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THE NEW YORK AND LONG ISLAND BRIDGE AT BLACKWELL'S ISLAND, NEW YORK CITY.-[See page 294]]

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a graceful act of international courtesy
We mentioned in our previous issue that the manu script $\log$ of the Mayflower had been delivered to the United States through its representative, Ambassador Bayard, on an order given in the Consistory Court of London. In this issue we present our readers with a photographic reproduction of this priceless relic, which, in point of its unrivaled historic interest, may be said to stand quitealone.
The manuscript volume of the log, at the time of the petition for its removal to the United States, formed part of the library of Fulham Palace, the residence of the Bishop of London, and among the precedents which were quoted on behalf of the petition was the case of the Library Company of Philadelphia. This company discovered that certain manuscript volumes presented to the library in 1709 formed part of the national archives of Great Britain, as was proved by the fact that they consisted of official correspondence which bore the sign manual of Janes, $I$ and of Elizabeth The volumes were at once restored to Great Britain, and the Master of the Rolls, Lord Romilly, into whose official care they passed, acknowledged the great obligation under which the British nation had been placed. and expressed his conviction that such acts of courtesy and friendliness would tend to draw closer the ties connecting the two countries.
The return of the log of the Mayflower to this country has been made with the same readiness and in the same friendly spirit which characterized the Philadelphia transfer, and, if anything, we are placed under an even greater debt of obligation than that which Lard Romilly acknowledged on behalf of England in the previous instance. Without depreciating in the least degree the generous spirit in which the Philadelphia transfer was made, it may be pointed out that the British archives which were voluntarily surrendered related to England alone, and had no historical interest to connect them with this country. The records of the Mayflower, on the other hand, have naturally a great intrinsic interest for the English people, as being thestory of the struggles of early English colonists who had the full sympathy of the middle English classes, from which they came and of whose sterling qualities they were faithful exponents.
The fact that there was no opposition to the request of Ambassador Bayard, and that, after this valuable document had been over a century in their undisputed
possession, it should be so freely surrendered at our first request, is another striking evidence of the friendly feeling unselfishly entertained by the English people toward this country.

FREE DISTRIBUTION OF SEEDS BY THE GOVERNMENT
There is a growing agitation against what is known as the free distribution of seed by the government. The system is too well known to the majority of our readers to need any explanation; but for the benefit of city residents it may be said that the government has been in the habit of doling out annually to Congressmen for distribution amiong their constituent with the $\$ 140,000$ worth of seeds. This has from the users as to the results obtained. Whatever theoretical advantage there may have been in the proposal, it has failed utterly to produce any practical results, and according to all reports the experiment has degene rated into a positive farce. The United States Agri cultural Department in its report on this subject says "While one purpose of the law was to secure re-
ports from the receivers as to the results of actual ports from the receivers as to the results of actual
experiment, the reports actually received did not amount to one-hundredth of one per cent of the per sons supplied. A careful review of the department reports, especially those of the chiefs of the seed division during the past decade, in which over $\$ 1,000$, 000 was expended for free seed distribution, fails to re veal a single instance of benefit to agriculture attribu table to this distribution." In the face of this officia statement, one asks with no small amount of bewilder ment, why did the last agricultural bill, which re cently passed both houses of Congress, contain an appropriation of $\$ 150,000$ for carrying on this palpa ble folly? If Congressmen can see any sound ethi cal or political reasons for a paternal distribution o seeds, why should they stop just here? Why not ap propriate another $\$ 150.000$ for spades, plows and fertil izers? As a matter of fact, the sristem is wrong in principle as well as a failure in practice, and it is to be hoped that this year will ser tha last of it.

## the fastest vessel afloat.

It is a great trium!h for the "rotary impact" form of steam engine that the first one of this type fitted to a steamship should have driven it at a speed far in excess of the world's record, yet this is what has re cently been achieved by the engines of the torpedo boat Turbinia. This little vessel of 100 feet length, 9 feet beam, and $441 / 2$ tons displacement, was built at Newcastle, England, specially for a marine trial of the compound stean turbine designed by the Hon. Charle Parsons. The Parsons turbine. utilizes the steam in |three stages and has shown remarkable economy, an
engine of this type which is at work in the electrio works, Cambridge, England, having achieved a. con sumption of $15 \cdot 1$ pounds of steam per indicated horse power per hour. The Turbinia was at first fitted with a single engine and screw, and in the trials the "cavi tation," or vacuum formed behind the propeller, was such that very disappointing results followed. The single turbine was removed and replaced by three separate turbines directly coupled to three screw shafts, the turbines being respectively the high pressure, in termediate and low pressure elements of a trible expansion engine. The results were truly remarkabie, a speed of 29.6 knots being realized. After further ex periment to determine the proper pitch for the screws, a series of trial runs were made on April 1 of this year, when a mean speed of 31.01 knots an hour was realized. The particulars of the run were as follows :

## Revolutions of engines (mean)......... .......................................................... 200 lb. <br> Thrust, horse power (calculated). <br> Indicated " " ${ }^{\text {Consumption of steam per indicated horse power per }}$ <br> hour ............................................ 15

Nine days later the Turbinia realized a speed of 323 knots an hour, thus surpassing the world's record by about a knot and a half. This is equivalent to $373 / 4$ miles an hour, or equal to the average speed of many so-called express trains.

## WAR MEASURES IN TIME OF PEACE.

The naval armor question seems to be getting into a state of hopeless entanglement, and the proposal of Senator Chandler that the government shall forcibly seize the plant of the Bethlehem Iron Company and proceed to make its own armor plate therewith simply makes "confusion worse confounded." The law by which the government would be enabled to take pos session of these works for the manufacture of war material is intended to cover cases ot emergency in time of war; but it has never been construed to give the government the same right in a period of profound peace such as the present. It is reassuring to learn that the bill is likely to receive very little, if any, sup port. Secretary Long's letter to Congress relative to the bids in answer to the department's advertisemen of March 10 states that the department did not feel justified in accepting or rejecting the bid of the Illinois Steel Company, and points out that the government is liable to incur heavy expense due to the delay in furnishing armor for the three battleships recently laid down, if some steps are not immediately taken to procure the needed supply. The secretary closes by recommending that authority be given the depart ment to make contracts at a price not exceeding $\$ 400$ per ton, "the rate recommended by my predecessor." This figure was arrived at as being a just price after the question had been carefully investigated by $a$ board of experts, and under the circumstances it look as though the recommendation of Secretary Long was the easiest way out of the deadlock.

## HIGH SPEED TELEGRAPHY

By making use of the alternating current and special designs of receiver and transmitter, two well-known American specialists have succeeded in sending mes ages over a wire at the rate of twelve hundred words a minute, and they confidently assert that between three thousand and six thousand words a minute may be dispatched by the same system between points that are a thousand miles apart. The new telegraphy marks a wonderful advance over existing methods. An ope rator using the Morse key sends only forty words a minute, and by the Wheatstone system about one hundred and fifty words can be sent over a single wire in the same time
This epoch-marking invention, which, if it fulfills ts early promise, will rank as one of the greatest f the century, is the result of the joint labors of Lieutenant G. O. Squier and Prof. A. C. Crehore, and it was first announced in a paper which was read at the New York meeting of the American Institute of Elec trical Engineers on April 20. The paper, with complet illustrations, is published in the current issue of the SUPPLEMENT, and it will be found to be one of the most valuable contributions ever made to the literature upon this subject.
The new scheme, as we have said, uses an alternating in place of a constant current. In the latter, a break in the contact of two wire terminals causes the emission of spark; but if an alternating current be broken at the zero line, that is just where the alternation takes place between a positive and negative wave, there will be no park. The Squier and Crenore device takes advantage of this feature and interrupts and restores the current at the zero points of oscillation. The operator adjusts his instrument until the sparking disappears, at which point he knows that its action is synchronous with the requency of the current employed. Hence these gen tlemen have given their telegraph the name of synchronograph. If the Morse alphabet of dots and dashes is employed, a brak in the current lasting from the be cinning of a positive wave to its end would signify a dot, and a break lasting from the beginning of a posi-
tive wave to the end of the following negative wave would signify a dash. The interruption must last just half a cycle or a whole cycle, a positive and a negative wave together constituting a cycle. The intervals between dots and dashes must also, of course, be either half cycles or multiples of a half cycle.
The transmitter in the experiments consisted of a narrow wheel with a flat metallic periphery, which was rotated at a high rate of speed, which was such that it was an exact multiple of the length of one cycle. The current was transmitted to the wheel by two metallic brushes, which were arranged side by side in contact with the periphery of the wheel. It is evident that the current would ordinarily flow from one brush through the wheel to the other brush; but if a strip of insulating material were pasted on the wheel in the line of one brush, every time it came round and passed under that brush the current would be broken. A strip of paper was perforated with holes of various length corresponding to the Continental Code, which was used in the experiments, and it was carried over the wheel in much the same way as a belt is by a pulley. Just as long as the brushes were separated by the paper the current was intercepted, and whenever the brush reached a hole and touched the wheel the current was restored. The breaks and contacts were arranged so as to occur exactly at the zero point of the alternations, as explained above, so that no sparking occurred.
The receiver was the polarizing photo-chronograph which Messrs. Squier and Crehore designed for use in timing the flights of projectiles. This ingenious instrument was fully described in a paper contributed to the Scientific American Supplement by these gentlemen and published in the issue of January 2 , to which our readers are referred for the full details and illustrations. The current in this instrument passes through a coil of wire which surrounds an instrument called an "analyzer." A ray of polarized light from an arc lamp passes through a series of lenses, and
when no current is flowing the analyzer is in such a position as to shut out the ray. When the current passes through the coil the plane of polarization is rotated in such a way as to permit the light to pass again, and the very rapid flashes of light are recorded upon a photographic plate.

The paper of Messrs. Squier and Crehore closes with a suggestion as to the changes that will be effected by introducing a telegraph postal system. It is estimated, for instance, that it would require only two lines working on their system, if they were in continuous opera tion, to handle the entire postal business between New
York and Chicago, which amounts to about 40,000 letters daily. By the present system it takes three days to receive a business reply between the cities named, but by the aid of machine telegraphy working at the rate of 3,000 words a minute, a letter could be sent and a reply received on the same day.

Our readers will recognize in this proposal some of the features of the Delany system, and the inventors of the "synchronograph" have given very generous credit to this ingenious system in the course of the paper under discussion.

## OUR SALTPETER CAVES IN TIME OF WAR.

Saltpeter, literally rock salt, chemically potassium nitrate, also known as niter, is remarkable for storing oxygen in a solid form. One volume of it has three thousand times as much oxygen as a like volume of at mospheric air. At a certain degree of heat this immense quantity of oxygen combines violently with carbon, thus forming carbonic acid gas, and also set ting free a quantity of nitrogen. Gunpowder contains
about 75 parts of niter to 15 of charcoal and 10 of sulabout 75 parts of niter to 15 of charcoal and 10 of sul-
phur. If ignited in vacuo, the powder quietly resolves itself into gas. But in the chamber of a gun, behind a ball, it explodes with energy and hurls the missile with deadly effect. For this reason saltpeter is essential to any nation engaged in warfare.
Edward Rawson was the first to attempt the manufacture of gunpowder in the New England colonies. In 1639 the General Court of Massachusetts granted him five hundred acres at Pequod, "so he go on with the business of powder, if the saltpeter come." By act of
June 14, 1642, all towns and families were ordered to promote the manufacture of saltpeter. But nothing was accomplished, and in 1648 the General Court voted to indemnify Rawson for his losses in the experiments made. I am indebted to Mr. R. N. Toppan for this authentic information, not found in local histories. the colony
At the opening of the revolutionary war the military stores of New England were mainly kept a Quarry Hill, near Medford, Mass, where they had two hundred and fifty barrels of powder, which was seized by the British on September 1, 1774. The act set the country aflame, and stirred the indignation of Burke, Pitt and Fox. After the news from Lexington and Concord, in 1775, the colonies were scoured for powder,
and less than sixty-eight barrels were found. New York had but one hundred pounds. Lord Dunmore had seized the entire supply in Virginia, and when Patrick Henry demanded its restoration at the head of
troops, he only got its money value and not the powder. When Washington took command of the troops raised by the colonies he " made the alarining discovery that there was not more powder than sufficient to furnish each man with nine cartridges. By great address this dangerous deficiency was conceal
It is remarkable that no American history, so far as 1 know, tells us whence the robbed and impoverished colonies got their powder wherewith to wage the wat of the revolution. A similar gap exists concerning the war of 1812 , when an embargo cut us off from foreign supplies. We are told about almost everything else, but not where we found our saltpeter. That question is now answered.

Among those who resisted the tyranny of Lord Dunmore in stealing the immunition of Virginia were two young men named Thomas Jefferson and James Madison. They were not ouly patriots and statesmen, but were also cave hunters. Among the caves found by Jefferson wa. sone that he named for his friend, "Madison's Cave," located in the rirottoes Ridge, in which also occur Weyer’s Cave and the Cave of Fountains Major Jed Hotchkiss, the veteran map maker and geologist, is my authority for saving that Madison's Cave was mined for saltpeter during the three great wars, of the revolution, of 1812, and of the rebellionprobably the only cave on the continent of which that can be said. But Jefferson found miny other and
richer saltpeter caves, which he describes in his "Notes on Virginia," page 44. He says that one of the largest was on Rich Creek, a branch of the Kanawha, from which more than eleven thousand pounds of niter were obtained. Others were on the Cumberland River, and at least fifty were in the Greenbrier Valley, in one of which Jefferson found the typical megalonyx made famous by Cuvier. His account is all the more valuable because written while the war of the revolu tion was going on, and thus showing us whence the patriots obtained their means to carry it forward. To
a limited extent gunpowder was seized from the enemy, a limited extent gunpowder was seized from the enemy
and a few pounds of saltpeter were made from excava tions under old stables, and by artificial processes, bu the bulk of it undoubtedly came from the caves of Virginia.

Kentucky was originally set off from Augusta County, Virginia, as Kentucky County, in $17 \% 6$, and was made State in 1792. Among its early settlers were strolling chemists who knew of the caves in the Greenbrier Val ley and elsewhere, and hunted for similar ones in the newly organized State. They were richly rewarded Under ledges, in "rock houses" and "rock castles."
they found solid masses of niter weighing from 100 to they found solid masses of niter weighing from 100 to
1,600 pounds. Previous to 1800 there had been found 28 saltpeter caves in Kentucky, from which more than 100,000 pounds of saltpeter had been obtained. These facts led Dr. Samuel Brown, of Lexington, Ky., to make journey of 1,000 miles on horseback, in 1806, in orde to lay them before the American Philosophical Society at Philadelphia. He closed his able paper, probably the first of its kind, with these words: "A concern for
the glory and defense of our country should prompt such of our chemists as have talents and leisure to investigate this interesting subject. I suspect that we have much to learn with regard to this salt, so valuable in time of peace, so indispensable in time of war:" The hought, for it burst upon us in 1812, and we were cut off from foreign supplies. Dr. Brown had estimated that what he termed the Great Cave contained $1.000,000$ pounds of saltpeter ; Scott's Cave, 200,000; Davis' Cave 50,000 ; three others not named, 30,000 . Since then th Mammoth Cave has been discovered, and the W yandot Cave and others in Indiana, and the niter fever almos rivaled the subsequent gold fever of 1849 . We have the authority of Flint's Geography for the statement that during the war of 1812-15, the annual yield of manu factured saltpeter from Kentucky alone was 400,000 pounds, besides what was made in Incliana, Tennessee and elsewhere. Part of this was used at home; bu most of it was carried by ox carts, or on pack mules cross the Alleghan
The term "'saltpet
The term "saltpeter caves' is a misnomer only justified by the general usage. That which is found in these caves, and which is colloquially called "peter dirt," is soil impregnated with the nitrate of lime, whereas true altpeter is the nitrate of potash.
Prof. W. B. Rogers holds that the "peter dirt" is derived directly from the overhanging rocks, which agrees with Dr. Samuel Brown's observation that the water trickling from rocky crevices has the same prop erties as the liquor got by lixiviating the cave clay Dr. Brown says: "The nitric acid is formed within the which it dissolves."
The fact seems to have been generally overlooked that the strata of sandstone overlying the cavernous
limestone is rich in niter. It was from this source that the first supplies of Kentucky saltpeter came. The process was to blast the sandrock and break it into small fragments for the boilers, thus getting niter given up was that the best sandrock was extremely
hard, because of the presence of aron, and it was practically easier and cheaper to treat the nitrous earth found n the caverns.
In order to give some idea of what was once a vital industry of our country, though now wholly abandoned, I shall briefiy describe the work done at the Mammoth Cave, which may be taken as typical of the rest. This includes what was done at the Salts Cave and Dixon's Cave, belonging to the same estate. Dixon's Care was, at some prehistoric time, a part of the Mammoth Cave. As measured by me it is 1,500 feet long. from 60 to 80 fect wide, and about 100 feet high. The floor of this enormous hall is ridged by eighteen transverse rocky piles some 40 feet high and as many thick cut by passageways for convenience. And every block and fragment of those massive ridges was laid there by the old saltpeter miners. By this means they got at the peter dirt to be carried outside for further treatment.
The main works, however, were at the entrance to the Mammoth Cave. Cart roads were made through the more accessible avenues, and from the more distant places, even from rooms three miles under ground, the negro miners brought the dirt in sacks. Hardly a yard of the cave as then known was left undisturbed. Audubon Avenue was particularly rich in nitrous arth. So was Bat Avenue, near the end of which ia the Crevice Pit, the ugliest black hole mortal eve ooked into, and at whose bottom the men though here must lee a nitrous mine. The story has been ften told of the miner's lamp dropped into that black hasm, and the sprightly negro let down as an ani nated plammet, who brought back, not the missing :mm, but a marvelous story whose truth was con firmed thirty years later by the discovery of the socalled Leryptian Temple. The Gothic Arenue was also diligently worked. The shovel and pick were plied from room to room of the main cave, and out through the windings of the Blue Spring Avenue. Abundant boriginal relics were found.
The nitrous earth thus collected was put in hoppers with each a capacity of fifty bushels, and which are till to be seen in the rotunda and vicinity, a few hun dred feet within the cave, where may also be seen the pumps and double set of wooden pipes, one set to bring water from the cascade at the mouth of the cave and the other to convey to the surface the liquor ob tained by solution from the hoppers. The floors of the latter were peculiarly grooved to allow the saturated water to run into the basins, whence it was pumped out to the great iron boilers. When the lixiviated arth had been exhausted, it was cast aside and a ne charge put into the hoppers. These piles of indurated arth extend for a long distance like miniature moun tain chains. The liquor, after sufficient boiling, was poured into another set of hoppers containing wood ashes, whence, by filtration, a clear solution of the nitrate of potash was obtained. This was again boiled down to the right condition for crystallization in troughs, whence, after twenty-four hours, the crystals were taken and packed for transportation.
The proportion of ashes to be used to the nitrified iquor was a source of much perplexity. Too much would "kill" the saltpeter, and too little would leave it "in the grease;" and in either case the salts would have to be run through the hopper again. Ashes from oak are three times as rich in potash as those from pine; and only half as rich as those from elm or maple. Best of all were the ashes made by burning the dry wood in hollow trees, two bushels of which, according to Dr. Brown, were equal in strength to eighteen of oak ashes. It is stated that "the contract for the supply of the xed alkali alone for Mammoth Cave, for the year 1814, was $* 20,000$." That, if correct, gives us an idea of the extent to which saltpeter was manufactured here in the days when Gratz and Wilkins carried on the business exclusively for the Philadelphia market.
Many curious facts might be added as to the antiseptic and sanitary $v$ alue of the atmosphere in Mammoth Cave, which is both chemically and optically pure, except as tainted by torches. None of the deep pits contain foul air. Indeed, the interior air is purer than that which is exterior, showing that its purity is not due to ventilation, but probably to the disengaging of free oxygen in the formation of the nitrate of lime, a theory advanced by Professor Silliman.
In time of peace it is cheaper to import saltpeter from Chile, India and elsewhere than to make it at home. But when the Southern Confederacy was cut off by the blockade of all its ports, it resorted to the caves of Virginia. Tennessee and Alabama, particularly to the great Nicojack Cave, near Chattanooga, for the means f making gunpowder, the process being substantially like what has already been described.
It is strange that these interesting materials of Amercan history seem to have compietely escaped the attention of our best historians. It is certainly of historic moment that, when the fate of the nation trembled in the balances, the mineral contents of our numerous
caverns enabled a waning force to gather new strength, and to prolong war far beyond what would otherwise have been possible. We doubt if victory could have been won in the war of the revolution, or in the war of 1812 , without the aid of the saltpeter caves of Virginia and Kentucky.

## an improved bmoze consuming furnace.

The accompanying illustrations represent, in side and transverse views, both partly sectional, a furnace which is designed to entirely abate the smoke nuisance, completely destroying all smoke and gases, while also being a great economizer of fuel. It is likewise especially adapted to consume the foul air and odors generated in the cremation of garbage in gas works, slaughter houses, limekilns, and all factories and places where


SMITH'S SYORE CONSUMING FURTHG CHAMBER
objection a ble
or dangerous
gases are proimprovement has been patented by S. G. Simitl, of No. 108 Fulton Street, New York City. The opening at the side of the ashpit, as shown in the large view, is connected with a suitable air blast, to insure a $n$ abundant upply of air or the fuel burning on the grate, the products of combustion passing over the bridge wall and backward between pendent box-shaped water legs conmected by transverse tubes, and also down around the mud drum, and upward to the rear of the boiler, and thence forward to the smokestack. The feel water is taken in from the front through a pipe formed in double curves in the top of the fire box, and is thence passed through the pendent water legs and their transverse pipes. and through the mud drum, thus promoting a rapid circulation and causing the water to be heated to a very high temperature before it is fed to the boilers, the water being also purified and incrustation prevented, as the sediment settles in the mud drum. In addition to these features for promoting efficient combustion and the heating and circulation of the feed water, this furnace is provided with a special condensing and gasifying chamber which surrounds the forward end of the boiler and into which foul air, smoke, gases, etc., to be consumed may be passed by means of a pressure blower, whether they be drawn from the stack or from any other source. The foul air and gases, etc., are passed into one leg of this chamber, as shown in the small view, a jet of steam commingling with the air and gases in
their course around the boiler to the point of discharge their course around the boiler to the point of discharge
from the apertures over the grate bars, in the bridge from the apertures over the grate bars, in the bre. By this means complete control may be had of all the products of combustion which might otherwise be wasted at the stack, and all foul odors from any source


## smith's deodorizer and smoke consuming furnace.

Discovery of Telemeople Dayllght Meteors.
Prof. William R. Brooks, director of the Smith Observator:', at Geneva, N. Y., made an lexceedingly ineresting observation on Thursday afternoon, April 29. While making daylight observations of the planet Mercury, then at its greatest elongation eastward from the sun, he discovered a flight of telescopic meteors passing through the field of the large telescope. This was between three and four oclock, and the sun was shining brilliantly

The flight lasted about half an hour, in which time over one hundred were seen
The meteors were as bright as Vega, or other brilliant stars, when seen through a large telescope, in the daytime. The direction of their flight was toward the sun.

## Sclence Notes.

In connection with the general meeting of the Verein Deutscher Strassen- und Kleinbahnverwaltun gen, which will be held in Hamburg August 6 and 7 next, a street railway exhibition is intended lasting rom August 5 to 9 .
At a recent meeting of a German engineering society, according to the Electrical World, the topic of the evening was: "Elektroautomatischensicherheitspatent eisenbahnaborthuerenverschluss." It must have been an interesting subject.
The famous Victor Einmanuel gallery at Milan is lighted in the evenings with rows of many hundred ras jets placed near the top, and the method of ignit ing these was an important question, says the Progressive Age. It was finally solved by using a miniature electric locomotive running on a track passing close to the burners. This locomotive carries an alcohol torch, and is made to run rapidly over the whole circuit after the gas has been turned on.
It is announced from the University of Geneva that Prof. Dussaud has invented an apparatus to enable the deaf to hear. The microphonograph magnifies the human voice in the same way that a lens magnifies. It is simply a telephone connected electrically with a phonograph, but a far more sensitive phonograph than Edison's ordinary model. A battery of one cell to sixty according to the degree of deafness, is used. Of course, the apparatus is useless in the case of absolute deafness, but such an infirmity is far rarer than is suspected. The London correspondent of the New York Sun, who describes this invention, says that 95 per cent of so called stone deaf persons can be made to hear and understand by I)ussaud's invention. Prof. Dussaud is preparing for the 1900 exhibition an apparatus which will enable 10,000 people who may all be deaf, in the ommon acceptance of the term, to follow a lecture.
When mine host in the ideal country inn, which ain of us seek but none of us find, brings up a bottle of crusted wine covered with cobwebs and dust, this outward and visible sign is taken as convincing evidence of age. We grieve to have to record that the trust may now be misplaced. A bulletin (No. 7) of the Division of Entomology of the United States Department of Agriculture says that in France and Pennsylvania an industry has recently sprung up which consists of the farming of spiders for the purpose of stocking wine cellars, and thus securing almost immediate coating of cobwebs to new wine bottles, giving them the appearance of great age. This industry is carried on in a little French village in the Department of Loire, and near Philadelphia, where Epeira vulgaris and Nephila plumipes are raised in large quantities and sold to wine merchants at the rate of ten dollars per hundred. This application of entomology to industry is one which will not be highly commended.
Professor Forbes, who had just returned from Wady Halfa, expresses a highly favorable opinion with regard to the utilization of the power of the cataracts for generating electricity, and considers the general circumstances of Egypt exceptionally well adapted for its use as motive power, says a cablegram from the Cairo corres pondent of the Times. Irrigation could be extended as well as cheapened by the saving in cattle, and especially in coal, which becomes enormously dear in Upper Egypt, owing to the expenses of transport from Alexandria Professor Forbes considers that the cataract power would be available al the year round for working the rail
may be destroyed at the same time that the efficiency of the furnace is increased and a very considerable saving effected in fuel.

A VERY fine specimen of an egg of the great auk wa recently sold by auction in London. Bidding began at 100 guineas and reached 280 guiness, at which price the egg was secured by Mr. T. G. Middlebrook.
way cotton ginning mills, sugar factories, irrigation machines, etc., also that it could be supplied ove distances of several hundred miles at a cost much below that of coal. Professor Forbes has just left for England, but will return in September to make a com plete survey and present the government with a project for utilizing the electricity to be generated at the Nile cataracts.

## AN EFFICIENT CHIMNEY COWL

The illustration represents a simple and inexpensive chimney cowl, designed to readily accommodate itself to the wind, no matter in what direction it may be blowing. The device has been patented by August Hirschel, and is being introduced by W. H. Boat wright, P. O. Box 2296, New York City. Fig. 1 show's its application, Fig. 2 being a sectional view. The smokepipe has at its upper end an outwardly and

hirschel's chimest cowl.
downwardly extending flange, and within the pipe are two brackets forming bearings for the lower portion of a spindle which forms a pivot for and supports upon its upper end a conical cap. The pivot end of the spindle is received in a socket bearing on the inner side of the cap, the bearing being made of tough glass, porcelain, china, or other material of a character not likely to become quickly worn. To permit the cap to rise slightly, or yield a trifle to the force of the wind, without rising enough to cause the spindle to leave its bearing, chains lead down from the inner face of he cap to a ring loosely mounted below a collar or lange on the spindle. By this arrangement the cap will be tipped to the side presented to the wind, as shown in Fig. 1, until its lower edge engages the coni cal flange on the top of the smokepipe, and the wind will be deflected to either side and prevented from passing down the smokepipe, the cap remaining balanced on the spindle when there is no wind.

## THE HALL BRASS PIPE WRENCH.

A wrench especially adapted for use on brass or nickel plated pipes, and with which the pipes may be turned without bruising or scarring them in the least shown in the accompanying illustration, and is being placed on the market by the Walworth Manufacturing Company, 18 Oliver Street, Boston. Bushings for the different sized pipes, as shown in the small figures, are placed between clamping blocks, the inner one of which has limited movement within a yoke piece, hrough a screw threaded opening in one end of which extends the screw threaded end of a handle rod, by means of which the bushing may be clamped upon a pipe and any desired amount of friction applied by turning the handle. The clamping blocks are finished true and smooth, and with the tool is furnished a set o bushings for different sizes of pipe. The end block is held in place by a slot and pin in the yoke, but may be

the hall brass pipe wrench.
easily slipped in and out. The friction of this wrench is said to be so perfect that it can be used upon the most highly polished pipes without injuring them in he least, while it can also be applied to threadeil brass nipples without injuring the threads.

The Pintsch srstem of gas lighting has now been in troduced in the Sixth Avenue trains of the Manhattan Elevated Railroad, in New York; three hundred cars have been equipped with it. It is a complete success, and a vast improvement over the old system of lighting by oil lamps. It took come years of newspaper agitation, supplemented by an act of the legislature, however, to compel the company to make the change.
$\triangle$ NINE HUNDRED DOLLAR BICYCLE BRIDGE Wherever you find a body of wheelmen, there you may count upon united support for road reform. Pioneer work is always difficult and expensive, and calls for a good deal of persistence to insure recognition. The bicycle craze has now penetrated every part of the country. The army of riders has invaded the South,

The Phonograph in court.
A case recently came up in a New York court where an owner, suing for damages from a railroad company for injury done his property by the noise of passing trains, sought to introduce the phonograph, and thus give to the court direct and practical evidence of the sound vibrations caused by the locomotives and car's


A BICYCLE BRIDGE AT TACOMA, WASHINGTON.

East and West, carrying the desire for better roads into as they were proparated in the apartments of the | East and West, carrying the desire for better roads into | as they wer propagated in the apartet, so that it really seems as though |
| :--- | :--- |
| evaintiff. The court did not finally rule upon the ad- |  | the future rf good roads was assured. It is very satisfactory to note that the good roads movement is not confined to the East, but is very largely in evidence in the far West.

We present an engraving of a cycle bridge at Tacoma, Washington. We are indebted for the photograph as well as the following particulars to Mr. E. Irving Halstead, secretary-treasurer of the Washington] divi sion of the L. A. W.

Many people from the East visit Tacoma every summer. A good proportion of them are wheelmen, and they were surprised to learn in the early part of 1896 that the Wheelmen's Association had decided upon the bridging of the gulch in the southern part of the city which leads to the good roads beyond. The nature of the riding district makes the bridging of the gulch of more importance than the casual visitor may imagine. The opening of the elevated cycle path, which had been built the preceding year, was the means of lengthening the cycle path, so that the riders have now four miles of excellent cycle path from the bridge direct to prairie roads. Since the completion of the bridge, which is the largest cycle bridge in the world, the wheelmen cannot understand how they managed to get to the prairie roads by the inconvenient old route. Many of the citizens were opposed to the building of a cycle path. There was an argument as to how the bicycle lieense money should be expended, and it was finally decided to construct the bridge. Some few hundreds of the wheelmen objected to the license be ing enforced: but they soon saw the benefits derived from the levy, and to-day there is not one of the 2,500 wheelinen who objects to the payment of the $\$ 1$ per annum license.
The length of the bridge at the roadway is 330 feet, the height 110 feet, the width at the top 12 feet, the width at the bottom 50 feet. The trestle is built of $8 \times 8$ timbers thoroughly braced, the bents being 20 inches apart. The total cost of the bridge and approach was $\$ 984.50$.

The management of the local road improvements at Tacoma is admirably divided between the Wheelmen's Association and the L. A. W. The former attend to all the improvements within the city limits and the L. A. W. officials take care of the outside work. The road committee is now at work with new propositions for the convenience and accommodation of the riders, and, as a result of their labors, there will be several small bridges built in Tacoma. Those constructed under the supervision of the $L$. A. W. will bear neatly painted signs. The wheelmen of the district desire to demonstrate their banding together for concerted action. The bridge is a fine example of what good re sults a little money judiciously expended could pro duce. It should be an incentive to those interested in good roads to prosecute the work.

The Paris Fire Brigade authorities are said to be quietly carrying out some trials with a hose van pro pelled by means of a petroleum motor,
missibility or non-admissibility of such evidence, holding the point open for further consideration as the case progressed.

## GOOD WORK IN CHIMNEY MOVING

The accompanying illustration is made from a pho tograph which represents the recent successful moving of a large chimney owned by the Manhanset Improvement Company, at Manhanset, Shelter Island, Suffolk County, N. Y. The chimney is 85 feet high and 7 feet square at base, with outer and inner walls 8 inches square at base, with outer and it weighs nearly 100 tons. It was moved about 950 feet over very rough ground and quite a grade, both up and down. The picture shows clearly the construction of the cradle trusses, etc. The cradle rested on two skids greased on the under side and sliding on greased blocks. The purchase used was a chain capstan, and one horse at 180 fold, and the time occupied in loading and moving was only nine days, with the labor of only four men besides the contractors, W . H. \& C. P. Topping, of Bridgehampton, N. Y. The chimney was placed on its new foundation without a particle of harm. This is the second chimney of the above description moved by the same contractors. The first one was 52 feet high, at Bridgehampton, and in both cases the work was completed without accident.
wo New Yor
Among some animals reently received at the Central Park, New York, was a big elephant named Jewel. As the elephant was being taken through the streets to the Park, accompanied by a crowd of people at a respectful distance, and with her legs so chained that she could take only short steps, she stopped and attempted to turn back, dragging her keeper a little distance, until he stopped her retreat by tying her to an electric light pole. Thus leaving her in charge of an attendant, the keeper hastened

moving a chmaney at manhanset in. y.
the new york and long island beidae, new YORE CITY.
We present in this issue an illustration of the great steel cantilever bridge by which the Long Island Railroad Company expects in due course to run its trains into New York City, and thereby add to the transit facilities of Greater New York. As our readers are doubt less aware, the New York Central and Hudson Rive Railroad is the only one of the trunk lines that possesses a terminus on Manhattan Island, and is able to land its passengers in the heart of New York without the inconvenience of a ferry trip across eitier the Hudson or the East River. Except the New York and New Haven Railroad, which has running privileges over the tracks of the New York Central, all the other companies are compelled to place their termini on the shores of New Jersey or Long Island, and subject their patrons to the delays and greater or less discomforts of ferry travel before they reach the metropolis itself. It was only a question of time before the problen of reaching M্ৰanhattan Island either by bridge or tunnel should be agitated, and at the present time there are three schemes on the New Jersey and three on the Long Islaud side for making a through rail connection. Two mammoth suspension bridges have been designed to cross the Hudson River, one at Fifty-ninth Street and the other at Twenty-third Street, and about a mile and a half below Twenty-third Street is the well known Hudson River tunnel, which has been constructed for three-quarters of the distance beneath the bed of the river. It is also proposed to make rail connection by a tunnel from the lower end of the city to Brooklyn, and by two bridges, the East River Bridge from Delancey Street, New York, to a terminus near Broadway, Brooklyn, and the New York and Lons Island Bridge, which forms the subject of our front page illustration. Although all of the above mentioned schemes are primarily intended to give an all-rail comection with New York City, the bridges will in every case make ample provision for vehicular and pedestrian traffic, and will thus form important thoroughfares to link together the street systems of Greater New York.
The bridge now under consideration will carry the tracks of the Long Island Railroad Company into New York City, which it will enter between Sixty-fourth and Sixty-fifth Streets. A great terminal station will be built on Manhattan Island which will cover the entire block bounded by Second and Third Avenues and the streets above mentioned. The station will be 610 feet long by 200 feet wide, and the platforms will be 54 feet above the street level. The basement will be occupied by the machinery for elevators, etc., and by a large cold storage plant, the space devoted to cold storage alone comprising 480,000 cubic feet. On the central hall 50 by we stores, a large rest be six, and elevators, each having a floor space of 150 square feet. Behind the elevators will be two express rooms. A covered carriageway will lead from Sixty-fourth to Sixty-fifth Street. The space from the carriageway to Second Avenue will be given up to a market. The second floor will be at the same level as the platforms of the elevated roads on Second and Third Avenues. It will contain a large entrance hall 50 feet by 150 feet, several large restaurants, and a number of spacious galleries from which it will be possible to look down upon the warket below. Above the entrance hall on the second floor will be a waiting room, 80 feet by 175 feet, and the various ticket and telegraph offices and bureaus of a large terminal station. Outside the waiting room will be a broad platform extending to the track buffers. There will be twelve tracks in the station, and the whole will be covered by a lofty roof, carried on arched steel trusses, in which liberal provision will be made for lighting and ventilation.
Outside the station the twelve tracks will converge to a massive four track steel viaduct, which will be of standard construction, and will be bil the portal of the great western cantilever is reached. The viaduct approach on the Long Island side will be about a mile in length, the street grade being reached probably at Hulse Street and Middleburg Avenue
The problem of crossing the East River at this point is greatly simplified by the existence of Blackwell's Island in the middle of the river. By locating two piers on each side of the island, and placing the cantilever piers close to the bulkhead lines of New York and Long Island, it has been possible to reduce the length of the channel spans to 846 feet, the intermedi ate span across the island being 613 feet in length. The bridge is built on the cantilever principle, and in its outline it will remind our readers of the high level bridge across the Hudson River at Poughkeepsie. The likeness is merely one of general outline, for in respect
of weight and size the present structure will easily outrank every bridge of the kind in America, and, with one exception, in the world. The Forth Bridge, in Scotland, is the largest cantilever structure in existence, its two channel spans being 1,710 feet in length, and it is likely to remain forever the longest, for the reason that when the distance to be bridged exceeds 1,200 feet it is found that sufficient rigidity can be ob-
tained in a stiffened suspension bridge-a type tha costs considerably less than the cantile
in bridges of exceptional length of span.
The bridge is made up of two cantilevers, each 50 feet long, one on the New York and the other on the Long Island side, a deep parallel truss across the island with overhanging cantilever arims at each end and two intermediate spans, each 350 feet long, sus ended above each channel. Perhaps the most strik ing, and certainly the most handsome, feature will be the six massive piers which carry the structure. Fou of these will practically carry the whole of the weight of these will practically carry the whole of the weight
the end piers being used as anchorages for the inshore the end piers being used as anchorages for the inshore
arms of the end cantilevers. The four channel pier: neasure 45 feet by 85 feet at the base, and will be carried up to 135 feet above high water, the require ments of the War Department calling for a clear head way of 135 feet below the bridge at high water. The oundations are carried down to solid rock, which has been found at from 20 to 50 feet below mean tide. As will be seen from the illustration, they are of very mas sive appearance, the four chammel piers containing 810,000 cubic feet of Commecticut rranite, and the two anchor piers 216,000 cubic feet of the same material anchor piers 2lo, It was originally intended to carry the piers up solid from foundation to capstone, but sulserguently the design was changed by piercing the center with an arched opening-a modification which will add greatly to the architectural appearance of the whole struc ture.
The trusses will be of the well known pin connected Pratt type with divided panels. They will be placed if feet apart and the space between them will be cecupied by four lines of track, those which are laid ext the trusses being used for local trains and the ther for express service. The floor system will be of the standard type, consisting of deep plate steel floor beams, riveted at their ends to the posts and vertica ties, with plate stringers, riveted to and between the floorveams and extending the full length of the bridge beneath the rails.
On the outside of each truss is a wagon way and six foot sidewalk, the sidewalk rails forming the extreme outside line of the bridge. This will be carried upon cautilevers or brackets, which are in reality extensions of the floorbeams. From the ends of the bridge the wagon ways will descend on a regular grade o the street level, and here they will be carried by the posts of the viaduct to which the brackets are riveted shown in our illustration.
The total width of the bridge outside the footwalks will be 98 feet. The greatest depth of the trusse will be 100 feet, measured from center to center of pins, and the total height of the top chords above high water will be 235 feet. The total length of the whole structure between terminals will be two miles. Thirty six thousand tons of steel will be used in the super structure, and the estimated cost of this great work, ncluding the terminals, is $\$ 8,000,000$.
It can well be imarined that the various member of a bridge of this size will be of exceptional size, and perhaps the best idea of this is conveyed by the dimen sions of the steel pins which transmit the weight of one cantilever to the piers. Each of these is 20 inches in diameter, 9 feet 6 inches long, and weighs four tons The many eyebars and compression members that are packed snugly against each other at this point repre sent, therefore, a solid mass of steel nearly ten feet in thickness.
In erecting the bridge, temporary falsework will be built between the two island piers and between the anchorage and river piers. Upon this the island span and the two shore arms of the cantilevers wili be erect ed in the usual way. The ends of the shore arms will b bolted down to the anchor piers. The temporary false work can then be removed, leaving the trusswork self-sustaining. The river or channel arms of the cantilevers can now be built out over the river, the weight of the overhanging parts being counterbalanced by the inshore portion. The center truss is built in the same way, the junction being finally made at the niddle of the span.
It should be mentioned in ennclusion that the bridge will embody in its construction the bes features of the pin connected and riveted systems of bridge construction. The whole of the massive wind and sway bracing will consist of built up plates and angles with riveted connections to the trusses.
Our thanks are due to Mr. A. C. Bedford, treasure of the Long Island Railroad, for courtesies extended during the preparation of the present article.

## A Copyright Decision.

Amberg File and Index Company v. Shea, Smith \& Company, 70 O. G., page 514. An index for the storage of letters is not proper subject matter for copyright It is not a book within the meaning of the word in the Constitution, since by itself, that is, without the letter or which it is used, it forms no medium of informa tion or intelligence. Nor is the inventor of such an index an author as that word is used in the Constitu tion. A monopoly for the index might perhaps hav been secured under the patent laws.

Recent Patent and Trade Mark Decisions.
inperial Chemical Manufacturing Company v. Stein (U. S. C. C. A., 2 d Cir.), 77 Fed., 612.

Neglect to Sue for Infringement.-The patent in thi ase was for a process of dyeing hair and the chemica reparations constituting the dye bath. The defendant sold the patented hair dye for about fifteen years in New York City, during which period of time it seem that the owner of the patent lived in that city but did not protest argainst the infringer of the patent. The failure, however, to make such protest when there is no evidence that she knew of the infringement, excepting that she happened to live in the same city, should not defeat a recovery for the infringement.
Newton v. Buck (U. S. C. C. A., 2d Cir.), 77 Fed., 614. Sale of Patent by a Receiver in Proceedings Supple nentary to Execution.-Buck transferred, in writing, to a firm certain patents, but, accidentally, one patent ncluded in the agreement was omitted in the writing Afterward all rights under the agreement were assigned by the firm to Newton. Then a receiver of the pro perty of Newton was appointed by the State Court in proceedings supplementary to execution. By order of the court the receiver sold Newton's interest in the omitted patent and the purchaser transferred the sam back to Buck. The equitable title that Newton held in the omitted patent by the receiver's sale passed to Buck and a subsequent assignment thereof by Newton passed no interest.

Muller v. Lodge \& Davis Machine Tool Company
(U. S. C. C. A., 6 th Cir.), 77 Fed., 621

Increase of Efficiency Ground for Patentability.-I an inventor has greatly increased the effectiveness of a nechanism, his patent will be sustained although his elements are old and no origiual results are accom plished. The patent in controversy was on a too holder for lathes. The patentee had arranged old ele ments in such a way that by a conjoint use of two nut he much improved the effectiveness and accuracy of old devices serving the same object. The patentee is not only entitled to the conjoint use of the two nuts in combination with the rest of the device claimed, but also to the benefit of every suggested conjoint use of hese nuts which adds to the effectiveness of his mechanism, although not claimed as within the purpose of the invention.
Limitation of Claims.-If the invention patented is not a pioneer or primary invention, and reference letters be used in the clains, they will be limited specifically to the combination of all the element specified; but if the invention be broad and meritorious working a decided advance in the art, it will require something more than the use of reference letters in the claims to limit them to the exact form of device de scribed.
Tool Holders for Lathes.-The Muller patent, No 272,304 , must be limited, as to claims 2 and 4 , to the precise structure claimed by reference letters and the patentee is not entitled to a liberal application of the doctrine of mechanical equivalents.
Steel Clad Bath Company v. Mayor, Lane \& Company
(U. S. C. C., N. Y.), 77 Fed., 736.

What Amounts to Invention.-The fact that one is the first to produce an article having features long lesired, that he has succeeded where many other failed, entitles him to a patent; and this fact, even if there are doubts as to novelty, should resolve the question in his favor. On this ground a claim for bath tub composed of a smooth sheet metal casing having a lining of copper, aluminum, etc., pressed into ose contact therewith, is valid and is infringed by a ub in which an asbestos sheet of very slight thicknes is placed between the casing and lining.
Bath Tubs.-The Booth patent, No. 458,995, has been held valid.
Repairing a Patented Machine.-The fact that a de ice is patented does not prevent the owner from put ing it in order when it gets out of repair, but when it is accidentally destroyed or is practically worn out, the wner cannot make a new machine under the guise of repairing it
Goodenough v. Cary (U. S. C. C., N. Y.), 77 Fed., 827.

Lacing Studs.-The Mathison patent, No. 525,152, for an improvement in lacing studs whereby non metallic, plastic metals, such as hard rubber or cellu loid, may be fastened to the heads thereof by attach ment to a crimped or corrugated flange, has been held void as lacking invention because it was like the old studs in every way except that the celluloid is held in place by minute depressions and elevations called crimps, inst
called lips.
Berry v. Wynkoop-Hallenbeck-Crawford Company (U S. C. C., N. Y.), 77 Fed., 833.

Money Checks.-The Berry patent, No. 268,988, for an invention consisting in providing checks or other papers representing money values with marginal tables of figures to be torn off so as to prevent raising or altering the amount, is void for want of invention over the prior art, especially the Stanfield 1873 patent.

## The Sun and His Relations to the Ea

The sun is the most glorious of all objects. Swedenborg made the sun, in his system, the correspondent of the Deity; the agent by which power and life were given to the inhabitants of surrounding worlds. Of all the energy that keeps things moving on earth, 99 per cent comes from the solar heat. The meteors help and the moon gives us tides; but 99 per cent of all the force that moves our mills, actuates our own hands and voices, comes from the solar rays. If the winds blow, it is because of some disturbance in the air. blow, it is because of some disturbance in the air.
What is the cause? At some point or other the air is What is the cause? At some point or other the air is
unequally heated; masses of air rise; other portions unequally heated; masses of air rise; other portions
rush in to take their place and you have winds estabrush in to take their place and you have winds estab-
lished. If Niagara does not run out: if Lake Superior does not find its way permanently to the ocean; if the Delaware does not stop running; it is because somewhere or other there are pumps running that lift the water back to the source, and those pumps are in the sun's rays. The constructor of the first steam engine says it is " nothing but bottled sunshine." What built the carbon in the stick of wood from which we derive heat? Simply the solar rays putting the elements of heat? Simply the solar rays putting the elements of wood together in a certain way, and when you burn
the stick you are allowing the hydrogen to resume its old combination with the oxygen from which it has been separated before. The power that actuates re-
sults is solar power, because derived from the food sults is solar power, because derived from the food
built up by solar rays. If you use a galvanic battery, built up by solar rays. If you use a galvanic battery,
a zinc and carbon battery with acids in it, how was the acid got out of its combinations and put in such shape you could use it? If you trace back the chemical processes by which we get these things used in a battery, they were put in shape by the solar rays. If you leave they were put in shape by the solar rays. If you leave
out the heat coming from the stars (as much in a year as the sun gives in a second), and the heat from the meteors (about as much as that), and all the tidal power, all the rest is sun power.
I am speaking within a quarter of a per cent when I say the sun is about $93,000,000$ miles away $-12,000$ times the diameter of the earth; so that the quickest railroad train, on a schedule of 60 miles an hour, would be 175 years on the journey. New York is a little better off than Pennsylvania for cheap railway fares, so that at two cents a mile it would be a little over one that at two cents a mile it would be
and three-quarter millions of dollars.
The unit employed in measuring star distances is 63,000 times the distance from us to the sun. Stellar distances are vastly greater, and our sun is no greater than any other sun. Our sun has a diameter of 860,000 miles, or rio part of its distance from us. The quantity of matter in it is 330,000 times that of the earth; the force of gravity upon it is twenty-seven times what it is here, so that a small man like myself would weigh about a ton, supposing there were life there. The average density of the sun is only a quarter part that of the earth. It averages a little more than the density of water. In all probability we don't see the sun itself at all; what we see is a great shell of cloud
that overlies and coversit and sends out light and heat that overlies and coversit and sends out light and heat
in somewhat the same way that the mantle of a Welsin somewhat the same way that the mantle of a Wels-
bach burner radiates light and heat from the gases within. The explanation of this low density is the intense heat of the sun. The temperature we don't know. The investigations of the past ten years show it to be between 10,000 and 20,000 degrees Fahrenheit, and probably not very far from 14,000 degrees. The effective temperature is no more than a thousand de grees one way or the other. The furnace in which our grees one way or the other. The furnace in which our
French friends make diamonds is possibly six or seven French friends make diamonds is possibly six or seven
thousand degrees; but this double temperature indicates a vastly increased radiating power.
What is the temperature of the earth? Do you mean the temperature of the North Pole, at the equator, at the top of mountains? There isn't "a "temperature of the sun. On the whole, it acts as if it were a body covered with lampblack heated to a certain tem-
perature, and we call that the "effective temperature. At a very small depth within the solar surface the temperature rises, rises, rises-just as it does as you descend in the earth. Then how is it that its temperature is in the earth. Then how is it that its temperature is is maintained by the continuance of a process going on age after age-the process by which the worlds were
made-the system that surrounds the sun. We are made-the system that surrounds the sun. We are
quite sure that it is not produced by any action of combustion in the first place. If so, I cannot stop to explain how the calculation can be made, but long ago the sun would have burned out. It could not last but about six thousand years in all. Neither can it be simply a warm body cooling and bringing the heat from inside to the outside and throwing it off by simply cooling as a ball of iron; it would not list long that way. Some have suggested that it was produced by the rotation of the sun, that the sun's heat is main-
tained by a sort of an electric arrangement like a Holtz tained by a sort of an electric arrangement like a Holtz
machine ; but it is very easy to calculate that no heat is produced in that way, that there is a hang back to the sun, just as power is required to drive a dynamo

* Condensed for the Scientific Ambrican from a lecture at the Drexel
Institute, Philadelphia, by Prof. Charlegs A. Young, profeseor of astronomy Institute, Philadelphia, by Prof. Charlees A. Young, profeseor of astronomy
at Prtncton Univeratty.
machine; and the sun's rotation would have been
stopped, on that basis, in five hundred years. Then stopped, on that basis, in five hundred years. Then
there is the older idea that the heat is produced by there is the older idea that the heat is produced by
meteors falling on the surface. When 'Tyndall wrote meteors falling on the surface. When Tyndall wrote
his book upon the "Mode of Motion" the theory was maintained in that way. The idea was that the meteoric matter falling upon the sun might account for the radiation of the heat. A mass as large as the earth falling upon the sun with the velocity that the earth would acquire in dropping that distance would supply the sun for a hundred years. But Venus and Mercury the sun for a hundred years. But Venus and Mercury say no! If there were any such quantity of meteoric
matter near the sun, their orbital motions would be difmatter near the sun, their orbital motions would be dif-
ferent. The earth would get as much heat from the meteors as it did from the sun. Helmholtz suggested about 1853 that the sun's heat is maintained by its slow shrinkage. Supposing I hold a book in my hand and drop it on the floor, what happens? Gravity acts upon it, with a little noise; but the main thing is, the book is warmed and the floor is warmed. Motion has been produced and hits been stopped, and a certain amount of heat umpuestionithly produced. If we put a hole through a weight and put it on apoge, and let it slide down, it would produce heat also. Suppose every portion of the sun's surface drops 150 feet toward the sun's center, diminishing its diameter about 300 feet; in that case, on any reasonable bypothesis of the con-
stitution of the sun, that would account for all the stitution of the sun, that would account for all the
heat the sun sends forth. If the sun continued slorinking faster than that, it is growing warmer; if it is shrinking more slowly, it ought to be cooling off : little. The sun is giving out 30 calories of heat for every square meter of its surface, which would heit 30 kilograinmes of water one degree every minnteequivalent to about $21 / 4$ horse power energy. If, by some means or other, we could case the sum in witi ice
60 feet thick and then let the heat start, it would be just one minute melting off. A yearly shrinkage of 300 feet in diameter of the sun would have to go on for 7,000 years before detection by the best telescopes that we or our posterity are likely to possess ; and it could go ing anything ; but the end will come: though just here we meet with a difficulty with reference to the past history of the system. The geologists want more time for the making of the solar system by the processes that seem to be indicated by the nebular hypothesis.
If the sun is throwing off heat alike in all directions, I do not think it can possibly be more thath $1.50,000,000$ years old. Can it be that energy is expended only in radiating from the sun to another mitterial body? The whole solar system does not receive more than two-thousand-millionth of the heat that the sum radiates. It goes off into space. Our hundred millions of possible life for the solar system might easily berome a million millions if it only loses heat when it qives it to something else.
Several diagrams were thrown upon the sereen illus trating the nebular hypothesis of developminent of the solar system. By means of the actinometer the heat of the sun's rays is measured, though we do not know
how much to allow for absorption by the atmosphere. The Wilson \& Gray (1894-95) ralionicometer is the most delicate apparatus yet devised for sum heat 1893 was shown a great reflector made of boiler iron lined with mirror glass, projecting light and heat that ran a two horse power engine as lonir is the sum would shine. The invention was Ericssonis, who had a great idea of the value of the sun's rays in Eirypt and other such countries where the sun's rays could be depended upon constantly. Our best steamengines do not give
one-sixth the power originally shot off firom the sun, stored in the coal, and finally brourht under the guid ance and coutrol of man as issuinis from the steam engine. The general surface of the sun is at least 5,000 times as bright as the lime light and not more you four or five times as bright as thime is an intens you are using to might. The lime light is a
jet black when held ingainst the solar surface.
Sun spots are a very interesting phenomenon. One Sun spots are a very interesting phenomenon. One
of the largest spots observed was over 100,000 miles in of the largest spots olserved was over 100,000 miles in
diameter. Sometimes spots do not last more than a day or two, and the Methuselah of the race lived eighteen months only. They very rarely last over a year. They do not lie below the sun's surface, on which they are a sort of a boil. Meteorologists have been discussing a theory of cold waves-spots formed by congealing taking place at certain portions of the colar surface; from certain portions of the materia spots are cooler than the survounding sun. The center of the sun spots gives usially not more than a quarter as much heat as the surface surrounding it; but when you get near the edge of the sim, they actually are
hotter than the surrounding photosphere. The spot hotter than the surrounding photosphere. The spot
of 1893 appeared in connection with the great electric storm, when the telegraph lines worked without bat teries for a whole day; and this great spot, just about the occurrence of this electrical storm, one of the co great magnetic disturbaneat solar disturbance and

We do not know the cause of the spots. Now they are rare and again abundant. The average interval is about eleven years. They were exceedingly numerous in 1872, alnost disappeared in 1880, but in 1884 there was another maximum. There is no regularity about it. Nobody knows what makes the slight approach to periodicity of their occurrence. Do these variations in the sun spots affect the earth? Some consider them causes of storms, some, of disease (cholera for instance), some, commercial crises; all sorts of happenings are laid to the account of sun spots: but, as far as I can make out the evidences, the line of magnetic storms corresponds with the sun spots. If you watch the magnetic needle, you find it keeps swinging back and forth and at times will dance about for days at a time. And we call that a magnetic storm ; for some reason or other the magnetic conditions of the earth are disturbed and the magnet vibrates. Some observers watch this change constantly, and records are kept. In years of numerous sun spots, magnetic storms and the aurora borealis appear frequently, but the connec tion we cannot account for. We do not know if they be cause and effect. They go together. It is entirely possible that the disturbances are altogether from out side and affect the sun and the earth together. Each new accession of sun spot activity breaks out on one
side of the sun's equator or the other. They move in well-defined zones.
When we look at the solar spectrum, we get a great multitude of diagrams. Fraumhofer discovered this in 1816, the Fraunhofer's lines being dark streaks across the spectrum. Prof. Young described the significance of these lines. The burning of gases produces beauti fully brilliant spectra; but where you have a solid or a fully brilliant spectra; but where you have a solid or a
liquid you have a spectrum that is continuous-no liquid you have a spectrum that is continuous-no
markings. The explatiation of these dark lines in the markings. The explanation of these dark lines in the
solar spectrum is that these photosphere clouds have an atmosphere of gases over them, and when the light from that photosphere passes through that atmo sphere, then those lines turn dark. In the eclipse of the sun shown upon the diarram at the monent when the moon had covered up all the sun except this edge the lines that had been dark before turned bright, and remained bright about a couple of secouds and then faded away. In getting the iron spectrum, the iron is faded aimply. In gerting thet simply melted-but it is aetually not simply warm-not simply melted-but it is aetually
boiling, and the iron vapor is just like the steam from boiling, and the iron vapor is just like the steam from
the tea kettle, and in that condition it gives a bright light, and then you could compare the spectrum of the sun with that of the iron and see if there is any iron in the sun. Two slides were exhibited giving the close resemblance of the iron and sun spectra. Rowland's concave grating spectroscope is the best extant. The spectrum of a sun spot shows that the darkening is due to the presence of cooler vapors in which vanadium is abundant. A blowpipe blister in a spectrum of the sun was due to a sudden blast of hydrogen gas of the sun was due to a sudden blast of hydrogen gas
moving 160 miles a second. A prominence of 200 miles moving 160 miles a second. A prominence of 200 miles
length rose up from the sun's surface on one occasion. During an eclipse occurring in 1882, visible in Egypt and of which photographs were taken, a comet was seen for just two minutes, to which was given the name Tewfik, being that of the then ruling Khedive of Egypt.

## The Bleycle Wood Rim Patent

In a recent decision in a case before the United States Circuit Court for the Northern District of New York Justice Coxe sustained the Fairbanks and Berlo pater: of May 9,1803 , on wood rims for bicycle wheels. The great popularity which these rims have attained within a year or two renders this decision especially interesting. The patent is for a rim composed of a series of sections or plies of wood of varying course or direction of grain, cemented together, the ends of each section breaking joints with the ends of adjacent sections The court held that "the introduction into the art.of the marked and at the present day universally recog nized improvement of the patent required an exercise of the inventive faculties. . . . Carriage wheels with the ordinary compression spokes and reinforced with iron tires had been made with laminated fellies, but there is no pretense that the break joint and varying grain features of the patent are found in any of these structures, which are not adapted for use in a wheel provided with suspension spokes and pneumatic tires. . . . The patentees have done much to make the modern bicycle a perfect machine."

Dr. Wm. T. Bull, says The Independent, has lately given to the world an account of the entire restoration o health of a woman who had carried a plate for artificial teeth in her esophagus for twenty-two months her health meantime being at a low ebb, for the remova of which he successfully operated. In that connection he relates some most interesting experiments with th $X$ rays. It seems that there are many things that may be swallowed-one surgeon enumerates twenty-fiye that have been-and more than half of them are substance that can be discerned by the aid of the $X$ rays. Hence he considers that " this addition to surgical resources can not be overestimated."
of the line was reached just as the sun was crimsoning $\mid$ tions is of such unusualinterest that we will attempt to the European shore, this being their first foothold in in the west, and thus was brought to a close one of the give a brief analysis of the "Eastern question" and the Europe. Constantinople fell into the hands of the most stirring marine spectacles ever witnessed by the fundamental causes of the present Greco-Turkish war. Ottomans in 1453 and Greece in 1477 . Three years city of New York. fundamental causes of the present Greco-Turkish war.
The birthplace of the Ottoman empire was Sugud, on later they in gained a footing in Italy, at Otranto, and in the Sakaria River, for here was born the illustrious the next ce
Usman, from whom the whole tribe took its name. It their hands.




CONSTANTINOPLE-DOLMABAGHCHI PALACE ON THE BOSPHORUS.


CONSTANTINOPLE-GALATA BRIDGE CONNECTING GALATA AND STAMBOUL
ninsula, but Hungary as well. Under his son, the empire began to decline. In the eighteenth century sevei al attempts were made to partition Turkey, but they were not entirely successful, though parts of the territory were pared off from time to time.
Greece won her independence in 1828, and by the Treaty of Paris, Turkey was placed under the tutelage of the other powers, especially Great Britain and France. In 1866 Moldavia and Wallachia united to form Roumania, and became practically independent, as did Servia the next year. Egypt threw off the boncis and was then ruled by khedives. In 1874 an insurrection occurred in Herzegovina, which set the whole Balkan Peninsula on fire.
In 1875 outbreaks and massacres occurred in Bulgaria; and Servia and Montenegro declared war against aided by the Roumanians, the Russians defeated the mighty Turkish general Osman at Plevna. The treaty of San Stefano in 1878 was made, practically surrendering everything to Russia, but Great Britain interfered, ing everything to Russia, but Great Britain interfered,
and the Congress of Berlin was held to regulate the and the Congress of Berlin was held to regulate the
affairs of the Balkan Peninsula. The congress greatly altered the conditions. Roumania, Servia and Montenegro were made absolutely independent, while Bosnia, Herzegovina and Novi Bazar were put under Austrian administration, part of Thessaly was ceded to Greece, and Bulgaria was made autonomous. Turkey in Europe was really restricted to a narrow strip from the Bosphorus to the Adriatic. Sultan Abdul Hamid II succeeded to the throne in $18 \% 6$. He came to the throne at a critical time. Years of evil rule had engendered the corruption which always seems synonymous with the name of Turkey. His efforts for reform met with no encouragement from the Powers; then came the Russian war, with the loss of several important provinces; each power seeking its own selfish gain without regard to the Turkish rights. The powers are never weary of reminding the Sultan that his empire exists only on sufferance. The Sultan has been the victim of bad policy which has been fostered by one or the other of the interested Powers. Thus, for instance, all the Christian inhabitants of Turkey were to be put under Russian protection, but England was jealous of Russia's power, joined with France, and compelled the treaty to be dropped. The result of this grabbing of the Powers was that England has practically possessed itself of Egypt and Cyprus. Roumania and Servia are independent kingdoms, Bulgaria is virtually independent, Austria has occupied Bosnia and Herzegovina, Greece and Montenegro have been aggrandized, but nothing but some "frontier trimmings" have fallen to the lot of Russia, so there is little wonder that Russia now insists upon taking a dominant
disposition of the Turkish empire
The present attitude of the six great powers is as fol-
ows : Russia means to recoup her losses in the Crin lows : Russia means to recoup her losses in the Crimean war, if possible, by seizing Constantinople, the bulk of the empire, and the island of Crete. She wants Thrace with Constantinople, so as to control the straits and to make the Black Sea a Russian lake. She wants Albania. so as to have a frontier on the Adriatic; she wants Crete as a naval station, in fact there seems to be very little that this already great country does not want. Austria-Hungary has virtually absorbed Bosnia, Herzegovina, Novi Bazar. Now she only wants a strip across Macedonia so as to make Salonica her own sea port on the Egean Sea. Great Britain appears to have renounced her old policy of opposing Russia and now seems willing that the latter should do about as she pleases. Haring a good hold on Egypt, which is one of the keys to India, and with Malta and Cyprus in the Mediterranean, she ought to be content. Italy follows the lead of Great Britain, and appears to have no ax to grind except, possibly, to see Montenegro en larged, as this country is the native land of the Princess Helene, wife of the Crown Prince of Italy France follows the lead of Russia and keeps an eye upon Syria as the share of the "sick man's" effect which she would like best. It is hard to say what the policy of Germany is. At present it appears her attitude is governed by spite against Greece, because the German Emperor's sister changed her faith to that o the Greek church when she married the Greek Crown Prince, without asking the Emperor's permission. This is, therefore, the so-called "concert of the
Powers." It is difficult to see how the interests of all can be adjusted without a general European war should the Ottoman empire go to pieces. At present should the Ottoman empire go to pieces. At present
each is engaged in blocking his neighbor, while to all appearance they are attempting to preserve the in tegrity of the Ottoman empire. This cry of the preservation of the integrity of Turkey is entirely insincere. When it has suited the purpose of the.Powers, they have not scrupled to encroach on the sacred ter ritory. In the Fortnightly Review for April. Sir George Baden Powell gives this instructive table of the area and population of Turkey in Europe at different periods in the present century :

This comparison shows that Turkey has in Europe to-day only about one-fourth of the area and less than one-fourth of the population that she had at the beginning of the century. The rest has been appropriated by the very Powers which are now declaiming about the necessity of maintaining the "integrity of Turkey."
The reason why England is always so anxious when the Christian subjects of Turkey are in rebellion is that she fears that Russia may destroy the power of that she fears that Russia may destroy the power of
the Sultan, capture Constantinople and then be in a position to fight for that splendid country-Indiawhich Russia has so long coveted. Russia in Central Asia is already too near India. Should the Russian ships once be allowed to go through the Dardanelles at will, she could build vast dockyards on the Black Sea, and in a short time become one of the great naval powers of the world. At present Russia's only other seaports are on the Baltic, which is closed to navigation the greater part of the year. From this it will be seen that the few miles of water has been the cause of endless diplomacy, and even wars, and the possession of the strait might in a few years change the political divisions on our maps.
As we have alreally stated, the Greeks won independence in 1828 , but the (ireece of 1828 was simply the nucleus of the nation to be. It is the growth of that nucleus that the Cretans and Greeks are fighting for The liberation of another section of the three or four millions whoare still held in Turkish bondage is only another step toward the unification of Greece. Greece does not claim the privilege of settling the Eastern question by itself, but does emphatically claim the right to aid other (rreeks to throw off the yoke of an intolerable despot. The government of the monarchy is, to a very large extent, a popular one, so that the Kaiser and Czar naturally do not regard it with favor The (ireeks are justified in fighting for freedom whenever the opportunity offers. Under Mohammedan rule no Christians can ever enjoy the degree of political rights that Mohammedans possess, and though the modern (ireeks have very little of the old Hellenic blood in their veins, still they will always be recognized as a patriotic and freedom-loving people. Things at last reached such a pass in Crete that Gireece could not with self-respect, stand by quietly any longer and see her brothers suifer. So troops were sent into Crete Then came the now well-known blockade of Crete this the majority of the Italian, French and English leople cordially condemn. The mismanagement of the Powers since the llockading of Crete is even worse than lefore, so that (ireece and Turkey really seem forced into the present war, though both have been informed that their success would mean no acces sion of territory to the victorious nation.
Turkey tried to throw the burden of the responsi bility of the war on Greece, stating that, owing to he incursions by the (ireeks on Turkish territory, their military commander was ordered to assume the
offensive. This was on April $1 \pi$, and since this time the Turks have been very successful in Thessaly ; but the outcome of the war is still in doubt. The Turks appear to have the advantage on land and the Grecian navy on the water
Turkey has many vulnerable points which might be attacked by the fleet of Greece, which, as we have al ready stated, is superior to that of Turkey. The fleet ready stated, is superior to that of Turker:. The fleet
of the Greeks consists of four battleships, two firstclass cruisers and twenty-five torpedo boats. Among what might be considered the vulnerable points in the Turkish dominions are Salonica, the base of supplies for the Turkish armies in Macedonia, the island of
Samos, which, like Crete, is now in a state of revolt, Samos, which, like Crete, is now in a state of revolt, and the Dardinelles themselves. It is thought that the Greek fleet is hardly strong enough to force the in defeating the Turkish tleet, which does not amount to much, it would cause great havoc among the palaces, mosques and other buildings of Constantinople. Conmosques and other buidangs of Constantinople. Con-
stantinople is sad to stand upon two continents, since Scutari is in Asia Minor. Vessels reach Constantinople through the Dardanelles, the narrow strait forty miles long and from one to four miles wide. The Dardanelles unite the Mediterranean with The Sea of Marmora which is connected at its other end with the Black Sea by another narrow strait ralled the Bosphorus, and it is on this strait that Constantinople is situated.
The peculiar harbor, by reason of its form and fullness, is known as the "Golden Horn." Directly on the Bosphorus are palaces which are most imposing. We Ilustrate one of them, Dolmabaghchi, which is one of the most beautiful, but the Sultan evidently considers
that it is too easy of approach and has established himself in the smaller but more secluded Yildiz palace where he can be surrounded with his soldiers. We also give an illustration of one of the bridges which nite Galata to Stamboul, showing the anim

Aluminum helmets have not proved entirely successful in the German army, the saving in weight being inore than offset by the metal's storing heat even
to blistering the foreheads of the wearers.

## Androo's Balloon Voyage to the No

On the 20th of March last, before the Society for Anthropology and Geography, in Stockholm, Sweden, Mr. S. A. Andree, the balloonist and explorer, gave a full account of the preparations for the coming polar expedition.
The plan for the ascension is the same as last year's some slight changes, however, are made in the equipment, based on experiences during the trip to Spitzbergen last summer.
The bulloon has been increased in volume 300 cubic meters. This was effected by cutting the balloon in two and inserting between the two halves a girdle one meter high. It was found necessary to increase the rolume, as the bulloon silk weighed close upon 300 kilogrammes more than calculated. Its weight is now $1, \dot{3} 20$ kilogrammes. The form is now somewhat elliptical.
The balloon is in good condition. The strength and ightness of the silk is unaltered. Mr. Strindberg, who has undertaken these important investigations, has found the loss of gas through the balloon cloth to be almost nil. Last year the entire balloon was found to lose through the cloth one or two cubic meters o gas during twenty-four hours.
For the tightness of the seams the overlying lists play an important part. Without them the balloon would not be able to keep floating many days. During the winter the tightening lists have been improved and altered according to the new form of the balloon. The maker, Monsieur Lachambre, has invented a new varnish especially for this balloon. By experiment it has been learned that moisture has no influence upon the tightness of the seams, and this fact has caused Mr Andree to somewhat simplify the construction of the balloon house. The net is just as strong as ever.
There isevery reason to believe that the balloon house has well withstood the Arctic winter of Spitzbergen. Mr. Andree has made himself sure that no whalers or seal hunters have passed the winter in the neighborhood. Consequently nobody has been tempted to use part of the house as fuel. In order to get an idea of the weather conditions in Virgo's Haven during the winter, Mr. Andree has communicated, through Consul Aagaard, with one of the men who, with Mr. Pike wintered there in 1888 to 1889 . This man stated that the hardest storms generally blew from the south and southwest, which perfectly agrees with Mr. Andree's heories. But from southerly winds the balloon house is sheltered by cliffs more than 100 yards in height. Thus the house is only exposed to northerly winds, but Mr. Andree, as well as the two architects who erected the structure, are of the opinion that it has suffered no essential damage. Still it goes without saying that the travelers will be provided with every means to quickly make necessary repairs.
Increased Amount of Hydrogen Gas.-For genera tion of hydrogen gas so much material will be brough along that the balloon can be kept filled six weeks, rwaiting favorable winds, even if the loss of gas should amount to 100 cubic meters in twenty-four hours. Mr. Andree hopes to be ready to start about the 20th of June, and is thus able to wait for suitable winds up to the first days of August, and to start later in the year is not to be thought of.
To Cut the Drag Lines.-From several quarters the fear has been expressed that the drag lines might catch hold of something on the ground and arrest the bal oon. Mr. Andree himself did not much believe in his danger, but now the expedition has been presented with a very ingenious device for cutting the line at any
desired point. The apparatus, invented by a Mr. desired point. The apparatus, invented by a Mr. Toruer, consists of a cylindrical metal case, which can be made to slide down the line to where it is intended to be cut. Inside of the metal case are two sharp knives driven forward with great force through the xplosion of a quantity of powder. Mr. Andree es hibited a thick cable cut in this way
When the Expedition Leaves Sweden.-The expedi ion leaves Lathenburg on the 18th of May. The time or the voyage to Spitzbergen and for the preparatory work there is calculated to about four or five weeks Nothing tends to indicate that the winter at Spitz bergen has been severe, and there is every reason to believe that the expedition will find the sea free from ice.
Na
Nansen's observations were, as far as the speaker knew, favorable for the balloon journey. This was as well regarding the temperature and the variations of the collipass as the direction of the winds. Toward the end of June and in the beginning of July the Fram had in the polar basin experienced identical winds with those which Mr. Andree had noticed a Spitzbergen. Dr. Nansen has confirmed another important fact, viz., that no highlands are to be met with up to 84th or 83th degree of latitude. The ex plorers need not therefore fear the necessity of consuming a great amount of gas by lifting themselves over any mountain ranges.
The Desired Way.-If we are so fortunate, the speaker continued, that we may choose our way, I
would rather, since Dr. Nansen has so well explored
the polar region toward the Asiatic side, steer our balloon toward the American continent. This part of the world is not now nearly so desolate and uninhabited as it was when the Franklin expedition perished. Ever since 1889, American vessels have been stationed about the mouth of the Mackenzie River for hunting purposes, and twelve to fifteen ships pass the winter there with 400 or 500 people aboard. The speaker had got these particulars of a Swedish harpooner, Bertonocini, who has been a long time in American service there. Along the coast of Alaska are to be found more or less civilized Indians and Esquimaux. In the inteor less civilized of Alaska there are a great number of gold diggers. rior of Alaska there are a great number of gold diggers.
Among the inhabitants of these vast regions inforAmong the inhabitants of these vast regions infor-
mation concerning the expedition is pretty widely spread, although, strangely enough, the circulars with cut of balloon have not here been distributed.
The speaker concluded with expressing his firm conviction that the outlook for the expedition is as good if not better this year than the last.
After Mr. Andree's lecture, Dr. Jaderin, the astronomer, arose and demonstrated before the society a very valuable improvement on the usual sextant, enabling
members of that devoted band which set forth into the unknown for conscience' suke, and subsequently governor of Plymouth Colony, and within its pages were recorded the names of all the pilgrims and the chief incidents of their voyage and ultimate landing at Cape Cod. But the log of the Mayflower did not end with the voyage. Its narrative was continued as a history of the formation of the first settlement at New Plymouth, and of the general colonization work of the next twenty-eight years. The inclusion of an official register of baptisms, marriages and funerals added a legal importance to the historical value of this authoritative account of the origin of New England. It was probably due to this circumstance that the volume was some time or another sent to the library of Fulham Palace, for up to the time of the Declaration of Independence the A:nerican colōies, strangely enough, formed part of the diocese of London. Nothing is definitely known, however, of the transference of this valuable document from the new country to the old beyond the fact that it has been stored at Mondon But at last the historic log is to be restored to the com
for their Puritan brethren. And, seeing that the new Boston claims to be "the hub of the universe," optimists may detect great significance in the generous surrender of what, to Bostonians even more than to Great Britain, is a precious historical record and antiquarian treasure.
The little village of Scrooby, on the borders of Lincolnshire and Nottinghamshire, where Brewster lived and taught lessons in freedom to Bradford and other brave souls, has been denominated "the cradle of Massachusetts." And if so, why not "the cradle of the American nation"?
The traveler on the Great Northern Railway from London way catch a glimpse of the slim white spire of Scrooby church on his leit ere he reaches Doncaster. Visitors from Massachusetts know it well. There are two shrines that the enthusiastic American tourist never misses. One is Stratford-on-Avon; the other, Brewster's old manor house at Scrooby, with the neighboring village of Austerfield, where Willian Bradford first saw the light. There is, indeed, comparatively little left of the structure that was familiar to the secret worshipers of Brewster's day. One of


THE LOG OF THE MAYFLOWER-FACSDILE OF THE BOOK.
the observer to make careful determinations even if he is oscillating and above the ground as when he is sitting in the car of a balloon. Dr. Jaderin calls his instrument "nivasextant" (the level sextant), and experiments have shown the error to amount to only about $2^{\prime}$.
Dr. Nils Ekholm will not accompany Mr. Andree. He has backed out, as he does not consider the undertaking likely to succeed. The party will now consist of Mr. Andree, chief engineer (of veringenior) at the Royal Swedish Patent Office, Mr. Strindberg, amanu ensis at the University of Stockholm, and lastly Mr. Fraenckel, civil engineer.

## THE LOG OF THE MAYFLOWER.

A graceful act of international courtesy on the part of the Consistory Court of London has drawn attention to the remarkable history of a manuscript volume which is essentially one of the most precious heirlooms of the American nation, although it has long been stored in English keeping. The Pilgrim Fathers who left their native land on board the Mayflower in 1620 bequeathed to their children a detailed chronicle of all their doings in the form of a manuscript book, entitled "The Log of the Mayflower." This volume, destined to acquire a unique importance as an historical document, was compiled by William Bradford, one of the foremost
monwealth of whose earliest beginnings it forms so precious a relic. At the application of the United States ambassador, the Consistory Court of London has decided, with the approval of the bishop, to hand over the volume to the President of the United States, zincographic copies being kept for the diocesan registry and the episcopal library at Fulham Palace.
This decision naturally recalls the tender solicitude with which everything associated with the sailing of the Pilgrim Fathers is regarded by all true Americans. Anti-British politicians may do their utmost to prevent the tightening of the bonds of friendship which should unite the two great English-speaking peoples, but there will still remain a huge section of new world inhabitants actuated by feelings of keenest admiration and deepest sympathy for the old mother country. The State of Massachusetts is especially inter ested in the present act of courtesy. It was a vicar of Boston in Lincolnshire who practically founded the chief city of Massachusetts. Several of the earliest governors of Massachusetts hailed from the Lincoln shire Boston. Governor Bellingham, whose character is sketched in "The Scarlet Letter," was recorder of the old England town. William Brewster, chief of the Pilgrim Fathers, and William Bradford, who kept the og of the Mayflower, noth suffered imprisonment at Boston before they managed to find a way of eacape
the few old oak beams remaining has already been secured by an enterprising descendant of the Pilgrim Fathers to adorn his dwelling across the seas, and, bit by bit, other memorials of the past are finding their way over the Atlantic to keep alive the feeling of kinship between New England and the old. The Norman font at which William Bradford was baptized still occupies a place in Austerfield church, and the parish register contains Bradford's baptismal entry. This quaint old edifice sadly needs restoration; and Americans, in particular, are being invited to contribute to the fund. So far, their response is not encouraging, nevertheless the church wardens intend to retain the font. As the Earl of Crewe writes in his appeal on behalf of the memorial fund, Austerfield is linked with Scrooby, the home of Brewster, as a cradle of the Pilgrim Fathers; and so long as the sailing of the Mayflower remains one of the historic cameos upon which English and American eyes alike love to rest, the footsteps of travelers will turn toward these quiet little hamlets in reverence for the men who embarked on an even nobler quest than did the fleet of Colum-bus.-Illustrated London News.

Ichthyol is recommended by Der Stein der Weisen monia

RECENTLY PATENTED UNVENTIONS Engineering.
Revolving Muffle Furnace.-Au gust R. Meyer, Kansas City, Mo. To facilitate the de
snlphurizing or chloridizing of ores or metallurgica producta, this farnace has formed in its walls a revoluble cylinder with independent longitudinal flues, the furnace channel at the end of the crlindines, and there being urnace, connecting the cylinder flues, and adapted to be placed in communication with the interior of the cylinapted to be sncceestrety connected with the crlin er flues. The products of combastion travel twice tilizing the dust to the pallest advantage, and the pro ducts of combustion are kept entirely separate from the

Feed Water Heating Apparatus. Elihn K. Jones and Thomas N. Wilson, Fulton, Oregon Accoragh hollow main grate bar having a series of parallel lengthwise paseages, and there being joined to it a series of mino serics of pipes connect the main passages, while he upper portion of the boiker and a pipe courne he lower portion of the boiler with the grate. practically equal distribution and circulation of wat in all portions of the grate are assured, and normally al we water from ihe pump posees through the grate befo entering the boiler.

## Hailuvay Appliances.

Eare Box.-Oscar Katzenberger. San Antonio, Texas. This invention provides a receptacle ehicles, the fare to be paid by each occupant upo ootorman, or gripman to readily ascertain the ares paid. Each fare is registered as paid in, and the receptacle may be opened by the driver or conductor to make change. The person depositing the fare may also know immediately that it has been registered, and coins the earess delivered to a receptacle not acceasible the conductor or driver.

## Electrical.

Utilizing Roentaen Rays.-Charles . Easton, Wallace, Idaho. An improved lantern for employing the Roentgen rays for experimental, demon-
strative or practical purpoese, has been devieed by this inventor, the lantern body being opaque to $\mathbf{X}$ rays, and having a front aperture and fixed disk whose centrai otatable disk has graduated apertores which may be ronobt intocoinclaence with those in the fixed parte. arranged in the case on a sliding carriage is a Crookes lube, and means for
Telegraph Key.-Martin M. Porter. oositive means for automatically closing the circuit through the instrument after the key shall have been respring plate adapted for electrical connection with a line wire, a key lever, and a figer piece of inelating material, to which is attached a metal contact having electrical connection with the key lever, while a plate hinged to swing vertically on the finger piece has a pro. jection adapted to engage with the spring plate to force
it out of engagement with the contact on the fluger piece.
Electric Selling Device.-Alexander Davician, New York City, and Charles G. Arm trong, Chicago. In. To sell reserved seat tickets a different stations, and prevent the sale of the same tickthe stations are connected electrically and each has daplis cate electrical apparatus, whereby a sale at one station is antomatically reported at the other stations. If the same ticket be offered foriale at two different points, the degiven. The invention comprec a or audible sonnd inne inention comprises synchronous clocks combined with a commutator, batters, each clock being combined with a commutator, battery, signal bell, and circuit for the operative parts of the ticket selling de-

## Mining, Etc.

Silver and Gold Ore Process. Henry Hirsching, Salt Lake City, Utah. This process per ores. but is also applicable for obtaining the silver and gold, whether with or without copper. It is an ammith refractory ores, whether with or without copper, and where melting or other proceseses would not be satisfactory or proftable, and consists in subjecting
them to the action of a solvent to dissolve the metala and then electrolyzing the solntion, firss with a cathode of the precions metal and then with a copper cathode.

## Mechantical.

Metaliic Packing. - Edward L. Raynsford, Susquehanna. Pa. This invention is for an mprovement on and valve rods, piston slide valves. and other machine parts, the packing beiug arranged to prevent all leakage, and readily compensate for wear of the parta, insuring a perfect joint at all times. It is made with a vectional ring having overiapping joints, and on its periphery is a transverse recese extenaing over the overiapping joint,
eegmental block fitting in the recese to cover the.joint.

Iffrting Jack.-William W Good.win Ind George A. Brown, Carhage, Me. Thin is a jack of
and with bat little friction, being capable of elongation
in both directions from the center to a length equaling wice its length when clued. The screw rod of the Jack has right and lert threads staring from its center, ends of the eaps other material with which the jack may be operated, these caps also engacing the auriliary screw threaded caps or extension pieces, to
of adjustment of the jack.

## Agricultural.

Lister Cultivator.-Cornealious $P$ Welter, Perry, Kansae. The cultivator blades or dieks of ides of the runners, and may be gimaltaneously raisel or lowered, there being means for adjusting the blade or disks toward and from the draught line of the carrier,
in proper position for rows of different widths. The in proper position for rows of different widths. The bars, and a rock shaft journaled on the runners has rched centerand angular ends on which the cultivato aise carrlers ar the coltivator blades by means of a ha ever within easy reach of the driver.
Cutting Roots, etc.-John J. Sher nan, Traverse City, Mich. The body of this machine front slot and a handle lever projecting through the rear lot, the lever having a broad portion adapted to ser a false oecillatory bottom to support the tubers or oots placed in the box to be cut. The knife may be readily removed for sharpening, and is aljustable f varying the thickness of the pieces or slices cut; it also
has attached short supplemental knives to further divide the material into pieces or slices.

## Hiscellaneous.

Centrifugal Machine. - Peter cooper Hewith, New York City. Two pawits hav been granted this inventor for an improved machine fo separaling liquids from viscla or solla smimelances centrifugal force, the construction being designed to
 power, and effect the complete separation of stlbstance The invention comprises a separating bowl of small diameter and comparatively great length, with weirs for controlling the distribution of the liquid or mixture to be operated on, there being a peripheral discharge con rolled by a vaive and valve operating mechamism. Combined with the bowl are perfirated hocops and per Crated annular plates within the bow on chack novel construction discharge the light and heavy liqids antomatically into hoods. The bowl has improvel bearings at its upper and lower ends, to facilitate the maintenance of a high velocity, there being a lubricating device for the lower bearing and an adjusting device for the upper one. The later improvement more especially adapts the machine for the separation of liquids and separating bowl with difficulty, and for the separation of iving organisms which have a different density from the iquid they grow in, but have the power to remain suspended in the liquid.
Apparatus for Arrating Liquids. -This is a further invention of the eame inventor, esineciaily applicable in aerating waters, beer and other
it consists of a centrifugul machine constructed particularly to reduce the liquid to the form of an ex remely thin film, the machine being operated in beer or other liquids being aerated while in the form of highly attenuated flm. When it is neceesery to carry on the operation under a preseure greater than that at which the liquid is to remain, the liquid is carried to a storage reservoir throngh a preseare reducer which allaws the sas to be ueped again in aeration, while the liquid is held in
pressure.

Beer Manufacturing Apparatus -Still another patent of the game inventor provides an mprove is connected with a gas receiver, where the gat developed mas be stored nnder presenre, and a cooling chamber, from which the beer is conveyed to a separator the gas receid aerator, the later being connected with mentation. A valve controlled pipe connects the beer receiving tank with the aerator, and a connected storage
tank is also connected with the aerator and the gas retank is

Protfeting Registry Rolls. Charles A. Schindler, Jr., Wcest Hoboken, N. J. To a range rolls exhibining the names of voters that they may be readily examined, and posted where desired withou being damaciaby hing ar an npper spring-actuated roller to which a flexible car ier is attached, there being stops at the top and bottom of the case and a combined guide and stop on the carrer, with means for clamping the registry rolls to the
carrier. By removing the cap of the case, the roller, with its carrier, and the registry rolls are all easily re

Bicycle Support. - Francis P. McNulty and Thomas McDermott, Cincinnati, Ohio. This support is adaptei to siving from the rear whee part nuta, the latter engaging the ring or top portion the support, which ia formerl of a rod bent to constitute a foot at its outer end. In supporting a wheel these rods extend slightly oat at each side, the feet engazing the ground. but when not 60 required as supports the rods
are turned up to engage the rear fork. One of these are turned up to engage the rear fork. One of these
rodilike supports only may be used, instead of two, as one prefers.
Bicycle Track. - John B. Hansler. Newbarg, N. Y. To turnion a cheap and smeoth track
for wheelmen between towne and villages, and one
han the ordinary highways, is the object of this inven
that lon, according to which the track is formed of met places having their edges roled upward and lnward and ends of the plates to each other and to supporting crose dams, the latter being held up by vertical posts whi into the ground through plates which act as sills. The posts are adjustable to support the cross timbers
and track at the desired level, and drainage holes are

BREAKDOWN Firgari, -Charles Bhilden, Charleston, s. C. For three barrel guns ha ng two shot barrels and a rine below and between them, cis inventor provides an improved arm with a remo ble rifle barrel, to be so placed in connection with the shot barrels that it can be autached firmly to a suitab ighten the gun, the removable barrel permitting the en ployment of many different calibers of rifle barrel with the same stock. A cocking and fring mechanism for the rife hammer is located within the body of the gun, and the trigger is of novel construction, only two trig.

TyPEWRITING Machine.-Andrew peare, West Plains, Mo. This invention is for an it provenent in tybewrters which, after a line of writing to completen, recurn the carriage and cylinder automat cally instead of ly hand, and provides an improverl co iage positively and directly by the acto of the or automatically returning the carriage after a line writing is completed or in the mildle of a line, and automatically turning the cellinder to present a ne pace for a line of writing.
CASH INDICATOR AND REGISTER. Ohn F. Parker, McPherson, Kansas. This is a machin of comparatively simple mechanism for registering al havidual salces and cash receipts fom one cent upwari, and indicating the total amonnt of salces and the casing, the registration of the previous sale is cancelecl and the cash drawer openeel, to be closed by hand after the nest rekistration is made, but, to guarl against allowed for the drawer to remaun ojen, automatically wrirking mechanism then locking the parts. This time he machine.
A New Coloring Agent.-Georg H . Weiss, Charlottenburg, (iermany. To form black
chrome morlanted wool dyestuffs exceelingly fast to light, milling aund soap, this inventor has devised a proeess of making carbonyl metadiamido salicylic acid phoggenc, thereby pmolucing carbonyl metanitroamidn alicylic acid having a melting point of approximately $203^{\circ} \mathrm{C}$., and finally reducing the product to carbony metadiamido salicylic acid, soluble with difficulty in water and alcohol, insoluble in benzine, ligroine and
chloroform, easily diazotizalle, the diazo compound forming, by combination with the usual color producing ubstances, azo dyestuffs which are easily mordanted.
Dif Holder and Box.-Robert Tur Der, New York City. To hold dies for stamping an movable end piece held by catches, there has a re lamping devices in the end piece and in the opposite have guldeways for the dies, held in place by a clamping evice. The box is arranged to hold separate dies forming matter to be stamped or emboesed, the dies heing ter.
Paper Holdder.-Thomas P. Mautz, inventor for a superior receptacle for paper in sheets of different lengths or paper bags, the device holding the redial in graduated arrangement, enabling a person sired dimensions. The holder has a bos or boxly por tion with removable partitions, having pockets at their lower ends, and each partition being independent, al though each servesto brace and strengthen the casing or holder. The tolder is used in an upright position or heary paper and in inclined position for light o manila paper. Although principally intended to hold paper, ite simplicity and cheapness making it pracical or everyday uee.
Preparing Nutmeal. - John H. Kellogg, Battle Creek, Mich. To produce an improved article from peanuts or other nuts, this inventor blanches the kerncls and removes their cuticles, then boils them oft. dries the conted product und preseure between mollers. Two prolucts are thus obtained, a dry and practically white nutmeal and a pasty Note.-Copies of any of the
urnished by Munn \& Co. for alove patente will be furnished by Munn \& Co. for 10 cents cach. Please
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## NEW BOOKS, ETC.

The University Titorial Series The Tutorial Chemistry.
Non-metals. By (í. H. Bailey. Editod hy William Briggs. London: W. B. College Press. New York: Hin
Noble. Pp. viii, $226 . \quad$ Price $\$ 1$.
The University Tutorial Serifs The Tutorial Statics. By Wil Iondon : W. B. Clive, New
Hinds \& Norkle.
Pp. viji, 260 . $\$ 1$.

These two works are designed to cover chemistry and
tatice as required for peasing the London University examination for a degree. Like all such books, while use-
fal, they are of limited and accurately defined scope,
which ecope is fixed by the requirements of the English
course. This renders them of restricted value for the American studen
Clay Glazes and Enamels. With a supplement on crazing, its causes
and prevention. By Henry R. Griffin, . E. The whole forming a treatise on glazing and enameling brick, terra recipes and formulas for all the principal colors now in use and full in application. Indianapolis, Ind. : T.
A. Randall \& Company. Pp. 138. Price $\$ 5$.
Of all practical subjects, the subject of the present work obtain. A glaze which would not crack and which would work with unfailing certainty time after time has been a subject very thoroughly tells The present work on the ing, but gives the technique of the blending, etc. It is not too much to say that it will fill a long felt want, as it
falle in the field of what has long been a trade secret. Turkeys and How to Grow 'Them. treatise on the natural history and origin of the name of turkeys, the va-
rious breeds, and best methods to inure success in the business of turkey rruwing. With essays from practical
urkeygrowers in different parts of he United States and Canada. usly illustrated. New York: Orange
Judd Company. 1897. Pp. vii, 154. Price $\$ 1$.
This monngraph treats of a subject of great interest to some in managing than the turkey, and certainly none can be said to give more eatisfactory results. This monograph should leld to increased success in the cultiva-
tion of the nollest of the tribe, and in the present days of poultry raising. the use of the incubators and other re pense.
Hypatism up to Date. By Sydney Flower. Chicago: Charles H. Kerr
$\&$ Company, 56 Fifth Avenue. 1896. Pp. 161. Price \$7.
The author of this curious book seems to be a be-
iever in some of the extreme views of hypnotism and at he same time states his views in a very guarded way, so to give one the idea that he is very conservative. The lian who is a hypnotist and his patient. The author in-
cian enough shows some skill in some explanations. Thut caders. and, instead of giving them, states that the ex planations were so simple and so convincing that the public the evidence of his own gullibility. Had he given a real, thorough treatment of the subject, instead of thus magic of the mind reader as well as to the hypnotist, he would have performed, we think, a very acceptaile serice. The psychologist of the day is vibrating between
full fledged hypnotism on one hand and materialism on the other, and this book may be a contribution to the lighter literature of the subject. Some of the author's
criticisms on Conan Doyle and others are very Die Bearbeitung des Glases auf dem RLASETISCHE Ein Handbuch für
Studirende, welche sich mit Wissenschaftlichen Versuchen beschäftinin:Verlag. von R. Friedländer \&
Soln. 1895. Pp. xiii, 154 Soln. 1895. Pp. xiii, 154.
This nicely illustrated book with contents, but, unforthe chemist and physicist, including the manufacture of strictly scientific apparatus by glass blowing before a using a single blast lamp, instead of the converging jets of flame so generally used by the professional glass blower. The bonk is very systematically arranged,well illustrated,
and its divisions indicate really thorough covering of the ground. It scems as if the work might repay translation, except that America is hardly yet ready for this class of
monograph. The manual of Statistics and Stock $\begin{array}{ll}\text { ExChange HaND Book. } & \text { New } \\ \text { York: Charles H. Nicoll. 1897. } & \text { Pp. } \\ \text { 500. Price } \$ 5 .\end{array}$ 500 . Price $\$ 0$.
The nineteenth annual issue of this work maintains
the reputation of its predecessors, which has made the the reputation of its predecessors, which has made the
publication a standard reference authority for investors, kers and brokers, and all interested in the values and fuctuations in prices of properties whose securities are
dealt in by the public. The book covers especially all railroads and street railways, miscellaneous corporations,
coal companies, cotton and petroleum, banks and trust coal companies, cotton and petroleum, banks and trust
companice, insurance companies, the mineral industries,

Metals: Their Properties and Treatment. By A. K. Hunting-
ton and W. G. McMillan. London
and New York: Longmans, Green \& and New York: Longmans, Green \&
Crmpany. 1897. Pp. 562 . Price $\$ 2.50$.
In the series of text books of science adapted for the
mse of artisans and students in public and science schools, published hy this well known firm, this volume occupies a most important place, especially the new edition, edited King's Collcge, London, and a lecturer on the same sulbject in Mason College, Birmingham. The latest rred as levonul the some of which are haray yetconsiuercu as leevond the experimental period, are here illus-
tratexl and deseribed. The work deals but sparingly in
chenical and ranthematical formule, and every chapter in the lxok is well withiu the comprehension of any intelligent mechanic or ambitious young apprentice.


| 158) J. W. W. asks (1) for a rule f ng over a lathe tail stock, for turning tapers. A. eter of the cone for the whole length between <br> 2. Do lenses ever lose their magnifying pow ecome non-achromatic? A. Lenses do not lose the any benefit derived from sleeping with the b ard the north? A. A magnetic soothing effect med for the meri lional position of the body in sle a progmation has much to do with it. 4 or blue print, except the difference in color? prints are made by using a green pigment in <br> DEX OF INVENTION <br> For which Letters Patent of the United States were Granted APRIL 27, 1897, <br> ND EACH BEARING THAT DATE <br> e note at end of list about copies of these patents. <br> outerment support, C. Dodge....... heater, compressed, J. H. Hoadley <br> algamator electrical, J. W. Warton <br> ejector for steam vessels, 1 H. See................. <br> xpanding, A. Lee re........... A. S. Cooley <br> slatior, G. W. Archer.............. pleel, J. McDonald. W. Amith. $\qquad$ <br>  bapp. $\qquad$ Arnolid. E. R. A Äle.... brake, brake, $\square$ alentine. 1130і4, Brien hand, lock, <br>  $\qquad$ <br>  <br>  |  |
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