

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


## NEW YORK, FEBRUARY 29, 1896



| VACUUM TUBE ILLUMINATION BY THE | the operations of the alternating electric current, we | in a way less extravagant than that of the incandes- |
| :---: | :--- | :--- |
| D. MCFARLAN MOORE SYSTEM. | find a particularly rich field for the display of induc- | cent lamp, where the results of an entire horse power | D. MCFARLAN MOORE SYSTEM. The most impressive exhibitions of the power of tive effects. From the induction coil or converter, of energy are represented by four or five feet of incanelectricity are those depending on induction. The where, without contact, a current is generated in an descent carbon filament. These hopes are all based mere pulling of an armature through space by a mag- independent coil, to the polyphase motor, where, fol- on induction, for it is in the utilization of alternating net, there being no connection between armature and lowing the lines laid down by the genius of Tesla, an or broken currents that the hope of the future for this magnet other than that furnished by the theoretical entirely disconnected coil of wire whirls around under thing seems to lie.

lines of force of the hypothetical ether, only loses its the influence of the induction, all is wonderful. The Mr. D. McFarlan Moore, of Newark, N. J., has, wonder to us because of its familiarity. Again, in hope of the future is that light may yet be produced
(Continued on paye 135.)

lighting tubes by induction.

vibrator, vacuum tube, signs, and letters.

general view of laboratory lighted by vacuom tobes.
VACUUM TUBE LIGHTING BY INDUCTION FROM INCANDESCENT CIRCUIT.

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ESTABLISHED 134E.

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SUCCESSFULGERMAN AND BELGIAN COMPETITION WIT GREAT BRITAIN IN THE IRON TRADES.
There has been a remarkable development of the iron trades in Germany and Belgium in the last few years. The serious inroads which the competition of these countries is making upon fields, both at home and abroad, which were supposed to be firmly con trolled by the English manufacturers have stirred up the British trade to make special inquiry into " the methods and conditions under which Continent al manufacturers-more particularly those in Belgium and Germany-were enabled to compete so succes fully with those in this country (Great Britain), not only here, but also in neutral markets." The delegation was composed of both employers and employed; and its mixed nature-the fact that it was so well qualified to judge the question from the two standpoints of capital and labor-make its findings of special interest, not merely in Great Britain, but in any country which, like our own, is a large producer in the iron and steel trades.
It appears that the cost of raw material, such as coal and pig iron, differs very little in England, Germany, or Belgium; and that it is in the process of manufacture that the Continental firms show such superior economy. The extent to which these nations have been able to underbid the British manufacturer may be judged from the following figures: "In 1882 Great Britain produced 8,493,000 tons of iron, against only $3,380,000$ tous produced in Germany. In that year the British produced $5,014,000$ tons of finished iron and steel, or about double the output of Germany. Since then, however, the annual German production of pig iron has advanced to $5.380,000$ tons, and the out put of finished iron and steel to $5,927,000$ tons, whil the British production of pig iron has declined to $7,364,000$ tons, and the British output of finished iron and steel has dropped to only a trifle over $4,000,000$ tons; so that Germany is now producing a considerably larger quantity of finished products than is Great Britain. Belgium has not during this period made anything like the same relative progress as Germany, but the output of Belgian steel has, nevertheless, more than doubled during the last ten years, and the capa city of production is now three times what it was in 1880." The report ascribes the rapid development of the iron industry to the "steady character of the workmen," and to the fact that strikes are very rare anong the German operatives. The delegation were im pressed with "the splendid discipline maintained," and there was a military exactness and regularity in the performance of orders. The visitors were struck with the "splendid physique of the men employed in the works, and not less so with their sobriety and steadiness. corkman, but the employer "gets the wage to the workman, but the employer "gets the
maximum production out of his plant, no heats being maximum production out of lost through broken time, etc."
It appears that, as between England and Germany, there is not so great a difference in the wages as is generally supposed. They are lower in Germany but on the other hand there is a larger relative number of men employed in a German mill. One secret of their economy is seen in the fact that there are no highly paid head "mill contractors," as in an English mill ; the oversight being left entirely to the engineer. As the result of its investigations the delegation report, "the general distribution of wages is more even ly balanced, and we do not find the extremes that obtain among English workmen."

## RAPID TRANSIT IN NEW YORK CITY.

We notewith pleasure that ex-Mayor Abram S. Hew itt, in his testimony before the Rapid Transit Commis sion, advocates an immediate extension of the elevated roads on the lines indicated by us in our last issue
Mr. Hewitt is opposed to the construction of an un derground road beneath Broadway, both on technical grounds and because of the unavoidable obstruction to traffic which must arise during its construction. He suggests the Elm Street route as being more feasible At the same time, he affirms that whichever route be adopted, it will be at least five years before the scheme would be completed and in operation; and that it is imperative that some immediate scheme of relief be carried out to meet the pressing needs of the hour.

Most of the difficulty" said Mr. Hewitt, "whic exists to-day and which will exist during the next five years during the construction of this road would be met by an arrangement between the Rapid Transit Board with the Manhattan Elevated Company for additional tracks and express trains. To-day the most important consideration for New York City is not the construction of the road, but that the existing elevated structures should be strengthened, increased, and put
at a rapid transit rate of speed. When I say this, want it understood that I have no axes to grind and I do not hold a single share in the elevated or the New York Central Railroad. I say, however, that the ele means of transportation."
tion that the elevated system should get "every facility" in carrying out this sorely needed extension It seems to us that the question is purely one of ex pediency, and that it should be judged as such. The mprovement of our transportation facilities is a mat er of compromise, in which the benefits which will arise from the doubling of the elevated tracks are to be weighed against any inconveniences which might result therefrom. The existing roads are a disfigure ment to the streets in which they run, it is true, but the mere addition of extra tracks and strengthening of the existing structures can scarcely make that dis figurement any more complete than it already is: and if the complete removal of one nuisance can be ob tained at the cost of a slight increase in some other common sense would suggest that the change be uade.
If, on the other hand, the question is not one of pure expediency, there must enter into it, as $\mathbf{M r}$ Hewitt's words would suggest, an element of senti ment or prejudice. The elevated system is, or at any rate has been, an enormously profitable investment it is true; but it has also been an enormous public onvenience. If the general public, or the body that administers its affairs, is willing to submit to the present intolerable overcrowding, rather than contemplate a possible increase in the profits of the corporation which serves its needs, and is seeking to serve them more effectually, it is collectively guilty of the $\sin$ of cutting off the nose to spite the facespecies of folly which is supposed to be remotely possible in the individual, but never in a collective body of men.

## A Large Gun Making Combination.

Several of the largest gun making establishments o the United States have combined to form what is to be called the American Ordnance Company, with Gen Albert R. Ordway as president. The firms in the agreement are said to be the Driggs-Schroeder Ord nance Company, of Philadelphia; the American Projectile Company, of Lynn, Mass.; the Hotchkiss Com pany, and a torpedo company of Providence, R. I. I is stated that the Bethlehem Company, of Bethlehem Pa., and the Gatling Gun Company, of Hartford, ar also in the new combination. The company will hav its headquarters in Washington, and a big plant for the manufacture of projectiles and guns will be started at once at Bridgeport, Conn. The reason given for the organization of the new company is that the separate companies are unable to cope successfully with the large European establishments, while a con centration of their capital will permit them to do so The new concern will endeavor to obtain the trade of South and Central America and of the Asiatic govern ments.

Refinements of Measurements.
Refinements of measurements have gone to almost ncredible limits. On lenses curvatures of $1-150,000$ inch can be measured. In spectroscopic analysis o mere traces of different elements, fractional wave lengths are read to $1 \cdot 2,500$ millionth of an inch. Pro fessor Dewar in his researches on liquid air attained a vacuum of 1-2,500 millionth of an atmosphere by filling a vessel with mercurial vapor and exposing it to a ver low temperature, and Professor Boys, with the sim plest possible arrangement of quartz fiber, torsiona balance, and mirror, claims to have been able to just detect an attractive force of the 1-20,000 millionth of a grain. So much for minute weights and measures and as regards angles the Darwin pendulum will indi cate a movement of 1300 of a second, which would be about the angular measurement of a penny piece a the distance of 1,000 miles. It is difficult to realize the minuteness of measurements like the preceding. The smallest gold coin of Great Britain, if drawn out into a wire 1-2,500 millionth of, an inch diameter, would be long enough to stretch to the sun and back again ten thousand times, and yet the fundamental mystery of the constitution of atoms and molecules would be locked up in every infinitesimal portion of the length ocked up in every infinitesimal portion of the length of that minute wire. "For the establishment of a
truer and more comprehensive theory of elasticity," truer and more comprehensive theory of elasticity,
write the authors of the last important work on the subject, " we shall probably have to wait until we gain wider acquaintance with the nature of intermolecu ar action."--Engineering Mechanics.

Dr. Max Wolf's method of detecting minor planets by photography is described in a recent number of Nature. He uses a 6 inch portrait lens of 30 inches ocal length in his telescope, which gives him a field o about 70 square degrees. To make sure that the trail of the planets are not defects in the plates, two photo raphs of each region are taken, with an exposure of wo hours. A positive and a negative are put togethe with the films in contact where the trails appear as a continuation of each other. Another method is to look at the photograph through a stereoscope, the planet then appearing in relief. Dr. Wolf has never looked through the telescope at any of the many planets he has discovered by the photographic method.

The Connecticut Yankee still preserves his pre-eminence as an inventor. For the last few years more patents in proportion to population have been issued to Connecticut than to any other State. At present one man in every 993 inhabitants of Connecticut is an inventor.
It is a remarkable fact that 5,479 patents have been issued for devices used in wearing apparel. Many of them relate to the method of cutting and fitting, while others are concerned with peculiar devices employed to strengthen the material in certain parts of the garment.
Strange to say, the District of Columbia contains a remarkable number of inventors, one to every 1,379 of the population. This state of affairs may possibly be explained on the supposition that many inventors make a temporary home in the District for the purpose of forwarding the interests of their devices.
According to the Patent Office reports, there According to the Patent Office reports, there are
5,014 different kinds of patented beds and lounges on 5,014 different kinds of patented beds and lounges on
which "tired nature's sweet restorer, balmy sleep," may be courted.
The care of live stock has received close attention at the hands of the American inventor, 3,089 appliances having been devised for the comfort and convenience of domestic animals.
The natives of Germany come next in order to those of England in $t^{\wedge}$ matter of taking out patents in this country. The nuı.ber of patents issued to subjects of the Kaiser is 582 .
the Kaiser is 582 . Massachusetts stands next to Connecticut in the
number of its inventors in proportion to population. number of its inventors in proportion to population.
In the Bay State one man in every 1,335 of the population patents something every year.
That music hath charms to soothe the savage breast of the inventor is demonstrated by the fact that he has taken out 3,928 patents on musical instruments or the various parts thereof.
The bees of America have no reason to complain of neglect, there being 998 patent hives in which the busy bee, that, according to the poet, improves each shining hour, maystore up its honey.
The butcher has 978 patents which may be employed or not, as he chooses, in his business. Most of them are devices used in the large pork packing establishments.
The manufacture of India rubber is protected by 1,864 patents.
The young American idea is taught to shoot by means of 793 patents issued upon as many educational appliances. The old-fashioned birch ruler or section of rubber hose used in education is not protected by a rubber hose used in education is not protected by
More patents have been issued from our patent More patents have been issued from our patent
office to British subjects than to the natives of any other foreign country, the number being 689.
Since the invention of the first harvester this implement has been constantly improved, there being no less than 10,155 patents upon it or its parts.
Mississippi stands next to South Carolina in the scarcity of inventions, there being in the former State only one inventor to every 21857 of its population.
Window shades have received extensive attention at the hands of the inventor, there being 2,435 patents at the hands of the inventor, there being 2,435 pate
upon them and the devices to keep them in place. upon them and the devices to keep them in place.
South Carolina patents less inventions in proportion to its population than any other State. There is only one inventor to every 25,581 of its population.
The American farmer will probably be surprised to learn that there are 10,122 different models of plows in the Patent Office, on all of which patents have been issued.

The natives of Canada do not scruple to take out patents in Washington; 296 have been granted by our Patent Office to our cousins on the other side of the St. Lawrence.
The greatest number of patents issued in any one line has been for devices employed in carriages, wagons and other vehicles. The total number of patents in this line is 20,096 .
The ordinary reader will probably be surprised to learn that 1,137 patents have been taken out either on different kinds of alcohol or on different devices for its manufacture.

The new woman may choose any one of 1,506 different kinds of crinoline and corsets, all of which have been patented.

The painter of this country is aided by 2,043 patents, covering his paints, brushes and other materials and appliances.
The granger of America need be at no loss for a har row, 4,691 patents having been issued on these aids to agricultural toil.
On stoves and furnaces 18.340 patents have been Issued, coveringevery part of these indispensible articles of comfort.

The manufacture of charcoal and coke is encouraged by the issuance of 178 patents on the processes or machinery employed.

Rhode Island contains a large number of inventive geninses, the proportion being one inventor to every 1,753 of its population.

Photography is not so fully represented in the Patent Office as might be supposed, there being only 1,481 patents in this art.
Advertising devices have received much attention at the hands of the inventors, there being 1,922 patents taken out in this line.
The man who loses an arm or a leg, a hand or a foot, has 421 different varieties of artificial limbs or members at his command.
The American housewife ought to make good preserves, for this art is covered by 1,541 patents, either of appliances or of methods.
The annealing and tempering of metals have called for much attention, no less than 736 devices for these purposes having been patented.
The irrigation problem, together with the necessity of having water in every room in the house, has called forth 7,707 patented appliances.
Lamps and their various parts have received much attention from the inventor, there being 8,211 patent ed appliances in this line of lighting.
The manufacture of the staff of life is carried on by The manufacture of the staff of life is carried on by
the use of 764 devices employed to make it or used as material in its manufacture.
Every American wears shoes, but not every American knows that 9,348 patents have been taken out on the machinery used in making them.
The processes of grinding and polishing surfaces of metal, stone, wood or glass may be accelerated by the employment of any one of 2,598 patents.
The problem of fencing farm land and city lots has received extensive attention, there being no less than 6,807 patents upon fencing devices and posts.
The vegetables of this country may be cut or crushed in our kitcheus by the aid of 2,005 patent machines. The art of printing is covered by 5,833 patents, either of machines or special devices employed in the work.
The inventors of artificial stone and the manufactur ers of lime and cement have taken out 1.159 patents. The surgeons of this country transact business with their patents by the aid of 3,335 patent appliances.
It seems strange, considering the delicate processes It seems strange, considering the delicate processes
employed in the manufacture of jewelry, that there should be only 1.106 patents in this line.
There is no State or Territory in the Union to some of whose citizens patents have not been granted.
The great department stores and elevators of our cities may choose any one of 1,167 cash or goods conveyors.
The fire extinguisher is represented in the Patent
Office by 1,023 different models, each covered by papers patent.
Montana has an unusual number of inventors for a new State. There is one to every 1,738 of its population.
Buttons, buckles and other devices for fastening straps or clothing have been patented to the number of 11,795 .
There have been 3,717 patents issued for devices or nachines employed by the carpenter.
There are 2,487 different varieties of fire escapes and ladders to be used in emergencies.
Soda water and other cooling beverages are manufactured according to 278 patented methods. The steam engines of this country need not lack for valves, 2,465 of these having been patented.
The Patent Office has issued 3,075 patents for inventions, contrivances, and discoveries in telegraphy. The fisherman has at his command 2,667 patented devices for attracting or capturing the finny tribe.
According to the reports of the Patent Office, there are 4,389 different varieties of patented chairs. The number of patent medicines is not so great as might be supposed, there being only 1,332 in the reports.
Harness making has received the earnest attention of the inventor, there being 7,400 patents in this line. The erection of fireproof buildings is encouraged by 455 patents, taken out for materials or methods.
Over 25.000 inventions for the manipulation of metals have been patented in our government office. Butter making is encouraged by 4,435 patents, either on devices employed or methods of manufacture.
There is no leading country in the world whose natives have not taken out patents in the United States. Woodworking tools have developed 4,235 patents, of which one is an auger which bores a square hole.

Of mechanical motors there are 1,775 known to the officers of the Patent Office. There are 1,351 patents which may be employed in the manufacture of glass.
Kitchenware, exclusive of stoves and ranges, is protected by 1,747 patents. Patent needles 'and pins are manufacture of sugar and salt is carrie! on by the aid of 2401 inventions.
The necessity of preparing tobacce for the consumer has developed 2.274 patents. There are 3,307 patents for machinery or processes employed in paper making. The farrier is aided in his work by the inventor to the number of 1,234 patents.
The implements and materials used in buildings are protected by 7,792 patents. Trunks, valises and bag
gage contrivances generally are protected by 1,383 patents. There are 636 patented fuei or methods of preparing wood, coal, and coke for use.
Over 16,000 patents have been issued for the various kinds of electrical appliances. There are 1,771 patents on the mechanism employed in sinking of artesian or oil wells. Railways and railway appliances are represented in the Patent Office by 8,334 models. The miller of this country is aided in his toil by 9,720 devices, all covered by patents.
The American mind may be amused by 4,453 different kinds of patented games and toys.
Inventors of military accouterments, harness and the like, have taken out 435 patents. The dentists of this country have at their command 1,283 patent instruments or processes.
The builder has a choice of 596 patent cranes or derricks with which to do his work. There are 1.549 machines or devices for the manufacture of cordage, twine and string. The manufacture of stationery may be carried on hy the aid of 4,532 patented machines.
The American roof may be covered by any one of 665 patent roofings. For the propulsion of steamships 1,583 appliances have been patented. There are 2,298 different contrivances for the purpose of spinning thread.
Knives, forks and spoons are protected by patents to the number of 2,103 . There are 5,883 models of diferent kinds of steam boilers in our Patent Office. There are patents for scrubbing brushes and broom to the number of 3,184 .
There are over 50,000 patents which in one way or nother benefit the farmer.
There are 4,854 patents for the manufacture of furniture other than chairs. New Jersey has one inventur to every 1,557 of its population. There are 2,188 tools used, or which may be used, in stone working. Patents on explosives have been issued to the number of 500 .
The builders of tall houses have 1,639 elevators to choose from. Papier mache goods have been patented to the number of 3,381 . Of air and gas engines, 1,025 different varieties have been patented. Cannons, guns, pistols, and projectiles are protected by 268 patents. One thousand and ninety patents have been issued for paving.
There are 4,240 models of patented pumps in our Washington office. Watch and clock making is encouraged loy 3,640 patents. There are 1,449 different appliances for drawing wire. Arkansas has one inventor in every 19,792 of its population.
There are 2.266 patents and moāels of sheet metal wire. There are 5,979 patent locks and latches for doors and gates. There are 4,299 different kinds of saws and sawing apparatus. North Carolina has one inventor to every 18,597 of its people.
The Patent Office has issued 7,633 patents on laundry appliances. There are 2,388 different kinds of velocipedes. The manufacture of gas is covered by 3,000 patents. The manufacture of felt is covered by 771 patents. Patented machines for bookbinding number 2,566. Boat builing patents number 1,216 . There are 1,580 patented knitting machines. The steam engine is covered by 8,237 patents. There are 1,523 different patented kinds of nails. There are 459 patents covering masonry work.-St. Louis Globe-Democrat.

## The Valuable Dogwood.

Dogwood wands make excellent whipstocks and are used in some of the best whips. They are cut sometimes by coachmen in the suburbs and sent to town to be dressed and made up into whips. The stocks made of this wood are notable for their ornamental knobs at regular intervals, which are the truncated and rounded branches. These are imitated in some other whipstocks, but the imitation is a cause of weakness. The dogwood stocks are extremely tough and elastic, being comparable in elasticity with whalebone. The wood is used for butchers' skewers, and some philologists conjecture that the first syllable of the name is a corruption of "dag," meaning a spine or dagger. Dogwood, being particularly free from silex, is used by watchmakers and opticians in cleaning watches and lenses. The American Woodworker adds : Bitter bark of the dogwood is used as a substitute for the bark of the Peruvian quinine tree. Dogwood is notably of slow growth, and in all thickly peopled regions the tree is recklessly despoiled for the sake of its blossoms, so that the supply of the wood for commercial purposes is not large.

Few people realize the immense power that is required to propel a vessel of any kind when a speed above 20 knots is required. Take, for instance, the British torpedo boat chasers, which are mere racing machines, even from a naval point of view. The most perfect specimens of vessels of this class, which have attained 30 knots speed, carry 60 tons of coal, which is full onequarter of their entire seagoing displacement. They burn $31 / 2$ tons of coal per hour. To attain the 3 knots over 27, which is the highest speed of ordinary torpedo boats, it was necessary to increase the fuel expenditure fully 50 per cent.-Marine Review.

## AN EFFICIENT SPEED CONTROLLER

The speed controller shown in the illustration is de signed to take the place of and supersede the old style cone countershaft, giving in its place a controller much more compact in design and having for its peculiar advantages the facility of changing the speed to any desired rate within its scope, even to the fewest number of revolutions. This is effected with out loss of time on the part of the operator or the touching of the belt, but simply by turning a lever from right to left, or left to right, as he may wish to increase or decrease the speed of his machine, thereby avoiding all danger from accident incident to hand ling the belt or soiling the hands from coming in contact with it.
This controller can be successfully applied to all ma chines now in use when it is particularly desirable to obtain the intermediate rates of speed which occur between the steps or risings of the cone pulley, and meets a demand which has existed since the cone sys-


## THE CUMMINGS' SPEED CONTROLLER.

tem has been known. It has been thoroughly tested during the past three years in actual everyday shop and factory service in the running of printing presses, winding, screw, grinding and knitting machines, drills, lathes, and film machines, and has elicited high commendation and duplicate orders from those who have used it.
The belt pulley, receiving motion from any suitable driving or countershaft, has connected to it or forming part of it a concave annular grooved face to be entered by one or more shiftable friction disks, a similar friction face being connected to or forming a part of the belt pulley of the inachine to be driven, and the lateral movement of the lever which regulates the position of


CUMMINGS' SPEED CONTROLLER APPLIED in RUNNING A PRINTING PRESS.
the contacting points of the disks with the two fric tion pulleys adjusts the speed of rotation of the driven pulley. It is patented by Henry H. Cummings, and is manufactured as represented in the illustration by H. H. Cummings \& Company, No. 110 High Street, Boston, Mass. It can be and has been made to operate automatically with complete success when desired, a feature which constitutes a very important peculiarity of the device.
T. R. Jernigan, United States consul at Shanghai has made a report to the State Department in which are presented in detail the amounts of wages paid in hat country for skilled labor. The sums are stated in American currency, and the wages may be understood as with food except in cases where asterisks are used

| Description. | $\begin{gathered} \text { Per Day. } \\ \$ 013 \end{gathered}$ | Per Month |
| :---: | :---: | :---: |
| Blacksmith |  | .... |
| Brassworker. | 16 |  |
| Barber | 3 |  |
| Bootmaker: |  |  |
| Native... | 10 |  |
| Foreign. | $\ldots$ | \$5 28 |
| Bamboo cabmaker. | 11 | $\ldots$ |
| Bricklayer... | 10 |  |
| Compositor: |  |  |
| Native.... | .. | 528 |
| Foreign. | .... | \$7 92 to 1584 |
| Carpenter. | 11 | .... |
| Cabinetmaker | 11 | $\ldots$ |
| Coolie*. | 13 |  |
| Bookbinder: |  |  |
| Native... | $\ldots$ | 422 |
| Foreign*. | $\cdots$ | 634 |
| Lithographer* |  | 1056 |
| Furniture polisher. | 21 |  |
| Tailor : |  |  |
| Native. | 10 |  |
| Foreign | $\ldots$ | 634 |
| Pressman | $\ldots$ | 634 |
| Coachman : |  |  |
| Native.... | $\ldots$ | 317 |
| Foreign. |  | 634 |
| House Boy : |  |  |
| Native*. | $\ldots$ | 211 |
| Foreign.. |  | 475 |
| Cotton mill machinist*. | \$0 11 to 22 | .... |
| Cotton factory hands*.. | 18 | $\ldots$ |

The inexperienced engineer who tries to cut a gas ket by first marking it out with a rule and dividers and then spaces off and lays out the holes is very clearly "not in it" with the man who understands his business, says Tradesman. That man will not try any measuring or spacing business, but will place the sheet of rubber on the flange it is to fit and with a small round-faced hammer he will go lightly over each line of surface boundary, both curved and straight. He will tap lightly so as not to strike through the rubber cloth and damage the iron work, yet the blows are heavy enough to cut the fabric nearly if not quite in two. If there are several holes or a more or less complicated outline to be cut, he will first cut one or two of the bolt holes, then put bolts or tightly fitting pieces of wood in the holes cut to hold the gasket in piace while he is cutting the balance of the way around. In this manner the gasket is cut out exactly to the shape of the surface upon which it is to be placed, and that, too, without the trouble of measuring, using dividers or maintaining a knife sharp enough to cut rubber. The only require ment is to strike light with the hammer, so as not to injure the corners of the iron.

## Fall of a Glacier

Engineering describes the fall of a glacier in the Bernese Oberland about 5 A. M. on September 11, 1895 from an altitude of 10,823 feet above sea level. The whole mass, estimated to be half as large again as the largest of the pyramids of Egypt, leaped down 4,600 feet to the bottom of the valley, then up 1,300 on the other side and back into the valley just far enough to not destroy the watercourse through it. It appear to have jumped the watercourse, moving as a solid mass. It only took about twenty seconds in its first downward plunge, ten in its leap upward, and ten in falling back, so that at the end of forty seconds the mass had changed its place from near the top of the mountain to the farther side of the valley, where it buried nearly one square mile of rich pasture to the depth of six feet. A similar ice avalanche is recorded as having occurred at the same spot on the same day of the year in 1782.

## SEPARATING GAS AND WATER FROM OIL

The separation of gas and water from oil as the lat ter flows from a well, and before it has reached a tank, is designed to be automatically effected by the separator shown in the accompanying illustration, the improvement making it possible to dispense with a great deal of the tankage room heretofore required, and saving expense and labor for steam. A patent has been granted for this invention to Benton Gilmore, of Deer field, Pa , and the improvement is being introduced by F. A. Wood, of Grand Valley, Pa. The upper end of the cylindrical body of the device is closed by a cap through which aitightly fittingltube passes down to near ly the center of the cylinder, and on the tube, above th one arm of the fitting being connected with the supply pipe from the well. An upwardly extending pipe is curved and leads downward at one side, forming a ga delivery pipe, while opposite the supply pipe leads a pipe having a check valve, and connected by a union with a branch pipe, preferably made up of fittings, so that it may be given any desired inclination, and the
latter pipe is connected with an oil outlet from the body of the device.
The oil outlet is a four-way fitting, and, by removing he plugs from one of the arms, one may observe the ow of oil through the outlet or main arm. The pipe opposite the supply pipe is not employed when the well flows water as well as oil, and in the upper portion of the gas delivery pipe is a reducing nipple, below which the pipe forms a gas chamber, preventing any escape of oil in case of a heavy flow. The lower end of the pipe extending down into the cylinder from

the top is plugged, and has adjacent apertures, forming a separator, and just below the oil outlet is a water delivery pipe whose inner end extends nearly to the bottom of the cylinder. In operation, the gas received rom the supply pipe is designed to pass off from the itting at the top, through the gas outlet, the water and oil passing together through the separating chamber, and each, from their differences in gravity, passing out by their respective outlets.

## AN IMPROVED SHADE SUPPORTER

The shade-supporting device shown in the illustra tion is adapted to sustain a shade roller adjustably in position at any desired point on the window frame, thus making it convenient to admit light from the top of a window only when such arrangement of the shade is preferred. The improvement has been patented by Joseph W. Turnbull, and is being manufactured by Turnbull \& Hennessy, No. 308 Baronne Street, New Orleans, La. Rack bars, on which are vertical guideways, are secured to the side rails of the window frame, and in these guideways slide bearing blocks in which are journaled the ends of a transverse shaft, gears at the ends of the shaft engaging the rack bars. One of the bearing blocks is shown ip the small view, and


TURNBULL'S SHADE SUPPORTER.
these blocks, in connection with the shaft, form a supporting frame in which is journaled the shade roller The shade supporter is drawn up or lowered by means of a cord passed over pulleys at the top and one side the end of the cord being secured to a retaining device at one side. As the supporting frame and shade are raised or lowered they are guided by the engagement of the slide blocks and the teeth of the gears with the rack, the shade being unwound or wound to properly shade the window after the frame has been adjusted to the desired position. A slot in one of the slide blocks at one side permits the ready removal of the shade from its support. The shadecannot fall under any circumstances, the device is inexpensive and may be readily put up by any one, and the shade is at all times held perfectly level.
an automatic vending machine.
A slot machine designed to afford unusual facilities for vending a wide variety of articles, particularly uch as are commonly supplied in elongated sized packages, is shown in the accompanying illustration, and has been patented by Charles W. Goldsmith, of New York. It is now being intro duced in many places throughout the city. As shown in the illustration, the machine is ar ranged to deliver stamped envelopes and note paper of different kinds, various samples of which are shown in the vertical glass-covered case at the rear, the top of the machine casing being formed for use as a desk. The mer chandise receptacle, as shown in the smal view, is sustained centrally in the casing, and projections therefrom form bearings for rock shafts which operate frames to deliver the goods, a single package at a time, the mechan ism being set in operation by a lever, an arm of which projects into an orifice of the coinway.
When the merchandise with which the machine is supplied has been exhausted, a stop lever comes automatically into operation to close the end of the coinway and prevent the insertion of additional coins. The machine as manufactured, is easily operated, and does not seem liable to get out of order. The mer chandise to be delivered, on the insertion of the proper coin, drops from the central recepta cle through a guide, falling upon a chute, by means of which it is passed out through the delivery opening.

RECENT OBSERVATIONS OF MARS.
-An American astronomer wishes to speak to you, sir. There are two visitors, and here are their cards :
"Percival Lowell."-"Alvan Clark."
-Ask them to walk in.
-I am highly delighted to meet you, Mr. Lowell. We are familiar in France with your splendid work. Have you come to see a little of Europe?
-I arrived this morning at Saint Lazare station and shall be off again from Lyons station.
-What, so soon? The Americans are always meteors!
-I am going to the Sahara to find out whether there is a particle of atmosphere that is perfectly calm; but, in the first place, I am anxious to show you what we have already accomplished upon our Arizona Mountains. It was vour work upon the planet Mars that gave us the impetus; but we no longer agree with you. You will utter a loud protest, perhaps ?
-On the contrary, dear sir. You well know that I am looking for progress only, and no one was as happy as I to see you dedicate a special observatory to our friend the planet Mars. You know that independent science receives bat little support in France. On the
-Mars transits at about thirty-eight million miles, but you have diminished its distance to forty-eight thousand miles, and even a little less. That is five times nearer than the moon seen by the naked eye. you have seen - . . ? I believe you in ad vance.
-No; you are much too academical, and, I shall dare to say, timorous. You are afraid to cut loose from the leading strings of the school. -Do you think so? Ask the astronomers of the Institute what they think of it.
-You are stopping by the way.
---That is in order to afford you the pleasure of going further.
-Well! the famous canals, you know. Of these you have but 79 upon your map, while we have 183, that is to say, 104 new ones. Several are as fine as hairs. And your lakes! We have 45 of these, almost all of which are exactly round. And as for the changes that you have described, they are not inundations.

## -What then?

-All that is vegetation.
-And our seas?
-Prairies.
-And our lakes?

- Oises.
_- "However," added the able observer, "I also have written a book about Mars, and have brought you the proof sheets of it, along with an impression of the new wap. You will conclude, as I do, that these are not seas here, since they are traversed by the so-called canals."
And Mr. Lowell unfolded before $m$ y eyes the map that is reproduced herewith.
- This is very remarkable. But are you sure of the accuracy of your observations? At the limit of visibility, one may be the victim of illusions, and even afterward see again what he thought he saw the first time.
You know as well as I that the dumbbel figure, for example, drawn by Cassini two centuries ago does not exist, and yet every one thought he saw it.
- Mr. Pickering and Mr. Douglass, like myself, are perfectly sure. And now we confidently submit our observations to the criticism of astronomers. I call your attention especially to the geometrical pattern of the canals. See these meeting points. This arrange ment is intentional and is for the express purpose of draining off the water.
The conversation between Mr. Lowell, Mr. Clark and myself upon this interesting subject expanded. I was not far from admitting (and I have already writ was not far from admitting (and I have already writ-
ten) that we do not truly see the canals. All those who


NEW PLANISPHERE OF THE PLANET MARS.


FOUR TELESCOPIC ASPECTS OF THE PLANET MARS.
have had the unspeakable pleasure of traveling in a cus, that the sun was the center of the planetary sys balloon and of hovering at a certain height over rivers have remarked that the latter are reduced to a mere thread, but that their course is admirably traced by the verdant valley that they water, the meadows out lining such course on both sides. One day, at six o'clock in the morning, while I was at an altitude of 8,000 feet above the Rhine at Cologne, 1 was much surprised at the tenuity of the river, which was scarcely visible as a green thread in the center of its meadow, which, likewise green, was elongated like a ribbon from south to north. I had the same impression one day in passing over Orleans at an altitude of 10,800 feet above the Loire, when the water was even invisible, and it was the bottom of yellow sand that was seen like a central thread of the strip of meadow land. In the carals of Mars, it is also the product of the water that we see; the vegetation and not the canals themselves.

As for the seas, we ask time to reflect until the month of December, when the planet will return to us, in obedience to the laws of attraction, and permit observers to confirm the lines of this new map. If these dark lines really traverse the seas as they do the continents, we shall be led to modify our interpretation and to no longer consider them as stretches of water.
Nevertheless, there is water upon this neighboring globe. The most evident proof of this is in the snow that extends all around the poles as far as to a latitude that corresponds to that of St. Petersburg, and sometimes eveu to that of Paris, and which, under the rays of the summer sun, melt almost completely. This melting of the cireumpolar snow is much more complete upon Mars than upon the earth; doubtless be cause the seasons, which are analogous to ours, are twice as long. None of it remains except at one point -not at the geographical pole, but at the pole of cold at 210 miles from the former. W
We know what becomes of it
We know what becomes of it. It fills the canals and is distributed over the entire surface of the continents for the irrigation of the dry land. It never, or scarcely
ever, rains upon Mars. Fine weather is perpetual ever, rains upon Mars. Fine weather is perpetual
there. There are no clouds, no rains, no springs, no brooks and no rivers. The circulation of the water takes place in an entirely different manner from that in which it does here.
According to these recent observations, the water derived from the melting of the snow in summer gives rise in the first place to the dark spots that we take for seas, in distributing stre that supply the fields and meadows, and perhaps the
woods, the tone of which varies with the seasons. woods, the tone of which varies with the seasons.
Then it is sent by the geometrical network of rectilinear canals to the most desert steppes.

The series of disks arranged in echelons at the intersections of the canals represent purposely created oase fed by these waters.
We know that upon this neighboring world a man weighing here 165 pounds would weigh but 52 , that the density of substances is much less there than here, that the atmosphere is very light there, and that the conditions of life there all differ very sensibly from our own. It is probable that the human kind, whatever it may be as regards form, is more advanced than our own (Mars being much older than the earth) and much superior in intelligence. Such fraternal unity of organization would seem, moreover, conformable to our theo retical ideas as to our neighbors of the sky.
Optics is rapidly advancing and will continue to advance. Let us not draw conclusions yet; let us wait. But let us testify to the rapid progress of the finest and most attractive of all the sciences. We
shall expatiate no further upon this subject. We shall merely add that Mr. Lowell was kind enough to postpone his departure in order to deliver a lecture before the Astronomical Society of France, and that it proved a great success. This session, which was presided over by Mr. Max Cornu, was particularly inter ety of France is? It is an association of which all those who love astronomical science may form part, in consideration of ten francs a year, and which, through its monthly bulletin, keeps one posted upon all the progress made in astronomy.
We reproduce herewith four globes representing the planet Mars in its entirety, according to Mr. Lowell's observations. The American astronomer has laid out a planisphere which we likewise reproduce. plane according to the Mercator system of projection, used in geography for the construction of charts.Camille Flawmarion, in L'Illustration.

Opposition to Inventions.*
One of the most remarkable things in the history of mankind is the opposition to the introcuction of inventions and improvements which has existed from the earliest times, and still exists to some extent.
From the time when the earth was believed to be flat, and Galileo was denounced and imprisoned for
asserting, in accordance with the theory of Coperniasserting, in accordance with the theory of Coperni-
tem, and that the earth had a diurnal motion of rotation, this opposition to new ideas has existed, and been manifested in the grossest outrages upon, and persecutions of, the originators and advocates of the new ideas. This has been true of inventions and im provements in the arts and sciences, as well as in gov ernmental and religious improvements or reforms.

Much of this was due to the existence of the prevail ing doctrine of the "divine right" of rulers and the arbitrary power exercised by them, and to the claim of superior wisdom and infallibility made by the then dominant church, supplemented and rer dered possible by the ignorance and helplessness of the masses.
Besides, human nature seems to be subject to the same laws as moving bodies; it moves always in a direct line when once set in motion, unless interfered with by a power sufficient to deflect it from its course. In the arts and sciences, as in politics and religion, men prefer to remain undisturbed, and naturally resent any interference with their settled beliefs and habits They look with suspicion on new suggestions or ideas and especially such as, in their ignorance, they think will interfere in any manner with their present inter
ests; and hence the tendency to continue in the old ests; and hence the tendency to continue in the old ruts, and violently oppose improvement
History shows that the great improvements in the arts and sciences have had their development only arts and sciences have had their development only
since free governments have been established, and general education introduced; and it is where these exist in the greatest perfection that the greatest advance has taken place.
In the United States, where there is the greatest freedom in governmental and religious matters, there has been the greatest advance in inventions. The growth and development of our manufacturing and agricultural interests, which is due to inventions fostered by our patent system more than to any other cause, have been marvelous, and excite the astonish ment of the world. Under the benign influence of this system, in a single century, we have grown from
a cluster of scattered settlements, mostly along the a cluster of scattered settlements, mostly along the
Atlantic seaboard, with a population of less than $4,000,000$, to a powerful and compact nation of nearly $70,000,000$; have increased our national territory from 830,000 to $3,314,220$ square miles; have subdued the forests and built up the whole country from ocean to ocean; and have built more miles of railroad, and established more post offices, than all other nations ombined. We have grown and prospered as no other uation has, until to-day we do one-third of the world's manufacturing, une-third of its mining, one-fifth of its farming, ano possess one-fifth of its wealth.
With such an illustration of the benefits of our pat ent system, one would suppose that opposition to inventions would long since have ceased ; but, unfortun ately, while it has greatly diminished with the growth of intelligence and universal education, it still exists. As illustrative of this spirit of opposition, it may b nteresting to cite a few instances. When, in 1807 , Papin, of France, the inventor of the digester in uni ersal use for paper making and many other purposes and also of the lever safety valve, made a swall steam boat and ran it down the river Fulda, the ignorant boatmen, who, like some of the laboring men of the present day, thought it would injure their business, seized and destroyed it.
So, too, when Jonathan Hulls patented his steam boat in England, in 1736, he was laughed at and ridiculed in every conceivable way.
When Jacquard invented his loom, which was so wonderful that the great Arnout, French minister of war, caused him to be brought into his presence and aid to him: "Are you the man who can do what the Almighty cannot-tie a knot in a stretched
string?" there was the strongest opposition to its introduction, culminating in a mob of the silk weavers who took it from his house into the streets, broke it up, and burned the fragments.
It was the same with Hargreaves in England, when he invented his spinning jenny in 1763. He was persecuted by his fellow workmen, who seized his machine, broke it in pieces, and drove him from his native town That invention, with the improvements of Ark wright and Crompton, and the invention of the cot ton gin by Whitney, who was outrageously defraud ed of his rights, have changed the entire art of producing woven fabrics. Indeed, so far as the cotton industry of the world is concerned, they may be said employm created the industry, which to ened the product that it is used the world over.
This opposition to and unbelief in the possibility of the success of in ventions has not been confined to the ignorant alone, but has been shared by many educated and even great men. When it was proposed
to build a railroad in the United States, Chancellor Livingston, one of the greatest men in the State of New York, published a letter in which, as he thought, he demonstrated the utter impossibility of the proposed undertaking. His reasons were, first, that it
would require a massive substructure of masonry the
whole length of the road, and that would be so expensive that it would not pay; second, the momentum of such a moving body as a train of cars would be so great that the train could not be stopped until it got several miles past the place; and, third, no one would want to risk his life flying through the air at the rate of 12 or 15 miles an hour.
So, too, Daniel Webster expressed grave doubts as to the possibility of railroads, saying, among other hings, the frost on the rails would prevent the train rom moving, or from being stopped, if it did move.
When Murdoch invented or discovered a means for producing illuminating gas, no less a man than Sir Humphry Davy ridiculed the idea of using it for lighting purposes, and said if it was to be used for street lighting, they would have to use the dome of St. Paul's for a gasometer. Sir Walter Scott made clever jokes bout "sending light through street pipes," and "lighting London by smoke," but subsequently had his house lighted by it. Wollaston, a scientific man said "they might as well attempt to light London with a slice from the moon." It is but a few years since the scientists of Europe demonstrated mathe matically that the electric current could not be divided or incandescent lighting, but to-day the contrary is demonstrated by millions of incandescent lights, illuminating every spot where civilized man resides.
But the strangest of all things in this connection is the fact that, even in this enlightened age, there are men who still insist that inventions are injurious. It is not many years since that, in a paper published at the national capital, there was the statement that the steam engine and the sewing machine were two of the greatest curses that ever befell mankind!
It is, moreover, a matter of history that in certain ections of this enlightened land prayers were fervently offered in churches beseeching that the wickedness of the newly invented sewing machine, which, it was supposed, would rob the sewing women of their means of obtaining a living, might become apparent, and its promoters be stricken by a conviction of their wrong doing in making it, and thus be told by heaven to deist from its manufacture
This spirit of opposition exists to-day to a greater or less extent among the labor unions, whose mem bers, without investigating the subject, are made to believe that labor-saving machinery deprives them of employment, or at least will lessen their wages, just as the silik weavers of Lyons thought in regard to Jacquard's loom, and as the spinners of Lancashire thought in reference to Hargreaves' spinning jenny.
It is no doubt true that, when a new invention is It is no doubt true that, when a new invention is
introduced which revolutionizes some particular art introduced which revolutionizes some particular ar
or branch of business, it at first decreases the number of persons employed in that particular line; but that is only temporary, for in a short time the result is a cheapening of the product, a greatly increased de mand for it, because of this cheapening, and then necessarily an increased demand for laborers in that ine, and almost universally at increased wages.
The statistics of the country show this to be true beyond the possibility of question. The records of the Labor Bureau show that from 1860 to 1880 , the most prolific period in this country of inventions, and the most intensified in all directions of their introduction the population increased 59.51 per cent, while in the same period the number of persons employed in al occupations-manufacturing, agriculture, domestic service and everything-increased 109.87 per cent ; and in the decade from 1870 to 1880 the population increased 30.08 per cent, while the number of persons employed increased 39 per cent.
As shown by the investigation of a committee of the Senate, wages have increased 61 per cent in the United States since 1360 . And, as all know during that same period the cost to the people of nearly all manufactured articles has been de creased in as great if not a greater ratio. As with manufacturers, so with farming. As a recent writer has well said, "The use of patented machinery has so changed agriculture that there is more propriety in saying that we manufacture crops than in saying that we grow them." And still another writer sayz: "We use implements that cheapen the cost of production, and make the labor f harvesting like the sport of the fairy books."
While most people have the idea that inventions have mainly benefited the manufacturing industries, it is susceptible of demonstration that they have benefited our agricultural industries nearly as much.
In speaking of the condition of the United States, recent English observer says:

America has for many years enjoyed an amazing degree of prosperity, so much so indeed, that, to use the eloquent words of Edmund Burke, 'generalities, which in all other cases are apt to heighten and raise the subject, have here a tendency to sink it. Fiction lags after truth, invention is unfruitful, and imagination cold and barren.' The United States has 65,000, 000 people, who spend more on dress than any other people on the face of the earth," and who, he might have added, enjoy more of the comforts of life in all directions than any other people on earth.

## VACUUM TUBE ILLUMINATION BY THE

(Continued from first page.)
with relatively simple apparatus, produced very re markable effects in inductive lighting, and, after some years of work and study, his system has taken a defi nite shape. Mr. Moore has worked upon the principle of effecting as clean cut and rapid a break of an elec tric current as possible, and has utilized for lighting purposes the effects of this break upon a current in a self-inductive circuit, recognizing the fact that it was the so-called action due to the break, the inductive "kick," which he had to rely on, and he concentrated his energy on making the break as sharp and as decided as possible
One of his first systems was the inclosing inside of a Geissler tube of a mechanical circuit breaker for the tube itself, and with this apparatus he obtained very good effects, the tube lighting up much brighter than when actuated in the usual way. The process seemed to lend itself so well to existing conditions that much was hoped for from it, but it has now been superseded. His present treatment of the problem of lighting, for his work tends to that end, has taken the shape of using a special circuit breaker, to make and break a current for actuating electrodeless vacuum tubes no longer inclosing the circuit breaker in the tube it is used for. This circuit breaker is based on the principle that in order to make a sharp break it is essen tial to remove anything that acts as a conductor between contact point and contact point, the air ordi narily acting as a conductor between the contact points so as to prolong the action. This prolongation of the action is precisely what it is desirable to avoid, the amount of counter E. M. F. is dependent on the length of time required for a single break, and in one of our illustrations we show the very simple apparatus by which it is disposed of. An ordinary spring cir cuit breaker is inclosed in a glass tube which is her metically sealed after a vacuum has been produced therein. In the usual type of circuit breaker the air acts mechanically as a damper on the movements of the spring. In the exhausted tube this dampening is done away with, the frequency of the oscillations being increaséd six times, which effects a step in the mechanical perfection of the arrangement. From the electric standpoint the absence of air causes the make and break to be far more instantaneous than it would otherwise be, the opening required in the vacuo being less than in air.
The circuit breaker is really the critical feature of the system. Its functions are performed in union with apparatus of known and accepted type. Connected to one of the terminals of the magnetizing coil in the cir cuit breaker is another coil of wire to increase the self-induction. The apparatus is put into the ordinary incandescent circuit.
Electrodeless vacuum tubes, sealed glass tubes with nothing in them, with no metal attached except the metallic paint on the outside, therefore with nothing to burn out, are used to give the light. They are connected either across the make and break or in parallel with the coil. When all is properly adjusted and the circuit breaker is operating to mak break the circuit, the tubes glow with a strong light, uniform from end to end, without striations and with out flickerings. It is as if the entire tube was filled with an even atmosphere of light. In the case of a
straight tube, it is a glowing cylinder of the diameter straight tube,
of the tube.
In his laboratory in Newark, Mr. Moore has carried out his experiments, and the exhibitions of his light have been very impressive. The direct current incandescent lighting circuit at 110 volts potential is used and is connected directly to the circuit breaker coil and to the other coil placed in series. When the current is turned on, the circuit breaker vibrates, and at once the tubes connected with it glow evenly from end to end, their light being many times brighter than that of the old fashioned Geissler tube as ordinarils operated, there being absolutely no comparison between the two, the Geissler tube giving a mere thread of weak light as ordinarily worked. Around the cor nice of one of his experimental rooms, Mr. Moore has arranged four tubes, $11 / 2$ inch diameter and $91 / 2$ and $111 / 2$ feet long. The ends of these tubes are coated with aluminum powder; there is no wire connected with interior of the tubes, and the interior of the tubes is brought to a degree of exhaustion suited for Geissler tube action. In his experiments these tubes may be lighted all at once from the one circuit breaker, or from several, when the whole room becomes brilliantly illuminated. In this distribution of tubes along the cornice a suggestion in a practical way is made, as it is proposed ultimately to illuminate apartments by placing vacuum tubes in exactly such positions. The recognized tendency of the day is toward multiplication of lights, the avoidance of strong shadows and of uneven illumination being desirable in the eyes of the public. In the illumination by tubes carried all around a room, we have what amounts to an infinite multiplication of lights, causing shadows to disappear and the room to receive the equivalent of what a
microscopist would call "the light of a white cloud," recognized by eye workers as the most perfect illumi nation. It is artificial day light without the red glare of ordinary lamps. Normally, the tubes would have their ends counected, but this is not necessary. The most beautiful effects can be produced by induction, as one excited tube will illuminate another if placed near it. One of the illustrations shows an experiment in which tubes held in the hand are illuminated by being brought near a metallic netting, the
A curious feate this experill
A curious feature of this experiment, itself most im pressive, is that the intensity of illumination is greatly diminished in the portions of the tube below the hand the increase of electrostatic capacity by the body apparently producing this phenomenon. It is obvious that in this illuminating there is an end less range for decorative effects. It is proposed to use it for advertising signs, and it has already been exhibited in thi capacity. It can be utilized for theatrical purposes. How economical the process will be is as yet uncer ain. The great loss in all high E. M. F. systems, in cluding a circuit breaker action, is in the are; great energy being dissipated in the surrounding air. When this is removed and the arc is left working, the economy is enormously increased. There is no question that the tube is economical; the efficiency of the circuit breaker seems now to be the critical point. But the most impressive feature is the compactness and simplicity of the apparatus by which the operations are carried out. The circuit breaker and coil occupy perhaps a quarter of a cubic foot of space, yet suffice for regulating the supply of current for an indefinite num ber of Geissler tubes, producing with inexpensive ap paratus effects hitherto unknown, and only approxi mated to by the most expensive apparatus.

## Laryngeal Tuberculosis.*

I do not take up this subject with the hope of add ng anything astonishingly new, but to impress those who treat general tuberculosis with the importance of accurate local diagnosis, as a prominent feature in the prognosis, and to give some few points in recent meth ods of treatment. It is probable that about one third of all patients suffering from pulmonary tuberculosis manifest a greater or less degree of laryngeal involvement. Although, according to most authors, the pulmonary involvement is the initial manifestation of the disease, and the laryngeal involvement presents only as the disease develops, still I believe there are many cases in wnich a careful laryngeal examination may tell us, sooner than any other physical examination of the approach of this insidious disease.
It is a too commonly accepted fact that, when an examination reveals a healthy pair of lungs, it is proof positive that consumption does not exist, for very fre quently in its incipiency the disease is located in the pper air passages, only revealing itself in the lungs fter complete systemic infection.
There is a class of cases with which you are all amiliar, presenting recurrent attacks of laryngeal cough, occasional hoarseness, associated with general debility, and yet showing no pathological pulmonary ondition. However, a careful laryngeal examination will reveal to the trained eye an unnaturally pale mucous membrane, which alone may give us warning
of some threatened disease; a little later on a slight infiltration between the arytenoid cartilages appears with possible swelling of the arytenoids themselves. All of these signs pass away, only to recur in perhaps an aggravated form, and finally we can diagnosticat unmistakable tuberculosis, perhaps, by this time, both in the lungs and the larynx.
The point that I wish to make is that these first sus picious signs should be promptly recognized, and treatment, both remedial and climatic, might prevent the development of the geweral disease.
The unmistakable sigus of laryngeal tuberculosis
ccurring in their natural sequence are :
(a) Inter-arytenoid thickening.
(b) Pyriform swelling of the arytenoids.
(c) Infiltration of the epiglottis.
(d) Lesions of the vocal cords (both false and true)
(e) Superficial and deep ulcerations, and
(f) Necrosis.

I will say nothing as to the general treatment of uberculosis, as you are all familiar with its variou phases; but the local treatment will often be of grea tion, in the removal of symptoms, and perhaps in pre venting much suffering.
Catarrhal laryngitis rarely becomes tubercular, but it is nevertheless advisable to cure such catarrhal rouble when possible.
Local cleansing sprays are both agreeable and helpul to the patient-such sprays as solutions of boraci acid, bicarbonate of soda, sulpho-carbolate of soda diluted listerine, Ponds extract, or dilutions of the in icated internal remedy.
In the case of suspected oncoming tuberculosis, but before it is actually present, local laryngeal treatment * By C. Gurnee Fellows, M.D., Chicago, Illino
cal Society, 1895 (as reported in Medical Arena).
is neither necessary nor advisable. But as soon as the inter-arytenoid thickening above mentioned shows itself, and through the progressive steps, local treat ment becomes of inestimable value. I have seen ulcerations heal, arytenoid swellings diminish, infiltra tions decrease, vocal power restored, and painful deg. utition cease under appropriate treatment.
For general applications to the larynxsprays are ad visable, but for accurate treatment, and particularly in the use of the stronger preparations, the laryngeal applicator is alone allowable. For simple infiltration, no matter where it is found, mild stimulation for the purpose of promotion of absorption is called for. Such stimulants are the sulphate, chloride, and sulpho-car bolate of zinc, carbolic acid, calendula, and glyceroles of various indicated remedies. Reaction should be watched for and noted, and the applications made only so often as is necessary to keep up the absorption, and not of ten enough to induce irritation. But when ulceration manifests itself, more radical treatment is demanded. Menthol, from 2 to 20 per cent, in ben zoinol, is highly recommended and has been of decided use in stimulating the healing process, and is perhaps econd in importance for the treatment of ulceration But lactic acid stands pre-eminently first and is worthy of its reputation. Its application has generally been made directly to the ulcerated spots, beginning with a 40 per cent solution and increasing gradually to 60 and 80 per cent, and often to the pure drug.
Recent researches, and particularly those made by "Heryug," of Warsaw, have proved that the effect of actic acid is far more powerful after curettement of the ulcerations, and a perusal of a recently published eries of 300 consecutive cases treated in this manne adds strength to our belief in its efficacy. In my own work I have had some good results with this treatment and several cases have maintained the improvement or a period of over two years. The internal treat ment I shall not discuss, because each case needs individualization. But in passing I cannot refrain from mentioning with highest praise the iodide of lime. Its phere of action has been particularly upon infiltrated tissue, causing its absorption and acting favorably upon spasmodic cough.
Inhalations of vaporized eucalyptus, menthol, pine needle oil, creosote, naphthalene, iodine, etc.. in ben zoinol, give us to a certain extent the benefits of climatic change by creating medicated air for respiratory purposes.

Tiny oxen.
One of the greatest curiosities among the domesticated animals of Ceylon is a breed of cattle known to the zoologists as the "sacred running oxen." They ar the dwarfs of the whole ox family, the largest speci men of the species never exceeding thirty inches in height. One sent to the Marquis of Canterbury in the year 1891, which is still living, and is believed to be somewhere near ten years of age, is only twenty-two inches high, and weighs but one hundred and nine and a half pounds. In Ceylon they are used for quick rips across country with express matter and other light loads, and it is said that four of them can pull a driver of a two-wheeled cart and a $t$ wo hunared pound oad of miscellaneous matter sixty to seventy miles day. They keep up a constant swinging trot or run and have been known to travel one hundred miles in a day and night without either food or water. No one knows anything concerning the origin of this peculiar breed of miniature cattle. They have been known on the island of Ceylon and in other Buddhistic countries for more than a thousand years.-Tit-Bits.

A means for preventing the noise made by trains in passing over iron bridges has been devised by a Ger man engineer named Boedecker. He puts a decking 1 $1 / 4$ inch planks between the crossgirders, resting on 3 inch timbers laid on the bottom flanges. On the planks a double layer of felt is laid, which is fixed to the rertical web of the cross girder. At the connec tions with the girder a timber cover joint is placed on felt, and two hooked bolts connect the whole firmly to the bottom flange. Four inches of slag gravel cover the decking, which is inclined toward the center of the bridge for drainage purposes. A layer of felt is laid between the planks and the timbers they rest upon and the ironwork in contact with decking and ballast is asphalted. The decking weighs 600 pounds per yard for a bridge 11 feet wide and costs 23 cents a squar oot. It is watertight, and has proved very satisfac tory in preventing noise.

## Vivisection in Switzerland.

Recently the people of the Swiss canton of Schwyz voted by referendum on the question whether vivisection should be permitted in the canton or not. A motion to pronibit vivisection entirely was rejected by 39,476 votes against 17,297 , and a proposal of the local Society for the Prevention of Cruelty to Animals to allow the practice of vivisection for bona fide scientific purposes was adopted by 35,191 against 19,554 votes.

REBUILDING DEFECTIVE WALLS OF A CHICAGO BUILDING.
The De Tamble building, just west of Des Plaines Street, on Jackson Street, Chicago, was built by Martin de Tambie, and completed about October 1, at a cost of about $\$ 100,000$.
It was already occupied on several of the floors, when one of the tenants-a tailor-thought the walls were not plumb. He brought the matter to the attention of the building department, but no attention was at first paid to him. He persisted, however, with the result that the west wall was found to be $141 / 2$ inches out of plumb, and the building was condemned as unsafe and ordered vacated and taken down.
Iver C Zarbell was the architect of construction, and the work of taking down the walls and rebuilding was given to Architect C. H. McAfee. The floors and roof were all supported on cob piles and timbers, as shown in the photograph, and the walls taken entirely down and rebuilt from the foundation. The cause of the settling of the walls was probably the laying of the foundation in dry concrete in frosty
days of "straight air"—and the 70 pounds we were supposed to carry had increased to about 90 . This higher pressure would give no more than a safe brake force, so far as wheel sliding was concerned; for at that time the low braking force employed was so much superior to hand brakes that maximum efficacy was not a ruling consideration.
From A - to T- was a distance of nine miles, The first thre miles being down a grade of 70 feet the mile, the remaining six miles being level, with numerous curves among the bluffs. A half mile from the foot of the grade was a water tank, where, with seven cars, it was our invariable practice to stop for water; but on the night in question, while standing at $A$-, the fireman reported sufficient water to make M-, fifteen miles away. It should here be remarked that this trip was the only one we ever made with seven cars without taking water at this tank.
One and a half miles east of T- was a lane crossing seldom used by vehicles, and it was not a practice to whistle at this point, particularly at night.
In approaching $T-$, the track began curving at

These thoughts passed my mind in an instant, and I applied the brakes. This had partially reduced the speed when I saw a headlight rounding the bluff. Over she went" on two pipes of sand, and the occupants of the cab located themselves on the steps preparatory to alighting among the stumps along the way.
Seeing the prospects were fair for stopping, we re mained on the engine, finally stopping on a trestle 20 feet in height, and the two engines so close together that in going from the one to the other-the bridge was too narrow to pass along their side-I stepped from one pilot to the other.
The station agent had company that night and was itting in the telegraph office with his guest, a lantern furnishing the light. He heard No. 12 whistle for the station, followed shortly after by our whistle for the lane crossing, and, noticing by the sound of the former, coming through the dense wood, that they were not going to take the siding, he ran out with his lantern and flagged them
Now to recapitulate. Had not the relief valve stuck,


## NECESSARY REBUILDING OF DEFECTIVE WALLS OF A LARGE STRUCTURE IN CHICAGO.

weather. It will cost upward of $\$ 30,000$ to re-erect the building.

## Was It Luck? An Incident of old Time roading.

s. J. Kidder, in Locomotive engineering.

In the summer of 1873 I was running a "Manchester" on one of our great Western trunk lines, pulling what was then known as the "night express," and it was while on the road with this train that I met with perhaps the most peculiar chain of entirely unusual incidents during my long experience running an engine, and in the absence of any one of them a disastrous head-end collision would have occurred.
We were west bound with No. 1, and should have met No. 12 freight and No. 2 at A--. We reached there on time, and headed into a siding, permitting No. 2 to pass. Following the departure of this train, we backed out and pulled up to the station, making our regular stop. The signal was displayed denoting telegraph orders, which, when delivered to the engine, found us thirteen minutes late. While standing at the station, I observed that the relief valve in main resarvoir was not operating properly-it was in the
the whistling post a half mile east of the station, con-
tinuing through and past the station grounds. $\mathrm{T}-$ was simply a passing point having a siding some sixty was simply a passing point having a siding some sixty
rods in length and a depot located about midway between the switches. In approaching from the east, the switch and depot were obscured from view by a bluff just east of the switch. On the opposite side of track, parallel to it and about twenty rods away, woods skirted the right of way. The only resident of the town" was the station agent, who occupied a portion of the depot
Upon leaving A—— we attained a high rate of speed, in descending the grade, which was kept up across the "bottom."
As we approached the lane, for some reason which I cannot explain, I sounded the whistle and shortly after the station signal at the whistling post. About this time I noticed the reflection of a light on the woods, and my first impression was that No. 12 had left its head light uncovered, denoting that the main ine was not clear ; next the thought occurred that Den. F. was conductor of the freight, and, contrary to the general practice, he always sent a flagman out at stations, as well as elsewhere.
giving us an excessive pressure of air, 20 pounds more than we usually carried; had we stopped for water at the tank; had I neglected to whistle for the lane; had I not known of the flagying habit of Conductor F., or had the station agent been in bed, where that hour usually found him, those trains would inevitably have come together with dire results, from lap orders Is it any wonder that in retrospecting on old time railroading, in thinkin $g$ of the ciscumstances as above related, I oftentimes wonder, "Was it luck ?"

## A Remedy for Black Eye.

There is nothing to compare with the tincture or strong infusion of capsicum annuum mixed with an equal bulk of mucilage or gum arabic, and with the addition of a few drops of glycerine. This should be painted all over the bruised surface with a camel's hair pencil and allowed to dry on, a second or third coating being applied as soon as the first is dry. If done as soon as the injury is inflicted, says the Medical Progress, this treatment will invariably prevent black ening of the bruised tissue. The same remedy has no equal in rheumatic sore or stiff neck,

## A FRENCH MODEL ACETYLENE LAMP.

The rapidity with which acotylene has received commercial developuent is very remarkable. It is hardly a matter of surprise that one of the most artistic and convenient oxamples of the uses to which this new material as an illuminant can be put is due to the ingenuity and good taste of the French. The lamp shown in the accompanying illustration is from the laboratory of Mr. G. Trouvé, the well known French scientist, and shows the practica! form in which the lamp may be constructed to render it available as a portable lamp for domestic uses. Before, however, such a lamp is introduced into general use in the family the fact of its absolute safety and impunity from accident must be assured, and such an end will be reached in time, no doubt, by experiment and by perfecting the apparatus.
It is interesting to notice the credit given in La Nature to the original simple apparatus, described by T. O'Conor Sloane, in our columns, as being the first acetylene lamp produced, which apparatus was given originally in the pages of the Scifntific American of March 30, 1895. This appeared in the spring of 1895, and La Nature speaks of it as the first acetylene lamp ever made.
G. Trouve's lamp, of an exceeding simplicity, consists of two glass vessels, one fitting within the other, and of a metal part closing the top, to the center of which top is connected the jet or burner tip.
which must be instantiy condensed so as not to interfere with the proper action of the lamp, whose burner, as in all portable lamps, is very near the generator. Mr. Trouve first tried to obtain this result by means


TROUVE'S ACETYLENE LAMP.
just above its lower opening, condenses the first vapor carried off by the gas. Furthermore, it enables one to withdraw this tube to get access to the entire system for cleaning and drying it.
It is very important to be able to govern the pro duction of acetylene, because if the basket contains a large quantity of calcium carbide, the production of the gas would become more and more rapid. In spite of the regulation by successive immersions, the vapor of water traversing the calciun carbide from below upward finally moistens the whole mass. To govern adequately the production, Mr. Trouve has adopted a system of superimposing the lumps of carbide in layers separated from each other by disks of glass. These act as dia phragms to prevent the vapor of water carried off by the gas from traversing the carbide which they support, and the automatic production of the acetylene is uniform from the beginning to the end of the lighting. First the lower layer is reduced to lime, then, as it softens, the sec ond layer, descending, takes its place, and this action is repeated with the successive layers until the carbide is completely exhausted and the disks of glass rest one upon the other on the bottom of the basket.
Acetylene having almost the density of air, 0.92 , burns best in a still atmosphere, so that the burner is placed in the center of the metallic disk, which tends to deprive the air of any up ward draught, giving the flame proper steadiness. These lamps spiral ribbon, and later by a still simpler arrangement consume on an average 1,543 grains (about $31 / 4$ ounces) shown in Fig. 2.
He uses two concentric tubes, a e, cut off obliquely with a large neck, is suspended litith basket and connecting with the cock, r. At first the gas passe which holds the calcium carbide ; the bottle in question by both tubes to the burner, as is shown by the arrows, has a conical opening in its bottom, the size of which but as soon as the vapor condenses in the central orifice depends on the use to be made of the lamp, so tube it seals it and it acts as a siphoi. The acetylene that the movements within this bottle, which acts as a continues to go through to the burner by the exterio bell jar, shall not be too sudden, depending as they tube, e, and by the little holes, $x, y, z$, by which the do on the speed of entrance and cutflow of the liguid. exterior tube communicates with the interior tube, Under these conditions the flame and its intensity are fixed. a. As this siphon action is continuous, the interior tube carries off constantly the condensed vapor of water into the recipient whence it came. Further-
of carbide for 38 candle hours.
STREET POSTAL CAR SYSTEMS OF NEW YORK AND BROOKLYN.
The establishment on February 3 of the street postal car service on Broad way, Brooklyn, again attracts puolic attention to one of the most important enterprises the United States postal service has undertaken. This is distinctly a novel development of the mail service and the recent general a wakening inlthis direction is due to the foresight and energy of Mr. Charles Neilson, the Second Assistant Postmaster-General, of Washington. Mr. Neilson's long experience as a manager of rail

road systems and his studies as assistant general superintendent of the railway mail service for the United States led him to perceive the immense advantage to the commercial and social interests of the great cities which would come about from having post offices on wheels to keep up a continued and regular exchange and interchange of mails between the main post office and the branch post offices in the large cities of the country.
He has pushed this idea into practice with wonderul rapidity and has accomplished remarkable results in view of the comparatively limited appropriations made by the last Congress for the postal service generally. Mr. Neilson has recommended to the present Congress a specific appropriation of $\$ 200,000$ for city railway mail service.
On June 30, 1895, there were in operation in the United States 82 street railway mail routes, covering a distance of 573 milos. These lines were performing a daily service aggregating yearly $1,144,201$ miles of travel with closed mail pouches carried from one post office to another. The magnitude of this particular class of service is shown by the fact that these lines carried each day 1,856 pouches of mail matter.
The higher development of the work, however, is to have traveling post offices in the cars, in which the postal clerks postmark and assort the mail while it is always in transit, thus avoiding the detention for sorting in the post office where the matter is mailed.
At the close of the last fiscal year there were ten railway post offices of this kind in operation, of which seven were in Boston, one in Brooklyn, one in Philadelphia, and one in St. Louis.
In New York and Brooklyn great strides have been made since July 1, 1895. In New York City General Neilson's views were heartily appreciated and furthered by Postmaster Darton and his chief of city delivery division, Mr. E. M. Morgan.
On October 1 the Third Avenue Railway post office was established to effect a rapid interchange by mail between the general post office and the great east side section of the city. The Third Avenue Railroad Company took up the subject with enthusiasm, determined to make the experiment a success. The postal cars are the handsomest that could be made.
There are twenty-five postal clerks assigned to the Third Avenue line. The cars run from the genera post office every half hour, and make an equal number of trips southward. On the way they exchange mails with Branch D (Ninth Street), Branch F (Twen ty-eighth Street), Branch H (Forty-fourth Street), Branch Y (Sixty-eighth Street), Branch K (Eightysixth Street), Branch L (East One Hundred and Twen ty-fifth Street), Branch J (West One Hundred and Twenty-fifth Street), and Branch M (Amsterdam Avenue and One Hundred and Fifty-seventh Street). Mails are worked en route at present to connect directly with the carriers' deliveries at the general post office and Branches $\mathrm{H}, \mathrm{K}$ and L . The possibilities of the service are only limited by the number of existing carrier deliveries. Letters postmarked at the general post office at, let us say, 3 P. M., can be delivered at the Metropolitan Club (Sixtieth Street and Fifth Ave nue) at 4:15 P. M., thus being postmarked, distributed transported four wiles, and delivered by carrier in a little over one hour.
The Third Avenue Railroad post office is the mos important mail line of its kind in the country. It not only advances the local mail, but also mail from out of town as well.
Mail reaching the city from the southwest by the Pennsylvania Railroad at 7:40 A. M. was not formerly delivered at, say, Branch H until the 10:45 A. M. car rier delivery. It is now sent directly from the railroad depot to the Third Avenue Railroad post office, is sorted going uptown and goes out to the public on the 9:15 A. M. delivery. Many other similar gains have been effected.
In Brooklyn Postmaster. Sullivan has been very en thusiastic over the new service, and Assistant Post master McCooey and Superintendent Lyon have been earnest assistants in promoting the new scheme.

Brooklyn has now four street railway post offices a well as two other street car mail lines carrying closed mails. The railway post offices run: First, from the general post office to Coney Island; second, from th general post office to Long Island City ; third, from the general post office to East New York via Fulton Street; and, fourth, from the Broadway Ferry to East New York via Broadway. All branches of the Brooklyn post office are connected by these lines, and the service is hourly.
The cars in use in the New York service are devoted entirely to post office business. The cars in use in Brooklyn are known as comparted cars; a compart ment at one end being used for the mail service while passengers occupy about two-thirds of the car, as shown in the engraving. The mail cars in both Ne York and Brooklyn are painted white.
The clerks employed in these cars are appointed in the railway mail service and Superintendent V. J. Bradley-to whom we are indebted for the facts here given-has charge of their assignment and their work.

There is now a direct interchange of mails between the Third Avenue Railway post office in New York City and the Brooklyn Railway post offices via the
Brooklyn Bridge without any of the old detention caused by the mails ooing through the main post offices in both cities.
Any one can see from this brief recital what a revolution has been accomplished in the methods of transmission and interchange and the possibilities of further and minute development which will not only expand and multiply mail communication in the met ropolitan district, but also unify and interconnect the segments of Greater New York.

## Belt Strain.

To find out whether the force carried by a belt is more than should be properly put upon it, or upon its fastening, we must know how much the arc of contact is, and what the tension on both the tight and the slack folds. The greatest tension upon it is that in the tight fold or side; and this is equal to that on the slack side, plus the pull which the belt gives to the pulley, or which the pulley gives to it. The greater the arc of contact the greater the ratio between the tight and the slack side, and the less the strain will be upon the belt and its fastening, to transmit a given power at a steady speed.
Thus if we have a pull of 10,000 pounds necessary to carry a certain horse power, when the arc of contact of the belt on the pulley is 90 degrees, that means that the ratio between the tension on the tight side and that on the slack side is 18874 ; in other words, for very pound upon the slack side there will be 1.874 pounds on the tight side; and if the difference be tween the tensions on the slack and the tight sides be 1,000 pounds, it will be necessary to have $1,000 \div 0.874$ $=1,144$ pounds strain on the slack fold, and 2,144 on the tight one. (These figures apply to leather belts in good condition upon cast iron pulleys, also in good condition.)
Working from this we get the following table for various ares of contact from 30 degrees to 300 degrees

TABLE OF GREATEST STRAIN ON BELTS.

| Arc. | $\begin{gathered} \text { Ratio Betwee } \\ \text { Strain and } \\ \text { Transmitted } \end{gathered}$ |
| :---: | :---: |
| Degrees. | Pull. |
| 30. | . 29 |
| 45. | . 7 |
| 60. | .2.92 |
| 75. | .2-4 |
| 90. | .2.14 |
| 105. | $1 \cdot 9$ |
| 120. | . 1.77 |
| 135. | .164 |
| 150. | . 154 |
| 165. | .147 |
| 180. | .140 |
| 195. | .1-35 |
| 210. | .130 |
| 240. | .123 |
| 270. | ..1 1 |
| 300. | .1.14 |

Now suppose that it takes a pull of 300 pounds to carry a given horse power when the are of contact is 195 degrees; we find that the strain upon the tight ide will be $1.35 \times 300$ pounds, or 405 pounds. Getting it down to horse power instead of pounds pull, suppose that it is necessary to carry 175 horse power with a belt running 2,000 feet per minute and having 210 degrees arc of contact; then the pull on the pulley will be $33,000 \times 175 \div 2,000=2,887$ pounds; and the greatest strain upon the belt will be $2,887 \times 1 \cdot 3=3,753$ pounds.

## Commerce with Great Britain.

The following figures of imports to and exports from he United States and dependencies for the fiscal yea 1895 are given as follows by Bradstreet's:


Electric railroads are proving of great benefit to he farmers in all parts of the country. The trolley ines run out from the large cities and towns to vi lages far removed from steam railroad communica tion, and in several districts arrangements are making to run trolley milk trains, vegetable trains and the like, to enable the farmers to get their produce quick trains, to supply coal to small towns that now use only wood.

## Sorrespondence.

## Local Causes of Rain.

To the Editor of the Scientific American
Will the Scientific American kindly inform me whether rain is always preceded by a rise in the tem perature ; and if so, how much of a rise or how sudden change is necessary to produce it ? W. F. W.
Brooklyn, N. Y.
[The Weather Bureau, to whom the matter was re ferred, reports as follows:
In answer to the query submitted by Mr. W. F. W., Brooklyn, N. Y., I have the honor to inform you as follows: Meteorologists are now adopting the opinion that dynamic cooling, if not the sole cause of rain, is, at all events, the only cause of importance. Whatever, therefore, will bring about an ascensional movement of moist air may be said to produce rainfall. In the tropics, where the insolation is much more constant than in these latitudes, clouds are formed regularly in the morning and rise to great heights in the afternoon, generally causing rain. By nightfall the sky is clear, and on the succeeding day the process is repeated. Here there is no rise in temperature other than that due to the altitude of the sun above the horizon. In the middle latitudes much of the rainfall occurs in connection with a cyclonic circulation in which there is an upward as well as a horizontal component. The temperature in advance of cyclonic storms is generally higher than the normal, and to this fact may be due the impression that rain is generally preceded by high temperature. In the summer season a period of great heat and high humidity is generally broken by rain and thunder storms, but it is not correct to infer that the rise in temperature is the cause of the rain that follows, or that a rise in temperature is necessarily fol lowed by rainfall. Very respectfully,

Willis L. Moore, Chief of Bureau.]

## Have Ants a Language

Because incomprehensible to us, there is no reason to believe that animals have no direct means of communicating with one another. Even in the insect world investigation has practically proved the fallacy of this supposition.
Sir James Boyle, the great Irish naturalist, always contended that ants had a language of their own, by which they made known their wants and fears to others of their kind. One day he encountered a colony that were evidently moving to new quarters. All ap peared in the very best of spirits, and whenever two met, the naturalist noted that they put their heads to gether as though chatting very earnestly. To settle the matter in his own mind as to whether they were really talking or not, he killed one of them to observe the effect it would have on the others. The eye wit nesses to the murder hastened to the rear and halted every one of the advancing column by laying their antennæ together. The column instantly separated to the right and the left, none of the marchers after ward passing within less than six feet of their dead companion, though the remains of the insect were lirectly in the beaten path.-The Argosy.

## Inequality in Eyes.

You are either left eyed or right eyed, unless you are the one person out of every fifteen who has eyes of qual strength. You also belong to the small minority of one out of every ten persons if your left eye is stronger than your right. As a rule, just as people are right handed, they are right eyed. This is probbly due to the generally greater use of the organs of the right side of the body, as, for example, a gunner, using his right arm and shoulder, uses his right eye, thereby strengthening it with exercise. Old sea cap tains, after long use of the telescope, find their right eye much stronger than the left. This law is confirmed by the experience of aurists. If a person who has ears of equal hearing power has cause to use one ear more than the other for a long period, the ear brought into requisition is found to be much strengthened, and into requisition is found to be much is not used loses its hearing in a correthe ear which is
sponding degree.

Patent Injunction-Government Use.
In the case of Belknap vs. Schild et al., decided recently by the Supreme Court of the United States, it appeared that the defendants were the owners of a patent caisson gate used by Belknap in prosecuting government work without permission of or compensation to the owners, and they sued for an injunction and an accounting. The trial court granted the injunction and a master reported the damages at $\$ 40,000$. The court held that the invention being used by an officer of the United States for the common defense and general welfare, no injunction could lie against him, and that the only damages proved being those in behalf of the United States, for which he could not be held liable, the judgment of the lower court must be reversed with instructions to dismiss the bill, without prejudice to a suit at law against the officer for damages or against the United States in the Court of Claims.

## THE BOA CONSTRICTOR

The boa constrictor is one of the western represent atives of the Boidæ family, inhabiting Honduras, Mexico, Santa Lucia, Guiana, Brazil and Peru. Cuvier decided that there was no boa in the old world. It was the object of snake worship among the Aztecs, and the skin of a boa used in this cult is now preserved in the British Museum. The boas are constricting serpents, killing their prey by coiling around it and compressing it until life is extinct. Their jaws are armed with strong, sharp teeth curved backward, the upper set interlocking into the lower. This gives their bite great holding power, and anything once seized they are almost unable to release. They are without venom. The jaws are peculiar in their articulation. Their members are merely connected by ligaments, so that they can be greatly distended, and besides this, they can actuate one-half of the jaws at a time, so as to hold their prey while swallowing it.
Their system receives nourishment in a peculiar manner. After killing an animal they swallow it whole, the animal swailowed often being enormous compared to the boa. The jaws open and distend and work along over the body being swallowed, it sometimes seeming as if the skin of the boa must burst under the strain. After the swallowing is effected, which may take severa hours, the snake becomes torpid and spends sometimes as much as three weeks in this condition, gradually and almost completely absorbing the animal swallowed. It has been a subject of dispute whether breathing is suspended during the swallowing operation. The boa constrictor rarely exceeds twenty feet in length, and is said not to be feared by the Indians of its habitat, who kill it with a stick. One very curious feature in its anatomy is the presence of two small hook-like claws on its under surface, which represent the termination of rudimentary limbs.
Our illustration shows a boa incubating, with its eggs distributed among its own plications. The eggs contain each a living reptile, the boa being ovoviviparous. The eggs are about as large as those of the hen. Some twenty years ago a boa in the Central Park menagerie in this city laid twenty-one eggs and each third egg was sterile. One snake came out of the egg at once, but soon died. The others never left the egg.

Lovers of Rudyard Kipling will remember how pic turesquely he has written of the constricting serpent, python, a near relative of the boa, in his Jungle Books, and how graphically he has described his method of striking a blow by projecting himself head on directly at the object to be struck.

## Cold Air for Consumptives.

There are now six sanitariums in Germany at which consumptives are treated by constant exposure to air

THE MANHATTAN INCANDESCENT ARC LAMP
The arc lamp illustrated herewith has several points of novelty, chief among which is the inclosing of the adjacent ends of the carbons in an approximately air tight glass globe, which confines the gases driven off by the carbons as they are slowly consumed, thus sur rounding the are with an atmosphere practically without oxygen. By excluding oxygen in this manner the life of the car bons is greatly prolonged so that one pair oi half inch carbons will burn for more than 150 hours, about twenty timens, or about twenty times as lon nary arc lamp
The construction of the lamp is such as to permit of using it singly between the mains of any direct incandescent circuit with little waste. The arc is of such length as to give a light more nearly of the quality of sunlight than any other artificial light, while the double globe surrounding the carbons causes a diffusion of the light, which obviates the painfully sharp shadows peculiar to the ordinars arc light. The mechanism of the lamp is arranged symmetrically around the symul line axial line of the carbons, thereby insuring great


THE MANHATTAN ARC LAMP.
ty, at the same time securing the uniform feeding o the carbons and producing a light without flicker or rregularity.
The slow consumption of the carbons necessitates correspondingly slow feeding, and results in a grea saving
ming.
In desion the lamp is plain and simple but it is eapable of artistic treatment, and can be made truly ornamental

Andree's Polar Expedition.
The Ministry of Foreign Affairs at Stockholm has sent notice to the governments of Russia, Denmark Great Britain, and the United States of Herr Andree's projected balloon voyage to the North Pole, and the

The front of a violin is usually made of deal, the back of maple. Now, a piece of wood can be set in vibration just like a string in tension, and a certain musical note will be the result, the pitch depending upon the length, thickness, and density of the wood. The curious fact has been established by experiment that in all the best Stradivarius violins the " note" produced by the front of the instrument is the same; and again, that in no case is the note of the front the same as the note of the back. It is known that there are acoustic reasons for this, and these reasons determine the kind and quality of the wood. The front of the instrument must be light, soft and porous, and deal answers best to these demands. When the wood is dry, the microscope will reveal a multitude of little hollow cells, once filled with sap. The more of these cells there are, the more quickly will the wood vibrate to the sound, and here fine skill in selecting the wood comes in. The maker might cut up a dozen pieces of deal, and perhaps only one piece would be absolutely perfect for its purpose. Similarly with the maple, of which the back of the instrument is made. This is a harder wood, containing less sap, and consequently fewer cells when dry. It is used because it vibrate more slowly than deal, and the effect on the violin is to detain the waves of sound radiating from the deal and to mix them with slower vibrations of the back in the hollow of the instrument. The ribs and sides of the violin are of maple, and these serve to connect the quickly vibrating front with the slowly vibrating back and hold them until both throb together with full pulsation and body of sound.-American Woodworker.

## Great Light at Barnegat Lighthouse.

A light of exceeding great power, probably exceeding in brilliancy any to be found on any seacoast in the world, is soon to be placed in the lighthouse a Barnegat on the New Jersey shore. It is one of the great German search lights exhibited by Schuckert \& Company, of Nuremberg, at the Columbian Exposition, and illustrated in the Scientific American of September 2, 1893. It was purchased by the governmen to be placed on Fire Island, but Barnegat has been chosen instead as its location. The present light at Barnegat is 165 feet above the level of the sea, and it is said thatit can be seen under ordinary circumstance at a distance of nineteen nautical miles. Important additions have been made to Barnegat lighthouse to prepare it for the new light, which is of such bril liancy that it will penetrate haze and fogs that have often made the present light invisible. The lamp used in the projector at Chicago required a cur rent of 150 amperes at 50 volts, and consumed about 10 electrical horse power. By its light a person standing eight wiles away could read a newspaper.

bOA CONSTRICTOR, WITH EGGS.
t a low temperature. Currents of cold air are allowed to pass through the bedroom at night, and during the day as much of the time is spent in the open air as possible. The pure cold air quiets cough, lessens temperature, arrests night sweats, improves appetit and modifies or arrests the course of the disease.
co-operation of these nations is asked. The authori ties in the countries immediately surrounding the polar circle will be asked to distribute thousands of leaflets containing illustrations of the balloon and asking for information as to the time at which it. is seen and the direction of the wind at the moment.

The light was placed, at the exposition, at a height of 240 feet from the ground, and one standing at the side of a projector could with a good field glass distinguish vessels twenty miles a way upon the lake. The new ligh's should be a great convenience to navigators approaching the Jersey shore in a fog.

## recently patented inventions.

 Engineering.Steam Condenser and Aerator. Edward Rowe, Indiana, Pa. This is an apparatus de signed to quickly condense the steam from an engine
and relieve it of back pressure, prevent water from the engine running back into the exhaust pipe, and aerate
the water of condensation to make it better for use in the water of condensation to make it better for use in
the boilers, It comprises a shell with air inlets into whic extend nozzles from a steam distributor, drawing in ai to mingle with the steam in the shell, the nozzles being nnected with a compressed air supp
Blast Furnace Relief Device.James Andrews. Allegheny, Pa. This improvement is
designed to afford instant relief in case of a sudden explosion of gases in the top of the stack. The bell is made with doors hinged at their lower ends in its sides, the
doors normally forming part of the sides of the bell and being adapted to swing open on pressure from within.
The doors are sufficiently heavy to withstand the ordinary pressure of from seven to twelve pounds within the furnace.

## Railway Appliances.

Car Replacer.-Robert B. Hawkins Clarendon, Texas. 'This replacer may be made princi pally of old rails, and is very simple and of great strength, providing efficient means for guiding the wheels of a de railed car to the track, even from a considerable distance,
In arianging the device an ordinary center-bearing rail is so disposed that its base and head are vertical and its web horizontal, a clip with a hooked end projecting lat erally from the replacer rail to engage the head of the track rail, while
bear against a tie
Car Fender Attachment.-Robert Muir, Brooklyn, N. Y. Attached to the fender frame,
according to this improvement, are a number of spaced and bowed springs, the free or central portion of the springs being all located in the same plane, so that they
will come in contact with each other when striking an will come in contact with each other when striking an
obstruction. Should the springs strike a prostrate body obstruction. Should the springs strike a prostrate body
or movable obstruction, they are designed to gently push the body or obstruction from the track, in a manner no likely to injure a person.
Rail Joint. - William D. Jones, Homestead, Pa. For detachably securing together the ends of railway track rails, this inventor provides a novee
and simple joint, easy to apply, effective in service, and readily removable for making repairs. The fish plates and rails are transversely apertured, the plates having sloped and grooved faces, while clamps passed through the aligned apertures in the rails and plates have diverg-
ing limbs adapted for engagement by spring latch pieces ing limbs adaptees.
Car Brake.-Ferdinand Gabler, To peka, Kansas. This is an improvement on a former pa-
tented invention of the same inventor, toggle arms at tented invention of the same inventor, toggle arms a
cach side of the car being connected to adjacent brake shoes and jointed to each other in the middle, there be ing a spiral spring between and connected to the brake
shoes of each pair, two transverse stems being also conshoes of each pair, two transverse stems being also con
nected to the middle jointo of the togglece, whice an equal izing device is connected to the inner ends of the stem
and to the brake applying mechanism. and to the brake-applying mechanism.

## Electrical.

Battery.-Walter S. Doe, Brooklyn, N. Y. In a suitable jar is a porous cup with bottle shaped top portion, the cup being sealed in the jar and
containing the carbon element and a depolarizing fluid containing the carbon element and a depolarizing fluid,
the zinc element being made as a ring surrounding the porous cup. A rod connected with the carbon extend through and is sealed in a top opening, a like opening forming a passage for the conducting rod of the zinc ele ment. The arrangement obviates the escape of danger-
ous gas, and facilitates utilizing the power of the battery to its fullest extent.
Electric Typewriter.-John L. Gar ber, Sidney, Ohio. This invention provides electrically
operated means for moving the typewriter carriage, and operated means for moving the typewriter carriage, and
for moving the platen or roller of the machine. Ar ranged adjacent to the typewriter are solenoid -mag a cross piece in which slides vertically a spring-presse aran having a tooth to engage a notched bar secured to the carriage, a magnet-operated lever effecting the verti cal movement of the toothed arm, and a circuit closer be-
ing arranged in the circuits of the lever magnets and the solenoid magnets. The improvement may be used
all kinds of typewriters having a sliding carriage.

## Mechanical.

Lifting Jack. - Malcolm Anderson, New York City. This is a jack of simple and strong construction arranged to readily transfer the load from the screw spindle head to an auxiliary support and to shift the load laterally with the support. An eccentric
is mounted to revolve and be raised and lowered with the load-lifting spindle, a support held on the eccentric being adapted to be shifted laterally thereby, while a nut screwing on the spindle raises and lowers the eccentric
Combing Machine.-Anthony Gunerman, Hoboken, N. J., and George Schacht, Jersey City, simple and inexpensive construction, for combing, without breakage or injury, hair, moss, fiber, wool, etc., am ple air being supplied during the work of combing and the escape of dust being facilitated. Provision is also
mate for easily and thoroughly cleaning the combing

Machine for Tapping Mains.-John Hearne, New York City, and Elmer E. Cisco, Brooklyn N. Y. This is a portable machine adapted to be easill
fastened upon a pipe, and of such construction that hole may be drilled, reamed and tapped in the pipe and a cock introduced without loss of fluid and without dan ger of asphyxiation. The tool may also be removed
from the pipe and another tool introduced without the escape of fluid.

Miscellaneous.
Typewriter Ribbon Holder.--EdTYPEWRITER RIBBON HOLDER.--Ed- Foster, Independence, Kansas. For readily clamping the typewriter ribbon to the spool, facilitating
its quick attachment and easy removal, this invention provides a clamp having arms riveted or pinned near one
end to the spool teads and flared outwardly, a cross bar uniting with the arms at a point between their ends, the curvature of the spool body.
Letter File, etc.-Richard Bennett, Neihart, Montana. This is a simple, inexpensive device, letters, etc. Covers secured to a back are provided with eyelets at opposite ends, index sheets being held between the covers, and elastic cords extending through the eye lets across the space between the covers to engage the in
dex sheets, hooks on the covers engaging loops at th dex sheets, hooks
ends of the cords.

Calipering Instrument. - George W. Mings, Holy Cross, Col. This instrument has tw pivotally connected members provided with sets of ad justable pins for measuring small and large articles, one
of the members being provided with a frame with forked of the members being provided with a frame with forked
arms in which segmental dials are adapted to be inserted and clamped, a pointer with a reading wire or hair extend ing on the dials, while a magnifying glass is held on the pointer over the wire or hair. The implement is adapted to automatically indicate the size of the article gaged in tandard and other measurements.
Bank Safety Vault. - Thoma Barnes, Rawlins, Wyoming. This invention provides for the erection of a burglar and fire proof vauit on a
skeleton frame elevated from the ground or floor of a skeleton frame elevated from the ground or floor of
building to expose the lower side of the vault, a galler sustained by the supports completely encompassing th vault, while mirrors are arranged to reflect all sides of
the vault in a manner to be visible from the street
Lock.-Andrew Alfors, Hanna, Wyo ming. In this lock the body section has hinged connec tion with the face plate, which is provided with a keepe
adapted for engagement by a rotating key-actuated bolt carried by the body section, a retarding device offering resistanee to the bolt. The lock is especially adapted for resistan
trunks,
made.

Controlling Hatchway Doors. rederick F. Jackson, Chicago, Ill. For automatically
controlling the closing of hatchway and other doors, this controlling the closing of hatchway and other doors, thin
inventor provides a system of wiring to be used in con with a lock mechanism tats, the wiring being connecte closed by the action of heat on thermostats. A retardin mechanism is also provided by which the doors may be ing inechanism being set going, and an alarm sounded
Fire Escape.-John Evans, Denver Col. This is a portable device, adapted to be readily car ried in a trunk for use by travelers and others, and com-
prises a light and strong frame in which are journaled rollers by means of which a regulated pressure may be placed upon a hanging rope, affording meane to let a per-
son down from a building, a strap or other girdle encison down from a building, a strap or other girdle encir-
cling the person of the user. By graduating the draugh cling the person of the user. By graduating the draught
strain one can lower himself to the ground as slowly or as speedily as desired.
Vehicle Axle.-Henry M. Powell, Florence, Ga. This invention comprises a sand bo adapted to fit over the end of the hub and provided with portions for connection with the body of the axle and for detachable connection with the spindle. The improve tion and wear of the hub upon the spindle, and when wheel or spindle, or both, become badly worn, the spin
die may be renoved and replaced by a larger spindle. Pump Operating Mechanism. William A. Anderson, Alpha, Mo. For operating pumps by a windmill rod or by hand this invention provides a
simple, light and inexpensive mechanism carried by an simple, light and inexpensive mechanism carried by an
open frame adapted for easy attachment to the upper end open frame adapted for easy attachment to the upper en
of a pump stock at the platform of the well. The me of a pump stock at the platform of the well. The me
chanism is designed to have a minimum of friction and give the greatest amount of working efficiency with the give the greatest amo
Washing Machine.-Loren B. Wal ters and Kinsey Cadwalader, Georgetown, Texas. Among struction of casing and gear framing, together with imsscuring a circulation of water and steam through the clothes. The clothing may be placed in the machine with cold water and
the boiling point.

Ash Sifter.-Agnes E. Bennett, Tojornaled in a suitable casing and adapted to be turned in sifting by a crank, the cinders being retained withi he casing during the operation and the dust being re conveniently removed. After the sifting the cinders ar discharged through a chute to a receptacle.
Cigar Box.-William F. Fuchs, Ga lena, Ill. This box has a false bottom adapted to be or tapes being employed to thus manipulate the false bottom. Springs are also used on the false bottom to prevent the cigars becoming loosened during transporta-
tion, and the lifting tapes may be employed to hold bun des of cigars in position. With this improvement cigar may be packed on the bottom from the top of the bo and the bottom adjusted
Window Curtain and Pillow Sham Supporter.--Edward W. Farnham, Chicago, Ill. This poles and brackets, substituting therefor a practically in visible support, which may be easily put up and remove and packed in a small space. With this improvement, also, rings and pins are not required to support the cur-
tains or shams, which are held by means of clutch
brackets
manner.
Raising and Drawing Off Liquids. -Alphonse Bonnoront, Paris, France. The apparatus devised by this inventor employs in its operation th water pressure from a tank or other suitable source, an comprises neither a fap valve nor piston. A vessel com unicating with the liquid to be raised is cut off from the atmosphere, and water under pressure is introduced
to compress the air in the vessel and also in a closed cask communicating with the liquid reservoir, thereby forcing the liquid through its discharge tube. The improvemen ay be employed in the place of beerpumps, etc.
Folding Gambrel.-Peter N. Swan son, Galva, Ill. This is a novel folding device for the suspension of a carcass of dressed beef, etc., in such
manner as to facilitate work thereon in preparing the ressed meat for consumption. It comprises a hange bar to be suspended from a support, there being on the bre two outwardly movable arms supported by adjusta
bonnections and having adjustable hooks.
Button. - Daniel B. Seward, East ampton, Mass. This invention provides a combination button with a solid center of vegetable ivory, bone, etc.,
affording a proper support for, and engagement of, the cloth covering, together with a clamping ring or shell therefor, enabling the button to be cheaply produced an the cloth covering neatly and securely applied. The but ecured by means of apertures extending through it secured by
solid center.
Dust Pan and Ventilator.-Franci M. Rector, Eddyville, Iowa. This device comprises a casing adapted to be set in the foor or wall of a building, and having a grated top, a box in the casing being pro vided with a slatted bottom, which may be opened and
closed. The device may be employed to facilitate the ventilation of a room or as a dust pan to receive its sweepings.

## Designs.

Eraser.-Oliver C. and Charles W Hackett, Akron, Ohio. This design is for an instrument and tapers toward both ends, presenting an elongated flattened ovate form, the head having one side rough ned and the other smooth.
Note.-Copies of any of the above patents will be
furnished by Munn \& Co., for 25 cents each. Pleas furnished by Munn \& Co., for 25 cents each. Please end name of the patentee, title of invention, and dat of this pape

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For hoisting engines. J. S. Mundy, Newark, N. J.

- c. S." metal polish. Indianapolis. Samples free. Presses \& Dies. Ferracute Mach. Co., Bridgeton. v. Handle \& Spoke Mchy. Ober Latbe Co.,Chagrin Falls. $O$ Want Mach'y to manuf. on royalty. Box 56, Troy,N.Y A frrst class patternmaker can obtain steady work at
Chas. 'T. Wallis', 193 Mill Street, Rochester, N. Y. For Sale-Patent No. 554,C75, extending window sash Screw machines, milling macnnes. and drill presse Emerson. Smith \& Co.. Ltd., Beaver Falls, Pa.. wil nd Sawyer's Hand

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nd other Books for sale by Munn \& Co.. 361 Broadway, ew York. Free on application.

NEW BOOKS AND PUBLICATIONS.
Tribune Almanac and Political Re GISTER FOR 1896. Henry E. Rhoades,
editor. New York: The Tribune Association. $1896 . \quad$ Pp. $305 . \quad 16 \mathrm{mo}$.
Price 25 cents. The Tribune Almanac was founded in 1838 as "Th Whig Almanac." It is one of the oldest and now ranks
among the highest of all American annuals for its ac among the highest of all
curacy and completeness.
The Daily News Almanac and Po LITICAL REGISTER FOR 1896. Con
Chicago Daily News Company. 1896 . Pp. 452. 16mo. Price 25 cents.
This almanac is very much like the preceding, and ore largely devoted to political affair
Report of the Commissioner of Edu
CA.TION FOR THE YEAR 1892-1893.
Vol. I. Containing parts 1 and 2.
Washington, D. C. : Government
Printing Office. 1895 . Pp. 1224. 8vo. This work contains a vast amount of useful informa-
ion. In addition to the statistical summaries there are hapters on public education in Belgium, France, En and, India, Canada, Germany, Uruguay, as well as chap ers on the recent developments in the teaching of geogra-
The bound volume for the year 1895 of
arden and Forest, a New York Journal of Horticulture,

Landscape and Forestry, affords a large amount of ex
eptionally high class reading on the subjects to whic his publication is devoted, and timely topics german hereto. To the scientific gardener, and especially to all
interested in the preservation of trees and the general interested in the preservation of trees and the general
promotion of their growth by wise and practical means his weekly is an invaluable assistant, and the 500 larg pages comprised in the volume present much matter well worth preservation and reperusal.
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##  <br> to may be had at the office. PPrice 10 cents each. Bored price.

Minerals sent for
marked or labeled.
(6729) A. V. H. says : Kindly inform me the relative value of the following materials: cinders,
oal ashes, coal, sawdust, mineral wool, as a nonconducto when used as filling or insulation in ice house walls which
are eight inches thick. A. The following table gives the are eight inches thick. A. The following table gives the
results of a series of experiments ky Mr. C. E. Emery results of a series of experiments ky Mr. C. E. Emery
for the New York Steam Company : for the New York Steam Company

| Material. | conductivity. <br> Per cent. |
| :---: | :---: |
| Hair felt. | . 100 |
| Mineral wool No. 2... | .... 8322 |
| Mineral wool No. 2 and tar | .... 71 |
| Sawdust. | 68 |
| Mineral wool No. 1 | 67.6 |
| Charcoal . | 63.2 |
| Pinewood, across grain. | .. $55 \cdot 3$ |
| Loam. |  |
| Gasworks lime, slaked |  |
| Asbestos.. | . $36 \cdot 3$ |
| Coal ashes. | 345 |
| Fuel coke. | 27 |
| Air space, 2 inches deep. | . $13 \cdot 6$ |

(6730) C. W. M. asks : 1. What should ormer to use a current of twenty-five amperes at 12 volts and furnish a current at one volt, and how many
amperes would such a transformer furnish? A. The mperes would such a transformer furnish? A. Th ize of the transformer depends on the frequency of the Iternations. For the primary you must use No. 9 wire The secondary will give nearly $25 \times 120=3000$ amperes o hort circuit. 2. Is there any difference between a engine and a petroleum engine other than the addition of the vaporizer? A. Little or none; proportions may slightly vary. 3. Could a gas engine be used as a p troleum engine by adding the vaporizer? A. Yes. 4 How is this vaporizer made? Have you ever described AN or in the Supplement? A. For details of gas and ol engines we refer you to our Supplement, Nos. 535, 618 $715,716,963,993$, and 1024 , price 10 cents each. 5. Ac cording to the best practice, what is the characteristic ifference between the construction of a motor and dynamo? A. There need be none. A cast iron field is ased in dynamos to make them self-charging. For mo
(6731) E. H. S. asks : Suppose Hiero's crown was an alloy of silver and gold, and weighed 22
ounces in air and $201 / 2$ ounces in $\mathrm{H}_{2} \mathrm{O}$. What was the proportion of each metal? A. Apply the following formula : Let
a weightofalloy in
$\mathrm{b}=$ weight of alloy in water
$\mathrm{c}=$ specific gravity of gold.
$\mathrm{d}=$ specific gravity of the other metal
$x=$ weight of gold in the alloy.
$-x=$ weight of other metal in th
Then $\begin{aligned} & a-x=\text { weight of other metal in the alloy. } \\ & x\end{aligned}$
$\frac{\mathrm{a}-\mathrm{x}}{\mathrm{d}}=\underset{\text { metal. }}{\text { weight of water displaced by the other }}$
$\mathrm{a}-\mathrm{b}=$ weight of water displaced by the whole. $\frac{a-x}{d}=a-b$,

## or $x=d c a-d c b-a c$

The specific gravity of gold may be taken as $19 \cdot 3$; of (6732) G. H. writes: Several times have change must I make in simple moetorons asked. What 641, to convert it into a dynamo, if I use cast iron fields? I think I bave seen on two occasions where you advised not to change motor in question to dynamo, as it is not
adapted for that purpose, but on no occasion have I ever seen the question asked : Why is it not adapted for dynamo? And of course naturally no answer. I must ad.
mit I am in the same predicament. mit I am in the same predicament. I have also built the Then I changed to cast iron fields, made a new armature with 14 coils, No. 22 wire, to a resistance of $1 \frac{1}{8}$ ohms with same wire on field to the amount of resistance as a
series machine, but got no results at all, not even enough series machine, but got no results at all, not even enough
to ring a bell properly. I would like to know, and per-
haps many more besides me, why it is not adapted for a corn meal, $1 / 8$ ounce burnt umber. The composition is
dynamo. Is it on account of the Gramme ring armature, or is it because of not enough coils on armature? of in the hand, and for plain wall paper, painted walls, course, one reason is, as you have answered before, use
finer wire on field and armature. A. The field core is too slender and long; for a dyname a massive field is far pre ferable. There may be much trouble anticipated in making it self-charging. We advise you to try separate
excitation of the field with a battery. Possibly you may get it started, and by connecting the field into the circuit first and then discounecting the battery, it may keep on workng. 2. What is the difference in constructing a high or a low speed dynamo and motor? A. In a moto or dynamo a strong field or an armature with many turn gives relatively slow speed and vice versa. 3. How many ohms resistance will bring current of eight light dynam as described in Supple
A. An infinite resistance.
(6733) Customer asks: 1. Will you kindly define the term "an ampere hour," as applied to A. An ampere expresses the rate of flow of current: an ampere hour means a current flowing for one hour at the rate of one ampere. The company is assumed to maintain a definite voltage. As you pay for electric energy, this maintenance of voltage supplies the factor requisite 2. If I make an agreement with a company for incan descent light "at a price or sum not exceeding one-half the company-how much electric lighting for my hal cent? A. You do not state the voltage At 110 volts one ampere hour should mean two 16 candle power lamp for one hour. If at 55 volts, then it slould mean one-half the quantity. 3. If the agreement does not specify the voltage or candle power to be supplied, what strength of light in my house could I reasonably demand from the company? A. The answer to No. 2 expresses it. Th
voltage is always ascertainable. There is no secret about it. A very slight drop in voltage cuts down your ligh enormously without reducing the bills in anything like the same proportion.
(6734) F. R. B. asks the rule for find gearing for cutting threads on a screw cutting lathe A. Read from the lathe index the number of threads pe nch cut by equal gears and multiply it by any number that will give for a product a gear on the index; put threads per inch to be cut by the same number and put he resulting gear upon the screw. Example.-To cu 48 cuts 6 threads per inch, then
$6 \times 4=24$, gear on stud,
and $111 / 2 \times 4=46$, gear on screw

Any multiplier may be used so long as the products in lude gears that belong with the lathe. For instance, in stead of 4 as a multiple, we may use 6 .

Thus, $9 \times 6=54$, gear upon stua,
6735) J. L. D. asks (1) for formulæ for inding the area of an ellipsoid or spheroid. A. If prolate nd $r$ the minor axis. If oblate, interchange $R$ and $r$ and apply the same formula. This may be used as a work ing formula. If a table of natural sines or logarithmic functions is at hand, use for more accurate work the following :

## $\mathrm{S}=2 \pi \mathrm{~b}^{2}+\frac{2 \pi \mathrm{ab}}{\varepsilon} \sin ^{-1} \varepsilon$

in which

## $\mathrm{a}=$ semi-transverse ax b $=$ semi-conjus.

$\varepsilon=\underline{\sqrt{\mathrm{a}^{2}-\mathrm{b}^{2}}}$
and b. 2. Also for the volume of same. A. Multip quare of revolving axis by the fixed axis and this pro uct by $0 \cdot 5236$. These formule are not directly deduc le from the equations named in your letter.
(6736) T. G. asks : 1. Will electro-plating with nickel or with silver affect the properties of permanent magnet? A. No, except as the polishing or cratch brushing would impair the magnetism. netized or after it has been magnetized? A Plate polish, etc., at first, and magnetize afterward. 3. Can iron or steel, after being heavily plated with nickel or in general, without being affected by and without having in general, without being affected by and without having
any influence on the above liquids? A. Silver would be less affected than nickel; we should not advise reliance
(6737) R. W. S. asks : 1 . What is the electromotive force and the current of the common
gravity battery? A. Allow 1 volt and 4 ohms resistance The resistance is subject to wide variations according to strength of solutions used. 2. Can you give me recipe for a good depolarizing fluid for a carbon battery?

## A. Water............... <br> Sulphuric acid.

100 parts

All by weight. Use the bichromate in powder. Be care gerous.
6738) R. A. C. writes: I am going to make a storage battery; the jar will be 4 inches high, $25 /$ into four cells; each cell will inches long and 14 inches wide. Will you plates 4 me how long the battery will light a three candle power lamp? A. For each square inch of positive plate immersed in a single couple allow $0 \cdot 03$ ampere, and for each need $5 \cdot 5$ to 7 volts and 1 to 1.50 amperes.
(6739) J. C. H says: Can you give me formula in your Notes and Queries for cleaning smok and dirty wall paper and leaving it as bright as new? A.
To clean wall paper, rye flour and wheat flour are mixed To clean wall paper, rye flour and wheat flour are mixed
together into dough, which is then partially cooked or together into dough, which is then partially cooked or
baked and the crust removed. Common salt, powdered or pulverized naphthaline, corn meal, and burnt umber rye flour, 1 pound wheat flour, 1 ounce common salt,
etc., the composition should be drawn in one direction
(6740) G. E. H. writes : I have a chlorid of silver cell made by rolling a piece of commercial shee zinc in the form of a cylinder 4 inches long and $3 / 4$ inch in internal diameter, and soldering a circular piece o zinc in one end and the cylinder down the side where
the edges of the zinc meet, so as to make a watertight cell the edges of the zinc meet, so amalgamating the zinc, a cyl inder of chloride of silver 3 inches long and $3 / 8$ inch in diameter. The silver chloride is cast on a silver wire and is suspended in the cell in such a manner as to pre vent it from touching the zinc and causing short circuit ing. The space in the cell is filled with a weak solutio of salammoniac and water and the end sealed with pitch 1. Is the solder used in this cell liable to cause local action
to any great extent? A. No. 2. Is 1 ampere too much urrent to take from this cell for a period of 5 minute each day, and how long should the cell last at this rate o discharge? A. Yes. If you can get as much as that out f it, it will soon polarize it. Arrange a number of cell in parallel. 3. What weight of silver is required to mak cylinder of chloride of silver 3 inches long and $3 / 8$ inch lametor. A. A. W.
(6741) W. M. H. asks : 1. How would ght in the mas a substitute for the oxyhydroge here hish magi lantern? A. It answers very well ght, but not as is not required. It gives a very whit racticable, would it be better to generate the gas from he solid article as wanted or would it be more economica is satisfactory to use a cylinder of the liquid gas such 1895 en (see Notes on Atlanta Exposition). A. Generate in the Sciente solid article. An apparatus is described imple one ifric American of January 4, 1896. A ver tarch 30, 1895. 3. If the article is used in the liquid tate, what is the best way of regulating the amount as consumed? A. Use a stopcock of first class co truction, and regulate by hand. 4. Is it safe to ship in either form on board ocean vessels, and whateffect would passage througn the tropics have upon it? A. Calcium carbide is perfectly safe if packed in airtight
and watertight cases. The liquefied acetylene is not
(6742) H. K. W. asks : 1. Where can I btain a dynamo for one 8 candle lamp? A. Consu will supply it columns. Any will be lecesical good such a dynamo? A. It is safe to allow torse powe . Where (in what book) can I get information necessary to make as small a dynamo as indicated above? A. The Scientific American Supplements treatof this subject in great detail-giving many dynamos of various sizes. We refer you to them.

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Pohlé Air Lift Pump The Ingersoll-Sergeant Drill Co.
$\qquad$ The Curtis Patent Damper Regulator
 D'ESTE \& SEEELEEY CO.


THE HAMMOND TYPEWRITER CO. NEW YORK OFFICE OF
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