writes: 1. I wish to make an ecta magnet for a burghanalarm. How many feet of eovered whe should I use on each spool? 2. How what sort of a burglar alarm you intend to make, it will e impossible for us to give you any definite informa ayers of No. 20 wire 3 will one cell of a gravity bat tory be sufficient, here being not more than twenty feet of wire connecting the battery and alarm? A. It is probable that one cell might do; but two
(16) F. N. P. asks how to mount prints or red prints on cloth so that the framed withont a glass in front of them. A. Tac nitable frame; cover the cloth with goorl paste; apply paste to the back of the print, and lay it smoothly o made by diluting $1 / 4 \mathrm{ib}$, of Venice turpentine with gill of alcohol.
(17) R. J. F. asks: Which would penetrat wood farthest, a ball from a pistol held 4 inches from The ball from the pistol held 4 inches distant would penetrate the farthest.
(18) W. \& H. ask if whitewood is a hard wood, to be classed with oak, maple, etc., or a sof ree, botanically Lirodendron tulipifera) is a deciduou ree like the oak, maple, etc. It is not elased betan cally with pine, hemlock, etc. In color the timber (hav ing heartwood and sapwood the same color) is classe with white pine as whitewood; and in texture the wood
(19) " A Subscriber" states that the largest teamer on the Ohio River is the U.P. Schenck, which is feet shorter, but 4 feet more beam, than the Golde Shenck, of Vevay, Ind.
(20) E. C. J. writes: There are many of mechanics in this city who own our homes, and we soil is very strongly impregnated with alkali in low
places, so much so as to show white on the ground; in What places only enough to slightly discolor the soil practicable to use? A. A heavy top dressing of manure intimately mixed with clay. The decomposition of the manure forms acids. The alkali unites or neutralizes the acids as they are formed. In consefuence of this the solibecomes sweeter or more propitious to vegeta tion, while at the same time it will cause the vegctabis e the case. The addition of the clay is to reduce the strength of the mixture, and otherwise prevent injurious action of the strong stimulants upon growing vegeta-
(21) B. B. asks: What is the difference of he electric current produced by Daniell's, Grove's, and electro-motive force of the Daniell cell is 1.079 voly and the various sulphate of copper elements are about he same. The Grove 195, Bunsen's nitric acid $1 \cdot 964$, 1095. Electro-motive force and intensity are the same
(22) W. H. B. asks: Can you inform me hat will keep a solution of paraffine with linseed oil in liquid state, and not destroy its drying qualities
Minerals, etc.-specimens have been re cived from the following correspondents, and xamined, with the results stated:
J. H. B.--No. 1. Juadging from your description they are probably quartz crystals containing crystals of tour maline.-No. 2. It is doubtless banded agate; some

## COMMUNICATIONS RECEIVED

 On Squaring the circle. By G. O. v. R On Vehicle Wheels. By G. A. H.On Scarlet Fever. By T. B. Mc. On the Metric System. By G. J.
Better Late than Never. By A. R. C.
On Suspended Animation. By G. F. A Voice from the Dominion of Canada. By J. G Telephone Circuit. By F. W. W.
On Squaring the Circle. By W.D. On Electric Light. By W. A. S.
On Solar Circulation. By E. F.D

## [OFFICIAL

INDEX OF INVENTIONS for which
cetters Patent of the United States April 22, 1879,

## AND EACH BEARING THAT DATE

[Those marked (r) are reissued patents.]
A complete copy of any patent in the annexed list, urnished from this office for one dollar. In ordering please state the number and date of the patent desire nd remit to Munn \& Co., 37 Park Row, New York city.
erial machine, H. Badgley
gricultural implement, J. ................... 214,546 ir for motive power, device for using com ir for motive power, device for using com
pressed, L. Mekarski (r) .................... . Album clasp, J. C. Koch, Jr
 Baling fibrous material, press for, G. D. Luce Baling press, J. Wilkes. Saling press, G. Wyc
Ball trap, M. E. Card
Bed bottom, spring, F. C. Mitchel
Beer, fining, J. Gropp........
Belt fastener, W. L. Shigley
Belt fastener, W. L. Shigley
Bench knife, G. S. Derr....
Binder for indexing and preserving tiles, tempo rary, T. Orton...
Boiler feeder, D. Hess ...
Boiler saddle, J. F. Allen
somb lance, T. W. Roys
Boot and shoe sole and plug, J. O. Gardell.
 Bosom board, J. Boger.....
Bottle stopper, A. E. Rich sottle stopper and stopper fastener, C. H.
Bottle stopper fastener, T: A. McFarland Box dressing machine P. B. H.S. Smath
Bracket. F. O. Worthley .......
Brake mechanism, E. A. Whit
Brake shoe, J. M. Christopher .....................
Bricks and other articles from calcareous clay
process and apparatus for manufacturing
Bridge, swing, H. F. Snyde
Buckle, V. A. Coleman.
Buckle, E. A. Smith
Button, sleeve, W. L. Bund
Button, sleevee, L Rubens.
Cane juice bleacher, E E Levice for, J.L............
Cap, A. Meyering
ap, child's embroidered,
Car coupling, w. L. Harve
ar coupling, J. Witsi1
ar coupling tool, McCarthy \& Osborn.
Car heater, J. A. straight
ar replacer, D. Russell
Car shunter, H. S. Willis..................
Carbureter and regulator, J. Ruthven
Carriage, A. Bink
Cartridge, L. A. Merriam
Caster or cruet stand, table, H. J. Davies Chain, driving, C. Wheeler, Jr.

Chamber drill for driling rock for blasting pur poses, M M. Shur...............
Chandelier, extension, J. T. Bruen Chandelier extension side support, J. 'T. Bruen hurn and ice cream freezer, M. Swihar Clothes pounder, W. A. Moore
Clothes pounder, C. M. Reed
Clothes reel, Brown \& Craw. Cock for fluid pressure bra
Copying and recording machine, C. Windrath Corn cribs, trap attachment with, A. Harper. Corn sheller separa
Corset spring, F. Meinberg
Cotton press, W. J. Butts.
Cutlery, attaching handles to...... Fishe...
Damper, A. J. Redway .....................
Damper, A. J. Red way ............................ Damper regulator for steam
Dash board, T. W. Gwinn
Derrick, portable, J. Uriell ................. .
Drawing frame stop motion. H. C. Grayson..
Electric lamp carbon float, Molera \& Cebrian.
Electric light, T. A. Edison........................
Electric light regulator, Molera \& Cebrian..214. Electric light regulator, Molera \& Cebrian..21 End gate, wagon, J. M. \& J. H. King. Fare box, W. H. Hornum
Faucet, M. Soellinge
Fence, Farr \& Easton .................
File, bill, W. H. Russell.............
Fire extinguisher, W. R. Ferguson
Fishing reel, L. T. Dickson......
Flour, etc., bin for, E. S. Bliss..
Flue cleaner, E. G. Felthousen.
lue cleaner, E G Felthou
Gaiters, elastic gore for, G. . Schiling.
Gas burner, w. H. Russell...... ......
Gate, N. Y. Shaw... ....................
Glass, melting and making, G. Leuff Glass, metting and mating,
Clove fastener, w.H. Storey.
Grain meter, R. H. Edmiston

A. Smith, Jr...................... Grain toller, D. Waugh
Grate, J. W. Reynolds
Grating, window, J. W. Snap
Gun wiper, T. Y. Brown........
Hame attachment, C. H. Allen
Hame attachment,
Harrow, H. M. Keller
Harrow, G. Lettenmye
Harrow or drac, spring, D. Waterbury............
Harvester rake fender, A. K
Hay rake, horse, R. Ellwood.
Hay rake, horse
Hay rake, horse, C. Scholz.....
IIedge trimmer, T. V. Nichols
Hog scraper, R. C. Tompkins
Horse power, D. Hess......
Horseshoe, A. J. Bidleman.....
Hub, vehicle wheel, , T. H. Guard
IIdrostatic press, T. J. McGow
Mydrostatic press, T. J. McG
Knitting machine, W. H. \& G. D. Mayo
Knitting machine, w. H. Pepper..........
Knob attachment, J. C. Hacker........
Lamp and reflector su
Lathe, button, C. H. Orcutt
athe for turning rings of cellulock wood......

Leather articles, making, G. V. Sheffie
Lightning rod coupling, E. C. Bacon...
Lightning rod coupling, J. w. Fritsch
Lightning rod coupling, J. W. Fritsch......... .
Liquid drawer and measurer, A. F. Lapham (r)
Liquid mixer and imbiber, W. H. Brown.... ...
Liquid mixer and inbiber, W. H. Brown..
oom, R. H. H. Huth
Loom shuttle operating mechanism, o. O'Reilly.
Lubricant, W. Smith...............
Lubricating device, W. J. Faul ..
andrel. tube welding, A. Telfer...........
Mane comb, H. H. Sibley
Metallic can, G. H. Perkins.
Metallic can, Perkins \& Brown
Metallic can, Perkins \& Brown...
Middlings separator, S. S. Shave
Milk, preserving, C. A. Catlin ...
Millstone dresser, D. L. Ellis.
Millstone driver, W. F. Coch
Motion converter, R. Gray
Motion, mechanism for converting reciprocating
into rotary, Goodwin \& Roberts ........... ..
Music holder, B. M. Ayres
Musical instruments, adjustable key board for
H. Heubach

Oil or other cans, H. Sangster...........................
Oxidizing and chloridizing furnace, W. T. Rickard
Padlock, T. H. Wichert...
Paper bag maker, s. Arkell (r)
Paper box, $\mathbf{C}$. K. Hamilton, Jr.
Passenger recorder, , B. Crane .................
process, H . Wuerz.
Pen and pencil case, J. W. Spear
Pianoforte action, grand, $\begin{aligned} & \text { E. Westerm } \\ & \text { Pipe wrench attachment. P. Pepler }\end{aligned}$
Planter, corn and seed, G. W. Mille
Plow, J. H. Burghardt
pressure accumulator hydraulic, T. Shaw
Printing film, B. Day
pump, C. 'Tyson.
Pump and blower, rotary, Phinney \& Robertson
Pump, lift and f rce, W. G. Fawcett
Pump, steam, Tregoning \& Hastings
Quartz, etc., apparatus for pulverizing metallife
Railway safety switch, J. T. Halsey
Railway switch, J. T. Halsey
355 Rein guide for bridles, check, B. A. Dennis.

|  | Rein hook, C. I. Calvert. |
| :---: | :---: |
| 214,720 | Ribb |
| 24,618 | Roc |
| 214,549 | ng mill |
| 214,729 | Rotary engine, D. Ab |
| 214,577 |  |
|  |  |
|  | tracting, e.'r. Gennert. |
| 214,485 | Sash tightener, F. J. |
|  | Saw handle, crosscut, N. Mosh |
|  |  |
|  |  |
|  |  |
|  | Screw machines, mechanism for operating the |
|  |  |
|  |  |
|  | ing maehine button holer, J. W. Blodge |
| 14,512 | Sewing machine shuttle bobbin. D. M. © 'hur |
| 24,619 | Sewing machines, mechanism |
|  |  |
|  | allo |
| 214,507 | R. W |
| 214,656 | onvertible, T. T. H. Har |
| 1,505 | Sla |
|  |  |
| 214,64 | Smoke condenser, etc., J. Mars |
| 214,516 | d trimmer, H |
| 214,6 | Spinning |
|  | Stamp, lranding, F. O |
| 214,637 | Stamp, canceling. G. W. Stephe |
| 214,509 | Steam boiler, G. D. Daly |
|  | Steam boi |
|  | inc. D |
|  | nd other hard |
| 214,499 | cleaning, R. S. Jennin |
|  | pipes, machin |
|  |  |
|  | ves, grate and fire pot |
| 214,995 | syringe, J. I. Connable |
|  |  |
|  |  |
| $214,728$ | Tank hoop. F. P. Wares ......................... . 214,536 |
| 214712 | Tea and coffee pot spout, |
|  |  |
|  | ter applia |
|  | Thill coupling |
|  | Thill coupling, S. T. |
|  | Tobacco, che |
|  | baceo pipe, J. Riedel |
|  |  |
|  |  |
|  |  |
|  | Truck, ear, P. Praechter |
| ,93 | ck frame, car, M. Ken |
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|  | Truss hoop, J. w. Ma |
|  | ting and untwisti |
|  | A.T. Sherwood |
|  | Valve, relief, D. F. |
|  | Vapor burner, W. H. Smith (r) ................... 8,486 |
|  | Vehicle running gear, C. Oester.................. 214,579 |
|  | tail piece, J. E. Weaver |
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|  | gon running gear, R. W. Davi |
|  | Wagon spring, L. Pulliam........................ 214,584 |
|  | wagon standard, L. W. Fr |
| 214,610 |  |
|  | Wall pendant and brack |
|  | shing machine, D. D. McIntyre |
| 214,504 | h case, |
|  | er wheel, J. Eberso |
|  | nhef |
|  |  |
|  | Whiffetree, spring, T. Maitland |
|  | Wick rai |
| 214,561 |  |
|  | Window, dust excluder and ventilating, w. J. Orr 2 |
|  | mill |
|  | harbing ma |
|  | W ire straightener and cutter, Cr |
|  | Wood turning machine, F. Hi |
|  | apper for samples, J. F. Tyrrell |
|  | Yarns, finishing, C. Hastings |
|  |  |
|  | TRADE MARKS. |
|  |  |
|  | nying mearine, A. |
| 214,617 | rtriages and percussion caps, Eley Brother |
| 24,701 | Chewing and smoking tobaceo, brown \& Hall |
|  | Cigars, cigarettes, and smoking and chewing to- <br> bacco, J. Baron \& C'o. ......... .................. 7, ${ }^{2} 006$ |
|  |  |
|  | bacco, Kerbs \& Spiess ..................... |
|  | Cigars and |
| 214,730 | ugh sirup. J . |
|  | uggists' or medicinal preparations, J. A. Heintzelman |
|  |  |
|  | s, The Heck limovision and P |
|  | Hlats and caps, Abbott \& Gibson |
| ${ }_{214,621}^{214,698}$ | Horse hay rakes, Ithaca Agricu |
|  |  |
|  | uminated or box signs |
| $\begin{gathered} 341,603 \\ 24,638 \end{gathered}$ | Lawn mowers, Mast, Foos |
|  | Malt extracts and malt extract preparations, J.Hoff 7, |
|  | Paints and colors, Parker, Coit \& Co |
|  | 11s, Spence |
|  | Post nasal syrnges, Carr \& Williamson............. 7,334 |
|  | Preparation for coloring butter, J. ©. |
|  | Sheep medicine, C. E. Williams \& Co. |
| 214,568 | Smoking and chewing tobacco, $\Lambda$ |
|  |  |
|  |  |
| ${ }_{214,736}^{214,595}$ | Vessels or apparatus for cooling milk and raising cream, Vermont Farm Machine Company .... .. 7,220 |
|  | terinary medicines, Hesselroth \& Camph ........ |
|  | erinary medic |
|  | ashing cream, Cincinnati Melophine |
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|  | DESIGNS. |
| 214,555 | Bracket, J. B. Sargent............................. 11,170 |
| 214,726 | Casters, J. J. Adgate ..................... ...... 11,166 |
|  | cloth, C. T. \& V. E. Meyer ............... 11,168, 11, |
|  |  |
|  | Spoons and forks, H. W. . Hirschfeld................ 111111 |

English Patents Issued to Americans. Fare registers, A. Hanee, New York city. Filters, J. Grant, Boston, Mass. oil cans, G. W. Banker, Brooklyn, N. Paper cutting machinery, C. Cranston, Brooklyn, N. Y.
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