
a Weekly Journal 0f practical information, art, scievce, mechanics, Chemistry, and manufactures.

MOSCOW AND THE CORONATION OF THE CZAR Palatial Petersburg and Holy Moscov are distant four hundred and three miles by rail, but the distance in time and civilization between the old capital and the new can only be reckoned by centuries. Moscow is a city of more than 750000 inhabitants, yet it hardly deserves the name of city. It is in reality a colossal village, for it does not resemble even a European city of the third magnitude. Moscow consists largely of one or two story houses with court yards and outbuildings, each property being walled in, or at least furovided with a hedge. There seems to be a lack of concentration to Moscow which interferes with the city having a monumental appearance. In the center stands the far-famed Kremlin, the shrine of Russian art and religion. With the Kremlin as a point of departure the city forms a succession of concentric zones. Mosecw has a few streets that resemble those in St. Petersburg, which are adorned with fine buildings, statues, etc., as that of Nicholas I. This statue is situated between the Cathedral of St. Isaac and the Maria-Nicolaierna Palace. Nicholas I was the third son of the Ewperor Paul. He succeeded his brother Alexander in 1825 and occupied the throne until 1855. The boulevards around Moscow are most imposing, and the parks and squares which are so abundant are in excess of the real demands. The reason of the isolation of the houses is the frequency and extent of the fires. From what has been said it will be seen that Moscow is not a monumental city, but at any rate churches with their bright blue and gilt spires and domes. This barbaric splendor of the decorations would soon become mean looking if, like the Holland-
ers, the Russians did not have a passion for paint and whitewash; and it is even stated on credible authority that the oldest churches in the Kremlin are entirely renovated every year or two. Moscow is not built on a level, and the elevation is changed so frequently that a large number of picturesque views can be obtained. The conveyances are numerous and are sometimes picturesque, sometimes prosaic, but they move at a brisk pace and help to give life and color to the scene
The quaint and gorgeous Kremlin, standing on a hill in the center of this city of magnificent distances, is of uncertain foundation. In 1339 it was surrounded by oaken walls. It forms an inclosure nearly two miles around. Its walls are pierced with five gates; the principal being the Shaski Vorota, or Redeemer's Gate, having a highly venerated picture of the Saviour over it ; all who enter by it are required to bare the head. Entering the square, the visitor sees three cathedrals and two other churches-one, St. Basil, having eleven polychromatic spires and cupolas; the great bell, the palace, etc. The great bell, which we illustrate, is one of the sights of Russia. The tower of I van Veliki is the campanile for the three cathedrals of the Kremlin. It contains thirty-four bells, the largest weighing 64 tons. The great bell at the foot of the tower is the Tzar Kolokol, which according to the inscription was cast in 1733. It never seems to have been actually hung or rung, having cracked in the furnace. It weighs about 440,000 pounds ; its height is $191 / 4$ feet ; the circumference is 60 feet 9 inches. The thickness is about 2 feet. The weight of the broken piece is 11 tons. It is now used as a chapel. In the Cathedral of the Assumption, used as a chapel. In the Cathedral of the Assumption,
a small church founded in 1326 and rebuilt in 1475, the
present Czar of Russia was crowned on May 26, with imposing ceremonies and fetes, the cost of which will exceed $\$ 20,000,000$.
The Czar made his triumphal entry into Moscow on May 21, accompanied by the Empress and the Court. The route from the Petroffsky Palace to the Kremlin, a distance about three miles, was lined by an enormous crowd of spectators. The way was elaborately decorated by fluttering flags, banners, pennants and escutcheons. Streamers stretched across the roadway and garlands of heather hung from Venetian masts. Little sleep could be obtained in Moscow the previous night, on account of the large crowds of the lower orders, who were obliged to shift for themselves in regard to lodg ings and places to view the pageant.
When the cannon announced that the cortege was getting ready, the church bells of the myriad-belled city began their chiming. Hats were removed and the sign of the cross was made by the devout Russians. His Majesty was followed by an immense retinue of officers of all nations in every variety of uniform. The Czar looked calm and serious and continually raised his hand to salute the acclaiming crowds. The progress was marked with a continual boom of cannon and a clanging of bells to the tune of the national hymn, joined to the cheering of the vast assembly. The Empress was seated in a magnificently gilded coach, drawn by eight beautiful cream colored horses, and in the following gilded coach, without a crown, sat the Empress Consort, graciously bowing acknow ledgments. Both their Majesties were dressed in Russian costume, pure white with silver brocade Their Inıperial Majesties alighted at the Gate of the (Continued on page 393.)


THE CORONATION UF THE CZAR-THE PROCESSION ENTERING THE HOLY GATE.

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TABLE OF CONTENTS OF
SCIENTIFIC AMERICAN SUPPLEMENT
No. 1068.

## For the Week Ending June 20, 1896.

BOTANY. - Stove Shrib-Posoqueria Macropus.-An interesting accession Trom Brazii. - Mastration...............



ENTOMOLOGY.-The Parasol Ant.-Note on a curious memb
of the ant tribe of insects.. of the ant tribe of insects.
Note on the Psychological Laboratory of Califönia
I. Forestr .-Forest Resources of the United States Briefly
Stated.-A very elaborate article. with tables.of of tatistics of the
forest industry of america and its relationsto other industries... II. GEOLOGX.- What is Bitumen ?-By S. F. PECKEAM.- An elab-
orateexamination or the nature of bitumen, with many interest
ing points in the bistory of petroleum......................... III. MECHANICAL ENGINEERING.-Latbe fre Turning Several
Obects of the Aame Shape.-An ingenious rathe carring anum
ber of centers and tool rests working from the same bed. -1

superbeating steam.- - 13 ilustrations..................................
IX. MEDICINE. TTe Senses-Their Use and Cultivation. Concu-
sion of this interesting paper, directed especially to young physi-



 Selected Hormix. .
Engmeerin Not.
Electrical Notes.








PATIENCE AND PERSEVERANCE IN INVENTION.
It is unfortunate that the person who claims, or is ac corded by the public, the title of inventor should be popularly regarded as possessing powers which border on the miraculous; for, as a matter of fact, the most suc cessful inventors have ever proved to be men of a prac tical turn of mind and of clear vision; wholoved to pur sue their investigation on logical lines, laying the foun dation broad and firm as they proceeded; men who were marked above everything else by un wearying patience and a perseverance that was unconquerable. The in ventor is posiessed of no sixth sense, whereby he probes more deeply into the secrets of the sciences than others can go. If he turn up nuggets of priceless value, it is not by virtue of any divining rod which he carries, but because he digs deeper than other men to find them.
This is a truth which the average inventor too often fails to grasp ; and if success does not attend his first or second attempt, he is liable to throw down his tools in disgust at the very time when a little more experi mental work would have achieved the desired result The archives of the Patent Office can show thousands of cases where a discarded invention, which lacked but one feature to insure its success, has ulti mately been taken in hand and perfected by a later inventor, who has had the patience to work out the notable details. It is true there hambled upon hi invention in the very first hours of his search; but they are rare. In the majority of cases the great in ventions of any age, and particularly of this present age, have first presented themselves as a vague idea embodied in forms more or less crude. It was only after this crude form had been laid on the anvil of the mind, and hammered and rehammered, day in, day out, and in some cases for years at a stretch, that the rough conception became the perfected mechanical shape, and brought fame and wealth to its author.
One of the great inventors of the age is Mr. Edison who has been called in terms of well intentioned, but doubtful, compliment "The Wizard of Menlo Park." There is no spirit of necromancy to be found Park. There is no spirit of necromancy to be fousd Mr. Edison's laboratory. The whole place is devoted to invention as expressed in the good old Latin root meaning of the word: "to come upon," and hence to find. Invention, in the case of Mr. Edison, is a search and the search is prosecuted along multitudinous line with a perseverance which may bave been equaled, but has never been surpassed in the history of the world Speaking of himself and his work, Mr. Edison has said : "In my own case but few, and those the leas important, of my inventions owed anything to acci dent. Most of them have been hammered out afte long and patient labor, and are the result of countles experiments, ail directed toward attaining some well defined object. All mechanical improvements may
safely be said to be inventions, and not discoveries." It is not the man who dreams of better mechanica ways of doing work, but he who by intelligent experi ment works out the mechanical forms that translat the dream into a reality, who is entitled to the name of inventor.
It is said that Elias Howe, as he lay one night watching the busy needle of his wife, dreamed of me chanical sewing. Doubtless other men had so dreamed before him. For a whole year he labored on a me chanical stitch; but when he tried the machine, it was a failure. Most inventors would have gone back to dreaming; but Howe threw aside his double pointed needle and continued inventing, or searching, until he found the fundamental idea in a combination of needle and separate shuttle, and gave to the world the sewing machine of to-day.
There is no invention in any age that has exercised so powerful an influence upon the destinies of the nations of the world as the steam engine, of which Watt may be truly said to have been the father; and yet it is a fact that a steam boiler, and an engine propelled by steam, were constructed by Heron, one hundred and twenty years before the Christian era. The apparatus was very crude and elementary; but the root idea was there. Had the ancient experimentalist persistently followed up the line of investigation which his curious experiments suggested, the history of mechanics might have oeen set forward 2,000 years.
Denis Papin, in 1688, with his piston inclosed in a cylinder, and Thomas Newcomen, of later date, with his condensing engine, were both standing on the very threshold of the greatest mechanical invention of the age; but it was only when Watt brought his powers of intelligent and patient search to bear upon Newcomen's crude mechanism that the steam engine of the nineteenth century was produced.
The bicycle, with its two wheels pivotally connected, up to a few years ago was restricted to the use of those who were acrobatically inclined. The introduction of the chain and rear driven wheel gave us the safety, increased, although the most important feature of all increased, although the most important feature of all
was yet lacking. It was only when the pneumatic tire
-an old idea-was perfected and applied to it that the bicycle became the most popular means of recreation in our day.
Stephenson's claim to be the inventor of the modern locomotive is based upon the fact that he was the first to combine the several features of horizontal cylinders, the vertical blast nozzle in the smokestack and a tubular boiler, and that by this combination he produced the type which is practically the same that we use to day. Stephenson was not the author of the iron rail, nor of the idea of a steam driven vehicle running upon iron rails and carrying its own water and fuel. These leading features were present in the earlier engine of Trev ithick. Had Trevithick labored to remedy the defects ithick. Had Trevithick labored to remedy the defects
of his locomotive with the perseverance which was so of his locomotive with the perseverance which was so
strong a characteristic in his successor, it is likely that he, and not Stephenson, would have been named the father of the modern locomotive.
And so, throughout the whole field of invention, it will be found that the greatest achievements have been in the strictest sense inventions rather than discoveries ; the work of practical mechanics who as often as not wrought out in concrete form the dreams their fellowmen
The obvious moral to be drawn from these reflections is that where the inventor has good reason to believe that the root idea of his invention is sound and useful, he should never become discouraged by failure in the minor details. Patience under the sting of failure and perseverance in new lines of search will often secure to the first inventor those fruits of his toil which are now too often gathered by other hands.

## To Mend Cracked Vulcanite Dishes.

by rev. t. perkins.
A mishap occurred to my only 12 by 10 developing dish a few days ago. A servant, in her misguided zeal for tidiness, finding the dish full of water on the table and thinking it had better be put into its usual place et up against a wall, proceeded to lift it by one corner, with the result that a piece of the walls of the dish, ncluding the angle, was completely broken out, so that the dish would no longer hold any liquid. Liv ing as I do in a remote country village far from all dealers and unable to get another dish, I found this a erious matter, as $I$ had just returned from a club "field day" with several 12 by 10 plates to develop. So resolved to see if I could make good the damage This I have done so that the plates have been succes fully developed and are washing as I write. I first ored several small holes with a hot darning needle near the edges of the broken part, and also corre sonding holes near the broken edges of the dish to which I wished to fasten it, so that I could rivet the broken part to the dish with rivets formed of wire similar to those used by the menders of broken china. Thus the broken piece was firmly held in place, but of course the dish leaked; so I melted some beeswax and resin in a spoon over a lamp, and when it had cooled a little poured it into the corner of the dish. At first it ran through the crack, but very soon set, completely filling it up and rendering the dish perfectly water tight. The developing solution has had no effect on this cement. Whether it will last long I cannot say Anyhow, the repair was quickly effected, and should the dish leak after a time, I shall be able to melt the wax and fill up the cracks with it again.-The Photographic News.

## Cumbrous Legal Machinery.

When a judge and jury have tried an offender and reached a verdict, the appellate court proceeds to try, not the prisoner for his guilt, but the trial judge for his procedure. Unless the latter can show that throughout the long and wearisome trial he made no mistakes, the case is sent back for new trial, by which time the witnesses have generally disappeared. The consequences of prolonged discussions and voluminous juđَicial essays on such details as the empaneling of a jury, the spelling of a juror's name, the initials of a witness, or the omission or misstatement of some legal fiction or antiquated phrase, tend not only to remove punishment far off from the criminal, but to depreciate the dignity and usefulness of courts. The decision of the court that tried the case comes to be of small consequence in public estimation, when it may be and often is reversed by some distant judge who never saw the jury or heard a witness. The court above, after many.months of delay, of ten decides on minute points, sometimes of mere practice, which non-professional persons can scarcely regard except with hilarity. Hence frequency of appeal in criminal administration has a mischievous tendency to minimize the respect with which every community should regard its local court, and to impair the prudent reflection with which the people should select their judges. For what signify the qualities or capacity of a county judge, if he is to be a mere conduit through which all cases where the prisoner has any money must flow on to more distant courts for the only real and final decision ?--I. J. tant courts for the only real a
Wistar, in June Lippincott's.

## The First Five-Day Experiment with Respiration Calorimeter.*

The respiration calorimeter at Middletown, Conn., designed by Professors Atwater and Rosa, of Wesleyan University, has been in process of construction and development for the last three years. It has this winter been perfected so as to render accurate experiments with it possible. A Swede, janitor of the laboratory, has been used from time to time for trial experiments of a day or so; but when it became possible (and, in fact, almost necessary, to insure accuracy) to make runs of a longer period than two days the Swede objected, and volunteers on the force were called for to give apparatus a fair test experiment running over a period of from five to ten days. Mr. A. W. Smith and myself offered our services. It fell to me to make the uitial trial, and the date of my entering the calori meter was fixed for March 16.
The object of a respiration calorimeter in general is to offer a means of determining the respiratory products of the lungs and the heat given off by the body of the animal or man experimented upon. Pettenkofer, a German, was the first to try a respiration cal orimeter. He experimented with animals. His analyses of respiratory products were more or less inaccurate, and, as far as measuring heat was concerned, only the grossest approximation was obtainable. The apparatus in Middletown is the first to render possible accurate determinations of respiratory products, carbonic acid gas and water, on a large scale, and to afford anything like accuracy in the measurements of radiant heat from human beings. The appliances for measuring the heat are electrical, and the greatest delicacy of registration has been attained. With this apparatus it is designed to determine the heat given of when a man rests, works mentally, and works physically. But all these things are only steps leading up to the great principle of the conservation of energy in the physiological world. This has long been assumed, but has never been definitely proved. In order, how ever, to accomplish anything definite in this line, the whole income and outgo of the body must be known In other words, a digestion experiment must be made, together with a calorimetric experiment-that is, a given amount of food is given a man; this food has a definite heat value or a definite amount of potential energy. By taking account of the waste products and their heat values, and the heat radiated by the individual, we see whether tbis is equal to the heat value of the original food. This appears easy, but a good many factors hard to estimate come in-for example, the storing of food in the body as muscle, fat, etc.which complicate the case very considerably.

Four days before I entered the calorimeter I began to live on a particular diet, which I kept up without change till I came out. The diet chosen and main tained from first to last was:
Breakfast--Apples, three ounces; two eggs, six ounces; potatoes, five ounces; bread, two and one half ounces; butter, one-third of an ounce; coffee, two thirds of a pint ; milk, one-fifth of a pint ; and sugar, three-quarters of an ounce.
Dinner-Beefsteak, Hamburger style, made into thick balls and broiled, four and-one half ounces potatoes, four and three-quarter ounces (plain mashed) bread, two and one-half ounces; butter, one-third of an ounce; tea or coffee, two-fifths of a quart; milk, two ounces; sugar, three-quarters of an ounce; and canned pears or peaches, five ounces.
Supper-Peaches, seven ounces; milk, one pint sugar, one-third of an ounce (on the fruit); and bread two and one-half ounces.
From this another interesting phase of the subject presents itself. Different diets can be administered from time to time, and different sorts of labor can be done by the person experimented upon, to see which is the most efficient and economical diet for a certain kind of work. The solving of this problem will inaugurate a new era in economic progres
I entered the calorimeter about 10:30 A. M. March 16, through the open aperture, a window, and the glass of the window was puttied in tightly behind me. With me I took a cot bed, a chair, table, some cushions, rugs, and books. The only means of getting anything in to me was through a brass cylinder about eigh inches in diameter. This was closed ordinarily a both ends. To pass anything in, the outer cap was re moved, the material placed in the cylinder, and th cap replaced. I then removed the inner cap and took out whatever was there. Everything I ate had to come in this way.
From the one window I received plenty of light to read and work by. In the evening an electric light was hung directly against the window outside, which gave even better light than daylight. I busied my self reading, writing, and working on some calculation I had on hand. By keeping busy I didn't mind the confinement at all. For exercise $I$ would walk about the box, which has about thirty square feet area, run back and forth, and go through various movements

* By Olin Freeman Tower, Ph.D., Middletown, Conn., Assistant Chem ist, Agricultaral Experiment
Medical and Sarglical Reporter.
with my legs and arms. Sometimes mornings my head would feel rather dull, but it would always pass a way after breakfast. A constant stream of air was supplied which was analyzed as it went in and culness in my head on arising I ascribed to the slight shaking of the calorimeter caused by a motor in the room. I slept well, my appetite kept up on my monotonous diet, and on coming out on March 21, I found I had gained two pounds.
The experiment was a success in showing that a person can remain in the calorimeter with perfec security, and, so long as he keeps busy contentedly, for a considerable period of time. Further results have indicate that it was a success in every way


## Improving Lake Trade

The Bessemer, the first of Rockefeller's line of twelve eamers and consorts, was launched at Cleveland re cently, says the New York Press. She is 412 feet long and will carry 4,600 tons of freight on 15 feet draught. She was one of three steamers launched that day at lake shipyards, one slightly smaller and the other slightly larger than the Bessemer. The shipyards of the Great Lakes had ninety vessels of various classes and dimensions under construction when the, season opened this spring. A fleet of this number a dozen years ago would have meant comparatively little, for the size would have averaged far less than this one does now, for only twent y-four are less than 100 feet long, and there are eight that will carry 5,000 tons each, and there are twenty others that will carry 4,000 tons or more, all on a draught of 15 feet. Nearly fifty of the new boats are to be of steel, which is now sup planting wood for all vessels of large size, in spite of the extreme liability of all metal bolts to receive seri ous injury from contact with rock, which abounds in the passages between the lakes. Fortunes are lost very season by raking the bottoms of the big carrier on the rocks, but the ease of repairing them and ren dering them as good as new holds the steel construc-
tion in favor. This new fleet will cost when finished a trifle less than $\$ 10,000,000$, and it will have a carrying capacity of close to 200,000 tons at a single load. As two weeks is rather more than the average time for a vessel to make a round trip on the lakes, unless it tow as well as carries, the amount of freight that the new fleet will move in the season of eight months is seen to be enormous; when it is added to the already great fleet in operation, some vessels of which are carry ing more than 5000 tons of freight at a load, the siz of the lake trade may be imagined. Now as to ocean] shipbuilding at home. There are under con truction on our seaboard, east and west, seventy-one vessels, most of them steel steamers, but many of them of moderate size. Only one, the cruiser Brooklyn, is 400 feet long. This is her exact length, while of the ake list there are thirteen that are 404 feet long o more. The total length of the new ocean fleet is 12,500 feet instead of the 20,000 feet of the unfinished lak fleet. Business on the lakes is much better than wa indicated when boats began to move a month ago Most rates of freight are firmer and some are higher.

## Low Temperature Research

At the Royal Institution, London, Prof. Dewar F.R.S., recently made some interesting remarks upon the apparatus to beemployed and the difficulties to be overcome in approaching the zero of absolute temperature. Below $-210^{\circ}$, he said, to obtain a single degree of greater cold involved a positive struggle with nature. The present aim of low temperature research was to get below the critical point of hydrogen, and the only means by which this was possible was by the adiabatic expansion of hydrogen itself. The principle discovered by Thomson and Joule, that cold was pro duced if gas at high pressure was allowed to escape cess. from an orifice one-quarter inch to one-tenth inch in diameter were made to impinge on the outside of a ube containing air, so much cold was produced that the air in the inside tube would condense on the side in a liquid form, provided, of course, the whole appa ratus were efficiently isolated with regard to heat. In a similar manner, a hydrogen jet could be used, as was experimentally shown, to produce a temperatur low enough to freeze air to a hard, white solid. A hydrogen jet at ordinary temperatures, however ould give no reduction of temp only be obtained if the gas were initially cooled to efficiency of such a process was by the nature of the ase very small, and the fact that the expansion of hydrogen at a pressure of 500 atmospheres and a tem perature of $-200^{\circ}$ would only produce about $7^{\circ}$ of
greater cold than would be won by its expansion at he same temperature from a pressure of 100 atmo pheres, showed the difficulties encountered in at tempting to reach temperatures sufficient to liquefy ydrogen. Even suppose the liquefaction accom
the density of liquid hydrogen at the boiling point could not be above one-tenth that of water. But, in spite of these obstacles, says the Colliery Guardian, Prof. Dewar believed that some day some one would succeed in collecting it and carrying out investigations upon its properties.

American Clock Making.
More than a hundred and twenty years since, Isaac Doolittle, an original warden (1770, April 16) of Trinity Church, in New Haven, and the most important man among its founders, was a brass founder and maker of the old time brass wheel clocks. He was a gener of character and enterprise, whose mark in his did he supply clocks in the colony, but in 1774 he ad vertised that he had built a bell foundry and equipped it for the casting of bells. In the war of the revolu tion he joined Jeremiah Atwater and Elijah Thompson in making gunpowder at Westrille, near New Haven, so much to the discontent of the Trinity Church Tories that from 1778 to 1783 they dropped him rom the office of warden.
The more extensive modern making of clocks, after new patterns and in considerable number, began with Eli Terry, nearly a hundred years since, and some what later, with Chauncey Jerome and his nephew Hiram Camp. Terry, the father of wood clock mak ing by machinery-i. e., wheels of wood to save the xpense of brass-was born at East Windsor, Conn. 1772. April, and in 1793 began, in a small way, clock making at Plymouth, Conn. In 1807 he bought an old mill and fitted it up to make clocks by machinery The next year he began five hundred clocks at once a thing never before ventured. In 1810 he sold his works to Seth Thomas and Silas Hoadley, and Thomas developed upon this foundation a very large business Terry invented, 1814, a style of clock called the pillar croll top case, and, selling a right to Thomas fo 1,000 , they each made about 6,000 a year, at $\$ 15$ piece, and later 10,000 to 12,000 a year-each clearing by 1825 about $\$ 100,000$ from the manufacture
Chauncey Jerome, under whom clock making was to become a world-wide interest, worked for Terry in the winter of 1816, and the next spring, when his job wa inished, began for himself, and effected that year his irst great sale-twelve wood clocks for $\$ 144$ in cash. In the winter and spring of 1821-22 he secured a shop, in Bristol, Conn., and in the fall of 1824 formed a com pany, which, in 1825, built a small factory. The sam year Jerome's device of what he called the bronze look ng glass clock made an epoch in the trade, many pushing into the business, and large profits resulting rom 1827 to 1837 ; after which the nest great develop ment was his device of a one day clock-i. e., a simple lock with wheels of brass insstead of wood-the ide of which he worked out early in 1838. The zinc dial instead of wood was first introduced with this precur sor of all cheap clocks. After reaching, 1841, success represented by $\$ 35,000$ profits in one year, Jerome tarted an English agency in London, 1842, against prejudice which at first absolutely barred making any sales at all, until a merchant was induced to permi two clocks to be left with him, and, finding that they sold at once, allowed four more to take their chance and then twelve more, thus initiating a trade which in ten years, reached $\$ 150,000$ a year, a profit of $\$ 20,000$. As soon as the English business was under way, the revenue officials, in view of the low price at which the clocks were invoiced, took a couple of cargoes, at the ten per cent advance which they had the option of iving, to take whatever came in, but did not meddl further with the American clock invasion.
In 1843 Jerome's works at Bristol grew to extensive proportions by the addition of two large factories, fit ed with machinery and tools for making brass move ments; and the next year, 1844, he started a factory in New Haven, for making cases and boxing the fin ished clocks. A year later, 1845. April 23, a great fire destroyed the Bristol works, including seven or eight buildings, extensive and costly machinery, and from 50,000 to 75,000 brass movements. This caused the ransfer at once of the whole business to New Haven where the brass movements making was under wa again by the middle of June. Rapid making by the best machinery was now reaching a marvelous perfec ion; competition was very keen; and some maker were flooding the market with poor clocks. Jerome inal device in clock making was a "timepiece" sold for a dollar or less-a time clock but not a striking clock. In 1850 Jerome united with the Benedict \& Burnham Company, of Waterbury, Conn., to form the Jerome Manufacturing Company, each putting in $\$ 35,000$. After a year or two of large and profitabl business Jerome bought out the other stockholders his son mainly managing the business from this time and new parties coming in, with an increase of capita to $\$ 200,000$. But the ensuing period proved one of dis aster, in which internal management and financial re lations with P. T. Barnum played a part. Six months after the connection with Barnum, 1855, the company failed, and its founder was hopelessly ruined.-Boston Journal of Commerce.

NEW DEPARTURE IN LETTER FILING CABINETS.
During the last ten years many improvements have been made and patents issued for all kinds of office devices, notably paper filing devices. However, loose sheet letter file improvements have been confined to some new kind of spring or cam fastening compressor or some more or less complicated index fastening. A patent just allowed Mr. George H. Richter, of Boston, tids fair to make a decided innovation in this line.
The invention consists first in substituting for a spring a removable weight which is attached to th front edge of the cover of the index. This weight is made of spring brass, and slips over the front edge of the index cover (see Fig. 1). The under part of the weight is doubled upon itself and has a hole through the double thickness. The index cover has an eyelet which is raised on the under side and when the weight is drawn on engages the hole referred to, locking it positively to the cover. When the file is filled with papers and the index is to be transferred with the papers to the transfer case, the weight is drawn off in an instant by springing the lips apart sufficiently to clear the raised eyelet, and is placed on the new index. The weight is a permanent thing that cannot wear out.
Another part of the invention is a very simple de vice, but a very great improvement of an index fastening. It consists of a continuous piece of heavy wire which forms the pins for the sheets to slide upon, and the loops on either end slip into metal slides set flush into the drawer front. This fastening is so smooth that in shipping or handling it cannot possibly injure the index and cannot be bent out of shape, neither can it pull apart.
The advantages of this file are, first, it clears the drawer entirely of all the obstructions necessitated by a spring and its fixtures. It save time in referring to letters, as the weight is raised with the index cover and so saves the two motions of first raising and afterward closing a spring when re ferring to or filing papers. This saving can hardly be overestimated. The weight is at the outer edge of th


## etter filing cabinet

cover and so keeps the papers free from dust instead of opening them to the dust, as is done by all spring files, wore or less, because they strike papers far back from the front edge. In referring to papers, the weight be ing very stiff and the full length of index, and being ifted with the index sheets, prevents the falling out of papers. The index wires being formed of one con inuous piece allow the cover to tilt back over the front of file entirely out of the way, while springs when used stand perpendicular over the file, overhang the top, or catch the fingers if falling close to the drawer top. It will also be seen that there is nothin to get out of order, to mutilate the papers and make a disagre able noise
The index cover is doubled over at back edge, which makes it very stiff and strong, and the two pins used prevent the cover or index sheets from getting abov the drawer front.
'The transfer case, as will be seen, has two metal slides set flush into the wood, as in the file drawer, to
receive the index wire loops, so that reference in the This as convenient as in the file
These cabinets can be had from the Office and York City.

## AN IMPROVED SAW MILI

A saw mill which is designed to economize time and power and save waste of material has been designed and patented by Mr. William H. Inglish, of East Ta was, Michigan. By reference to the engraving it will


## INGLISH'S IMPROVED SAW MILL

be seen to consist of a strong $U$ shaped frame, at the bottom of which is the main drive shaft of the machine which carries a balance wheel, a large and small pulley and two crank disks. To the front disk is attached a pitman which is pivotally attached to the bottom shank of a vertical $U$ shaped sash, which moves in suitable guides and in which are adjustably held the two vertical reciprocating saws, vertical motion being given to the same through said pitman by the revolu tion of the drive shaft. The desired lateral vibratory movement of the saws is obtained by means of a pit man which extends laterally from the side of the bot tom shank of the sash, and engages with a rock shaft which is operated through a horizontal arm and a pit man by a disk crank keyed upon the main drive shaf at the rear of machine. The amount of said lateral vibration or oscillation is determined by an adjustable connection between the rear arm of the rock shaft and the rear pitman. The proper tension in the saw blade is obtained by means of strong spiral springs which are arranged around the buckles which carry the up per ends of the blades at the top shank of the before mentioned sash. By an ingenious arrangement of bevel gears attached to the buckles which carry the inner saw blade, meshing with similar gears upon vertical slotted shaft, and a system of friction pulleys perated by a belt driven from the main shaft, the distance between the two saw blades may be varied at will while the mill is running. The invention is adapt ed for use with a carriage and mechanism of any suita ble form, and adjustable rollers are provided as shown in the engraving, to guide the log in its passage through the mill. The inside saw is set in the gate about on inch ahead of the outer saw, so that the outside boar is cut off first, an arrangement which enables the lumber to get away freely from the saws.

## The Grafting of Living Tissues

The German biologist Dr. Born has been grafting portions of one tadpole on another. The subject has been treated facetiously by the lay press and at last a novel has been based upon it. The editors of Natural Science, of London, make the following statement con erning it:
"The original experiments of Hunter, in which he transplanted structures from one animal to another probably led to the modern attempts at bone and skin grafting. A few years ago, surgeons were confident that grafts of bone from rabbits and calves might be transferred to human bodies, while it was a cur ent belief that skin might easily be grafted, or blood transfused. Mr. H. G. Wells, whose scientific novel have been a feature of the last two years, has base the plot of his recent 'Island of Dr. Moreau' on th artificial production of semi-human beings from ani mals. Dr. Moreau is a ferocious vivisector, with some thing of the hypnotist thrown in, and, by carving liv ing animals (without anæsthetics) for many consecu veeks, he has produced, and turned loose on his
men, ox-hog-men, goat-vixen-ladies, and a puma-dog lady who escaped in an incomplete condition, to the subsequent destruction of her artificer. The story i grewsome and exciting to a high degree; but we hav doubt that our readers, who have missed great de ights if they have not read the earlier scientific novel and stories of Mr. Wells, will form their own opinio of the qualities of the 'Island of Dr. Moreau.' Frou he scientific side, however, Mr. Wells seems to us to have allowed his imagination too free a run in his new story

Recent work on!transplantation and transfusion [is] conclusively against the success of operations con ducted upon animals of different species. Transplan tations from one species to another almost invariably have proved unsuccessful. Most often the trans planted pieces become centers of suppuration; in the most favorable cases, they serve as inert centers around which new growth takes place. Histological examina tion shows that they die. So extreme is the aversion of a body to extrinsic material, that transplantation rom other individuals, even of the same species, rarely hold. They are treated as foreign kodies. The successes are almost entirely confined to plastic opera tions, in which material from one part of a body is adapted to another part of the same body."

## AN ELECTRIC LAMP HANGER

A convenient device for regulating the height at which an incandescent lamp is suspended is shown in the accompanying illustration. It has been patented by Mr. Joseph Schmidt, of 257 East Seventy-eighth Street, New York City. It consists of a base block of insulating material, provided with a removable cover, beneath which block is arranged a winding pindle, upon which the suspending circuit wires are wound, and from which the lamp depends. The spindle, which is made of insulating material, is provided with two V shaped grooves in which are seated meta ontact bands, which are engaged by two brushes, in the form of rollers, held against them by coil springs. The brushes are pivotally connected with plates, with which the line wires connect. The lamp wires pas hrough the body of the spindle and connect with he above mentioned contact bands. The end of the pindle is provided with gravity dogs, which engage notches formed on a collar of the fixed rod upon which said spindle revolves. On the opposite end of the pindle is mounted a bevel gear, which meshes with a horizontal bevel gear, mounted in a recess formed in the base block, the said gear wheel being provided with coil spring. The lamp wires pass down through a tubular carrier which slides in a horizontal slot formed in the bottom of the cover. In operation, when the amp is pulled down, the rotation of the spindle wind up the spring, the dogs holding it in any desired posi


## sChmidt's electric lamp hanger.

ion. To raise the lamp, it is pulled slightly down ward, thereby releasing the doy from the notch, when the spring will rotate the spindle and wind the wires thereon, the action being similar to that of a spring oller shade.

AT the annual meeting of the British Ornithological Union, a proposal is to be discussed for a classification of birds, in a handbook divided according to the six great geographical parts of the world. Each division would form a volume containing 2,000 species, with a Latin diagnosis and a few selected synonyms. The proposal is made by Mr. P. L. Sclater, the secretary of the Zoological Society of London. The scheme has been on the whole approved, but it will have to undergo much discussion, and some species will be difficult to classify in the way of geogranhical distribution. The common crow, for instance, is popularly supposed to be found in all climates and all corners of the world.

THE PRODUCTION OF METALLIC BARS OF ANY SECtion by extruision at high temperatures.* The author in his opening remarks drew attention to the fact that so rapid are the sirides sometimes made by invention that it frequently overtakes the means at disposal for giving practicable form to otherwise practical ideas. A case in point is afforded by the invention of Mr. Alexander Dick, which deals with all kinds of metallic sections, by forcing metal heated to plasticity through a die under hydraulic pressure. The principle is the same as that employed in the manufacture of bricks, drain pipes, and similar articles
It is true the principle of extrusion has been applied to the production of continuous lengths of leaden pipe and wire, and of leaden rods for the manufacture of small arm projectiles; but in the present case the metal is operated upon at a very high temperature, that of plasticity, or about $1,000^{\circ} \mathrm{F}$.
The process of manufacture consists in placing the heated metal in a cylindrical chamber, at one end of which is a die. Upon pressure being applied at the opposite end, the plastic metal is forced through the die, issuing therefrom as rods or bars of the required section and of a length governed by the quantity of metal placed in the receiver. This pressure chamber has not only to withstand the high temperature of the contained metal, but has likewise, while under the influence of that temperature to meet the severe strain brought upon the interior by the resistance of the metal to the pressure of the hydraulic ram in forcing it out through the contracted area of the die Hence the first and most important point to be settled was the design of the cylinder and the material of which it should be constructed.
Several cylinders were made, some of cast and some of wrought steel, the chamber being 24 inches long and 6 inches internal diameter, and the walls from 3 to 6 inches thick. The cylinder was surrounded by an annular chamber, which was heated by a coke fire, the object being to maintain the plasticity of the metal during the operation of pressing. The cylinders, however, cracked badly as the result of expansion and contraction strains, and for a long time the progress of a promising invention was retarded.
The difficulty respecting the pressure chamber, or container, was eventually overcome by dividing up the container into sections composed of concentric steel tubes alternating with annular spaces packed with a dense non-conducting material. This arrangement is based upon the principle that steel, if heated only to moderate temperatures, will retain its full power to resist pressure; so that a cylindrical chamber formed of several conparatively thin walls, and protected from extreme heat, will resist pressure better than a chamber having a thick solid wall heated to a higher temperature.

By this compound system of construction, the liner which is exposed to the extreme heat of the metal, may be made with a comparatively thin wall, and will not be liable to be will not be liable to be frac tured by unequal heating and cooling, and consequent expansion and con-
traction. Further, in order that it may be capable of successfully resisting pressure, it is re-enforced by means of the surrounding steel tubes, which, although of themselves thin, are insulated and supported by a dense packing of non-conducting material, and are therefore kept at a comparatively low temperature and in a condition to offer the greatest resistance, which condition is further mechanically influenced by a stout steel outer casing.

Another problem which took some time to solve was the selection of an efficient non-conducting material. After experimenting with a variety of sub. stances, Mr. Dick found that the best results were obtained frow crushed granite mixed with a small proportion of borax. This compound satisfactorily fulfilled all the necessary conditions, and was there fore adopted as a non conductor
The apparatus consists mainly of the compressing cylinder or container and the hydratilic ram. A longitudinal section of the container is shown at Fig. 1, a transverse section at Fig. 2, and an end view at Fig. 3. The container, which is 2 feet long and 2 feet diameter * Abstract of paper read before the Iron and Steel Institute of Grea Britain at the Spring meeting, May, 1896. By Perry F. Nursey.


PRODUCING METALLIC BARS BY EXTRUSION.
time. The container was turned into a vertical position and 168 pounds of molten metal was poured into it. It was then allowed to stand for six minutes so as to acquire a plastic condition. In order to prevent a back flow of the plastic metaltaking place, a dished steel check disk, which is less plastic and more rigid than the heated metal at the working temperature, is first placed on the top of the charge, and when the pressure is brought on, the disk is expanded and com pletely fills the bore of the liner, thus effectually pre venting the back flow of the metal
Upon this check disk was then placed the loose steel block just referred to, which, having been previously heated, prevents the cold end of the plunger chilling the charge of metal. The plunger being of smalle diameter than the liner, there is no fear of the latter becoming chilled by the former. To preclude the possibility of such an occurrence, the back of the loose block is recessed to receive a corresponding projection on the front end of the plunger, which is thus kept horizontal in its forward travel and prevented from coming in contact with the liner.
The loose block having been inserted, the container was brought into a horizontal position, the stop plate removed, and the container run up to the die block, which, with the die, had been previously heated. The hydraulic pumps were then started, and in four minutes the charge was expelled and had become converted into four 1 inch rods, each measuring over 12 feet in length. The clips were then released and the ram continued its forward travel, pushing out the re maining metal, or stump, together with the die and its holder, as well as the check disk and the loose block, leaving the container perfectly clear for a fresh charge.
With regard to the physical characteristics of the bars thus produced, it is obvious that, owing to the great pressure put upon the metal, its quality mus necessarily be greatly improved, in the same way that Whitworth steel is improved by compression. In the first place, it is found to be perfectly homogeneous The actual increase of strength in extruded bars over that of hot rolled bars of the same metal varies with the nature and composition of the metal or alloy. Taking ordinary yellow metal, the increase in tensile strength is 24 per cent, with a proportionate increas in elongation. Some tests made at Woolwich Arsena with Delta metal bars produced by extrusion show a tensile strength of 107.520 pounds per square inch with 32.5 per cent elongation on 2 inches, agains 85,120 pounds per square inch tensile strength and 20 per cent elongation of rolled bars of the same metal. The samples shown by the author of the paper were The samples shown by the author of they ranged from light sections, such as] wire weighing about $\frac{1}{100}$ of a pound per foot, to heavy rounds, hexagons and square weighing forty pounds and more per foot.
It will thus be seen that we have, if not a new in dustry, at any rate a new industrial process of farreaching importance. It is not outside the bounds of possibility that, given an improved description of steel or other metal for the dies, other metals, such as iron and steel, which are less ductile and less expensive than those to which the system is at present applicable, may be used for the production of a still wider range of articles by extrusion.

## Acetylene in Use.

It is stated that acety lene is being tried in some of the tram cars in Paris, and with promising suc cess. The generator, con taining the calcium car bide and water, weigh under thirty pounds, and is placed beneath the steps of the vehicle, and it contains sufficient material for generating thirty-five feet of gas. As the lighting power of acetylene gas is something like fifteen times that of coal gas, the cost is stated to be less than that of illuminating dense it. The metal is forced out of the container the cars by petroleum. Doubtless, after this, we shall through the die by an 18 inch hydraulic ram, work ing under a pressure of 4,480 pounds per square inch. Upon the occasion of a visit of the author to the Delta Metal Works, New Cross, London, where this machine is in operation, it was producing Delta metal rods 1 inch in diameter and 12 feet long. The die used for them had four openings, thus producing four lengths, or an aggregate of 48 feet of rod at the same birthday
the cars by petroleum. Doubtless, after this, we shal have a practical and safe application of acetylene for lantern purposes next season.-The British Journal of Photography.

As the exact year of Gutenberg's birth is not defi nitely known, the year 1900 has been selected by the birthday.

## Science Notes

The fourth Congress of Criminal Anthropology is to be held at Geneva, Switzerland, under the auspices of the Swiss government, from August 4 to 29 of the presnt year
An International Exhibition will be held at Brisbane, Queensland, Australia, during June, July and August, 1897. Special attention will be given to labor saving appliances of all kinds.
The instruments used in the observation of the British Association's committee on earth tremors are so delicate that an angle can be detected which corresponds with that subtended by a chord an inch long of a circle 1,000 miles in radius.
It is recorded that a fully equipped expedition will shortly start for the exploration of the remaining twothirds of the interior of Australia which the Elder expedition left unfinished. Mr. Albert E. Calvert provided the funds for the expedition.
An aluminum quadrant has been devised to measure the actinic power of the Roentgen rays. The aluminum is arranged in concentric layers varying from one to ten millimeters in thickness. Measurements are made by holding the quadrant between the excited Crookes tubes and a phosphorescent screen or a sensitized plate.
Arrangements are now being perfected in Limoges to celebrate this year the centenary of the introduction of porcelain into France, by means of a retrospective exposition in which the history of porcelain manufacture will be traced. The exposition is being organized by the Société Gay-Lussac, working in conjunction with representatives of the town of Limoges.
A seismological department has been established at the Athens Observatory. It has been placed under the direction of Dr. Papavasilon, who is well known for his investigation regarding the Locris earthquake in 1894. Earthquakes are very frequent in Greece; 34 were recorded in January alone. A monthly bulletin will be published and regular observations will be made over the disturbed area
Mr. E. D. Fridlander, B.Sc., recently gave an ac count of some observations of the amount of dust in the atmosphere made at various places during a voyage round the world in 1894-95. The experiments, which were made with a form of Aitken's pocket dust counter, showed that there are often considerable variations in the number of dust particles in a very short space of time. Dust was found up to an altitude of 6,000 feet or 7,000 feet among the Alps, and also in the open ocean so far away from any land as to preclude the possibility of artificial pollution.

Columbia University will send a party of naturalists under the leadership of Prof. Bashford Dean, to ex plore Puget Sound. Three zoologists and one botanist will accompany the party. The deep sea work will be done with the Albatross. The region is almost unexplored. The region around Puget Sound is exceed ingly rich and promising in its marine and botanical life. The expedition hopes to make extensive addi tions to the teachers' collections of the university, to add new types to the herbarium and zoological muse um, and to collect unique material for research for staff and graduate students and for training in independent marine research. The party will return about the first of September.
In a paper publisned in the Astronomische Nach richten Dr. See shows how, by a very ready method, determination may be made of the absolute dimen sions of the orbits of bright and rapidly revolving binary stars by single spectroscopic measures of the motions in the line of sight of the component stars, and from the dimensions and other known data of the orbits the actual masses of the stars and their distance from the earth can be easily calculated. But perhap the most important result claimed for this method is the means it furnishes of testing the question whether the Newtonian law of gravitation applies to stellar systems as well as to the solar system. Dr. See show the manner in which may be calculated the motion in the line of sight in all parts of the binary orbit, these calculations being based upon the law of gravitation and a single spectroscopic measure. If such measures be continued upon a number of pairs, while the stars complete their revolutions, and the computed and observed motions in the line of sight agree throughout, within reasonable limits of error, it will be strong pronf of the universality of the Newtonian law.
One of the most interesting exhibits at the Royal Society's recent conversazione was the series of photographic spectra of the Bessemer flame, as seen at the Northeastern Steel Company's works at Middles brough, shown by Prof. Hartley. The photograph demonstrated the presence of gallium, and subse quently this body was separated both from the metal and from the ore of the district. The discovery, in 1876, of the very rare element gallium was the grea achievement of Lecoq de Boisbaudran, who obtain ed it in extremely minute quantities from certain Westphalian zinc blendes. Some of its properties resemble those of nickel, and others those of alumi num: but it has qualities of its own rendering it specially remarkable among the metals. It would
be interesting to learn to what extent it is found in Cleveland ironstone. The Westphalian blende used by Lecoq de Boisbaudran contained, according to Adolphe, Wurtz, only one sixty-thousandth of a part of gallium. The element was predicted, with most of its properties, under the name of "ekaluminium," by the Russian chemist Mendelejeff, on the basis of the periodic law.

## a combined bed and sora.

The object of the invention shown in the illustration, for which a patent has been granted to Mr Thomas Langdon, of South Los Angeles, Cal., is to combine in a single article of furniture a single or double bed, a sofa, and a separate, detachable, crib or berth. The device consists of a base to which are at tached two stout end pieces, which are connected by a longitudinal partition centrally located between them. The body of the bed is hinged to the top edge of this partition, so that it may be thrown up, to form the back of the couch, or lie down horizontally, when it will rest upon said partition and upon folding legs which are suitably hinged at the front and rear of the bed. A hinged head board and foot board are pro vided, which are held in position by pivoted braces, and provided with locking bolts, which are controlled by springs and engage suitable holes in the sides of the bed when the same is folded up, thereby holding the clothes firmly in place. The sofa is located in the front compartment of the base, and consists of a cush ioned top and hinged sides and ends, which are folded down when it is to be used as a lounge or sofa, the base of the bed being likewise cushioned to form the back of said sofa. If the sofa is to be used as a crib or couch, the front board of the latter is turned upward to form a side rail; and if a second single bed is required, in addition to the large bed, it is formed by taking out the frame of the lounge, turning the end


## LaNGDON's COMBINED BED AND SOFA.

and side pieces upward around the cushioned top and latching them into position, the small bed thus formed esting upon two transverse pieces secured to the bottom of the cushion.

## A Polar Region Map.

The United States Hydrographic Office of the Nava Bureau has just issued a map which embodies the en tire history of North Polar exploration. It is pub lished in two sheets, which divide between them the entire area included in the Arctic circle, and with a uarginal belt of four degrees outside it. In other ords, the map covers the entire area of North Polar exploration from latitude $62^{\circ} 30^{\prime}$ north. It is, of course, circular, and is drawn to so large a scale that the diameter of the great circle contained on the two heets measures forty inches. The longitudes east and west from Green*wich are marked on the Arctic circle, and the latitudes on two great meridian lines which cross the map at right angles from $75^{\circ}$ wes nearly the latitude of Washington) and at $165^{\circ}$ west The great circle of Lock wood and Brainard's nearest approach to the Pole, May, 1882, is drawn at $83^{\circ} 24$ porth, and the point where they reached that altitude is marked at $44^{\circ} 5^{\prime}$ west. The history of every North Polar expedition and exploration of the coasts is indicated by a series of ingenious colored lines and trac ings. They can be easily followed, and tell the story with absolute accuracy and in graphic terms. The mount of skilled labor and geographic detail incor porated in the map is enormous, and is saved from be ing confusing only by the large scale to which the nap is drawn. Seventy-six distinct explorations ar traced on the map, from Sir John Franklin's, in 1845 down to Peary's, in 1895. Eight nations are represented in these explorations-Great Britain, Germany, Austria, Norway, Sweden, Netherlands, Russia and the United States. The height of the land is marked in feet and the depth of the water in fathoms. The and is culored to a light gray and the water left white. The names on the map are not crowded and
are most delightfully legible. The entire lithographic execution of the work is the best. We are at a loss which to pronounce the more admirable, the high degree of perfection reached in the printing or the judg ment shown in avoiding unnecessary refinements and the overloading the surface with more names than it could carry clearly, as is done in the recent editions of Stieler. It was a good stroke of practical judgment which divided the entire Arctic circle between two which divided the entire Arctic circle between two
sheets instead of giving it all in one huge, unmanage able sheet, an arrangement whose convenience any one who wishes to consult the maps often will appreciate at once. At the bottom a complete key to all the signs or symbols employed to indicate the polar explorations and expeditions, with the names of the explorer and the dates of their expeditions, is printed out in full We are proud to see so great a work as this bearing the imprimatur of the United States Hydrographic Office and, more than all, we are glad to have such a con densed clew map to tell in a few words the confused and confusing story of these heroic expeditions to show what each accomplished, and what the relation of one to the other is and what remains to be done The map is issued at the low price of one dollar which, says the Independent, barely covers the cost o publication.

## A Trolley Without Poles.

Chemnitz, Saxony, two years ago banished horses from her street cars and substituted the trolley In a report to the State Department, Consul J. C Monoghan says one of the principal novelties of the adopted system is that no poles are used. The method f stringing wires is by means of ornamental rosette astened into the wood work or walls of houses, having projecting hooks to which the wires are attached These hooks are firmly fastened and are tested with seven times the weight they will be called upon to bear. Owners of houses, without exception, preferred to allow the use of their houses free rather than have posts on the sidewalk. The streets through which the cars wind their way are wider than $W$ ashington Street Boston, or Westminster Street, Providence. The rail way tracks, in conformity to the law, are level with the pavement, and accidents to vehicles of any kind are rare. The gage is narrower than in America, but the cars keep the track and run as rapidly and smoothly as in the United States. In the heart of the city they run 220 yards per minute, and in the suburbs 330 yards per minute
The increase of traffic since the introduction of electricity in Chemnitz has been 60 per cent. The cars have no conductors. The motorman is the only per son on board who represents the company. By doing away with conductors the company saves 44,000 mark annually. The fare is only ten pfennigs, or a trifle less than $21 / 2$ cents, on all routes, including transfers Should 150,000 persons evade payment in twelve months, the loss would be only 15,000 marks. It would take 450,000 evasions in fare to offset the company's savings by dispensing with conductors' salaries Among a people who pay for food and drink in restaurants, saloons, and gardens on their honor alone, it is unlikely that the company loses much. Culprits in this regard when detected are punished by having their names advertised in the newspapers as a warning to others. Fare boxes are attached to both ends of the car, so there is no such excuse offered as "difficulty n getting forward."
Experiments are being made in Dresden with stor age batteries and underground conduits with a view to replacing the overhead system of railway propul sion in Chemnitz. The overhead trolley system has been very profitable. The system has worked per ectly for the past two years, and has much to com mend it to cities bent on an overhead system.

## Prompt People.

Don't live a single hour of your life without doing exactly what is to be done in it, and going straigh hrough it from beginning to end. Work, play, study -whatever it is, take hold at once, and finish it up squarely; then to the next thing, without letting any moments drop between. It is wonderful to see how many hours these prompt people contrive to make of day; it is as if they picked up the moments which he dawdlers lost. And if ever you find yourself where you have so many things pressing upon you that you hardly know how to begin, let me tell you a secret Take hold of the very first one that comes to hand and you will find the rest all fall into file, and follow after, like a company of well-drilled soldiers, and though work may be hard to meet when it charges in a squad, it is easily vanquished if you can bring it into line. You may have often seen the anecdote of the man wo asked how he had accomplished so much in his life. "My "other taught me," was the reply "when I had anything to do, go and do it." There is the secret-the magic word now! Make sure, how ver, that what is to be done ought to be done "Never put off till to-morrow what you can do to-day" a good proverb, but don't do what you may regret. -Merchant Sentinel.

A premium of $\$ 250$ is offered by the Scientific American for the best essay on
the progress of invention during the past
This paper should not exceed in length 2,500 words.
The above-mentioned prize of $\$ 250$ will be awarded for the best essay, and the prize paper will be pub lished in the Special 50th Anniversary Number of the Scientific American of July 25. A selection of the five next best papers will be published in subsequen issues of the Scientific American Supplement a our regular rates of compensation.
The papers will be submitted for adjudication to select jury of three, consisting of-
Prof. R. H. Thurston, Cornell University
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Rejected MSS. will be returned when accompanied by a stamped and addressed envelope.
Each paper should be signed by a fictitious name, and a card bearing the true name and the fictitious name of the author should accompany each paper but in a separate sealed envelope.
All papers should be received at this office on or be fore June 20, 1896, addressed to

Editor of the Scientific American,
361 Broadway, New York.

## Our Trade with Africa.

The New York Sun told recently of the great increase within a few years in the business of shipping mining machinery from the United States to South Africa. The growth of the general export business to spondingly great, and the increase during this year has been little less than phenomenal. During the year ending with last June the value of the exports was $\$ 5,000,000$. Such has been the growth of business since then that it is estimated the exports for the yea ending with the coming June will be at least $\$ 10,000$, 000 . What this means will be seen readily by a glance
at the figures for two or three previous years. The at the figures for two or three previous years. The
value of the exports for the year ending with June, 1894, was $\$ 4,122,912$; that for the preceding year $\$ 3,500,000$; and that for 1892 was $\$ 3,400,000$.
One reason for the increase of shipments is that now steamers are available for the South African trade. A few years ago the business of southern Africa was either so largely in the hands of the English or in such condition that only sailing vessels plied between here and South African ports. For the last three years steamers have been sent from here, and although no regular line has been in operation, there
are firms which send steamers out pretty regularly are firms which send steamers out pretty regularly now at the rate of about three a month. They are
tramp steamers and they take cargoes out but do not return.
While com paratively few articles were sent formerly to South Africa from here, now almost every kind of commodity that this country produces is exported. Trade is drummed up, and Americans are pushing their interests vigorously. Only recently the Oregon mill interests have worked their way into the African continent, and steamers are sailing from the north
Pacific coast to South African ports. Of course, the great bulik of the shipments from this country are made from the port of New York, but vessels are dispatched also from Gulf ports and others from San Francisco.
The shipments from the South are of wood. All the white pine used in South Africa is sent from this country. The shipments from San Francisco are said to be mainly of wheat. During the present year wheat has formed a very large portion of all the shipments from
this councry. The reason is that the African wheat crop failed, and the Australian crop was an utter failure.
What the future has in store for the business relations of this country and South Africa would seem to be almost without limit. One of the things which work against the shipping firms is Africa's paucity of
good harbors. Harbor improvements are under way good harbors. Harbor improvements are under way
there, however, as for example at Port Natal, the port there, however, as for example at Port Natal, the port
of Natal, where the depth of the channel at the bar was increased from 1882 to 1892 by seven feet and seven inches. The depth in 1892 was thirteen feet eight inches.
What America has to look forward to may be seen those of England. America's exports to South Africa were $\$ 3,500,000$ in 1893 and England's were $\$ 46,000,000$. The total exports of manufactures from this country last year were in the neighborhood of $\$ 200,000,000$, or Iess than half of Germany's, and less than a quarter of England's. Yet American manufacturing plants are capable of turning out twice the amount of goods re-
quisite for the supply of this country in a year. One of the things, not always spoken of as a manufacture, that South Africa got from here is $\$ 1,000,000$ worth of rum, which was sent out in one year.
Naturally most of the exports for Africa are staples, but some fancy articles, among them bicycles, are
being introduced there. A good many medicines are sent over. Everything in the line of cheap wooden in large numbers, mainly of the old fashioned kind, or what are now regarded as old fashioned, although some nowers and reapers are going out. The reason the de mand is for wares of the old style instead of the laborsaving machinery is said to be, not that labor is cheap over there, but the farmers prefer to do things in the old way. A good many cheap plows are exported.
An idea of the variety of the shipments made from
United States ports to South Africa may be gained by United States ports to; South Africa may be gained by a glance at the manifest of the cargo of a ship now on oil, shoe Among the goods there are lard and lad fish, corn, flour, canned meats, axle grease, turpentine, varnish, manufactured wood, barbed wire, doors, han varnish, manufactured wood, barbed wire, doors, han-
dles, parts of plows, axes, cigarettes, canned fruit, baking powder, brooms, carriages, nails, apples, apricots canned oysters, kerosene, wheat, clocks, medicines evaporators, hams, stoves, wheelbarrows, dried fruit, sugar, cotton goods of many sorts, spokes and hubs of wheels, lubricating oils, crucibles, ropes, seeds, and iron pipes. One of the commission merchants speak ca. Besides, there are in the cargo steam pumps and starch, plows, glassware, gloves, curtain fixtures, rubstarch, plows, glassware, gloves, curs, mining machinery ber goods, sport organs, whips, hay, clothing, soap,
furniture and ors, seeds, cartridges, galvanized oilers, wire mats, oats, lumber, nectarines, candy, can openers, tongues, hay
cutters, iron bolts, refined petroleum, books, candles, cutters, iron bolts, refined petroleum, books, candles,
paraffine wax, suspenders, playing cards, glucose, mail coaches, knives, electrical machinery and supplies, hammocks, paper bags, trunks, exterminators, tomatoes, sirup, white duck, Florida water, windmills, benzine, oil stoves, razor strops, coffee wills, essences, quantities of pain killers, copy presses, iron sieves, picture frames, bird cages, plated ware, watches, den-
tal chairs, dress goods, catalogues, lawn mowers, scales, wooden horses, drugs, typewriters, paper, charts, rye bicycles, typewriter supplies, lead pipe, paint, roofing carts, trucks, canvas, canned salmon, feed cutters, and electrotypes.
In many, if not most, of these products there can be no competition between this country and England. Of course, England can send no wheat. In manufactured hard ware, the supremacy of American goods is ac knowledged. The English goods in this line, it is saia re heavy, without being any stronger than the Amer ican, and while the African residents stick by old
methods in farming, they like light articles for hand use and for use round their buildings. The exports of doors and sashes and made up wooden ware gen erally, together with the metal fittings and fixtures
that go with these things, are enormous. In structur that go with these things, are enormous. In structur-
al iron goods the exports are light, which would argue that Africa is not yet anxious to have very tall buildings.
Ordinarily the time of the ship's passage from here to the African ports is about thirty days. It is cheaper oo ship freight from here to those ports than from England. The freights are less. One feature of the
trade of England and America with South Africa is the difference in their terms of sale. English merchants the commission houses of this city say, are ready to give six months' credit to the African dealers, whereas American houses draw promptly for all shipments
Many of the African houses have London connection and the financing is done at the London offices, which simplifies matters for a New York firm.
There are said to be about twenty commission house in New York sending goods to South Africa, and be sides these there are, of course, a great many direct shippers, many of the large manufacturing firms making their own shipments. It is not so long ago that Boston did a large part of the shipping done by the United States to South Africa, but now the bulk of it is done from this city.
The steamers call at various ports around South Africa, Mossel Bay, Delagoa Bay, Tamatave, East London, Algoa Bay, Port Elizabeth, Port Natal, Cape Town, and so on. All the way to Delagoa Bay, the ort of the Transvaal, the consiguments go from her the one ship. Goods for the Zambesi River country have to be reshipped at Delagoa Bay. English com-
panies run coasting vessels from Port Natal, Delagoa, etc., northward and to Mauritius. Althongh Delagoa Bay is the port of the Transvaal, Johannesburg is the center toward which all lines of travel converge from the coast points, and it is the objective point fo Bulawayo, in Matabeleland.

The Egyptian government has determined to com nence a geological survey. The work will be begun this year, and will take about three years for its com pletion. The estimated cost is $\$ 125,000$. Capt. H. G. Lyons, R.E., who is at present engaged under the
Public Works Department of the Egyptian government in superintending the excavation of the ruined temples of Philæ, will have charge of the survey.

We extract from an editorial in the Evening Post of June 2, in which the editor argues that the cause of hard times in most industries is owing to the bicycle. Theatrical managers say they have had the poorest season for many years, and that after patient and anxious search for the cause they have found it in the bicycle craze. They say that not only do young men and maidens, but old men and women save up their money in order that with it they may buy wheels. This of itself is disastrous to the theaters, but wors remains to be told; for having bought the wheels they ride on them in the evening instead of going to places of amusement. They ride also on Saturday afternoons, and in Chicago they ride so universally on Sunday that the theaters, which formerly gave successful per formances on that day, have discontinued them. The Sabbatarian might find encouragement in this fact were it not true that the churches are suffering almos as severely as the theaters from the same cause.
Business men are as loud in their complaints as the theater managers. The watchnakers and jewelers say they are nearly ruined ; that all pin money which the young people saved formerly with which to buy watches and jewelry now goes for bicycles; that parents, instead of presenting a boy with a watch on his twenty-first birthday, now give him a bicycle, and that all the family economy is now conducted with the object of equipping every boy and girl, as well a ather and mother, with a wheel. The confectione cries "me too" to this plaint, declaring that about al the business he does is in chewing gum, ice cream, and soft drinks, while his candies find few customers. The tobacco manufacturer says he is the worst hit of all, since few riders care to smoke on the road-for which there is reason for profound gratitude-and the jour nals of the trade say it is a fact that the consump ion of cigars is decreasing at the rate of a million a day, the total decrease since the craze became general averaging no less than $700,000,000$ a year. Instead of sitting idle and smoking niost of the day, hundreds o men now ride, and swoke only when they are resting The tailor, the hatter, the bookseller, the shoemaker the horse dealer, and the riding master, all tell simila tales of woe. The tailor says that so many men go about half the time in cheap bicycle suits that they do not wear out their good clothes half as rapidly as ormerly. The hatter says so many of them wear cheap caps, in which there is no profit to the maker, hat their hats last them twice as long as heretofore The shoemaker says he is even worse off, for while they buy cheap shoes for the bicycle, they do not even wear these out, and they refrain from walking much in any kind of shoes whatever, so that his loss is almos total. The bookseller says people who are rushing about on wheels, days, nights, and Sundays, no longe read anything, and his business has become practically worthless. As for the horse dealer, stable keeper, and riding master, it is notorious what has happened to them. They are no longer " in it," and, like the horse are a drug in the market. Even the saloon keepe roans, for he says that while many riders drink beer the number who take "soft drinks" is much larger while the number who take "hard drinks" is dimin shing, which must be the case in a pastime which annot be followed with an unsteady head.
But the greatest gainer of all is the American race An eminent physician is quoted as saying that "not within 200 years has there been any one thing which has so benefited mankind as the invention of the bicy ele," that "thousands upon thousands of men and women who till within a few years never got any out door exercise to speak of, are now devoting half thei ime to healthy recreation, are strengthening and de veloping their bodies, and are not only reaping benefit themselves, but are preparing the way for future gen
rations which will be born of healthy parents." Ther erations which will be born of healthy parents." There is no douht about this. As a people the American have never taken sufficient outdoor exercise. We id been a nation of dyspeptics, simply becalop an strengthen our bodies. The bicycle is a wonderful builder up and purger of the system. It not only bolishes indigestion and dyspepsia, but rids the sys tem of that curse of middle and old age, rheumatism, nd thus adds enormously to the national good natur as well as to the sum of national happiness.
As a social revolutionizer it has never had an equal It has put the human race on wheels, and thus changed completely many of the most ordinary processes and methods of social life. It is the great leveler, for not till all Americans got on bicycles was the great American principle that every man is just as good as any other man, and generally a little better, fully realized. All are on equal terms, all are happier than ever be ore, and the sufferers in pocket from this universal raternity and good will may as well make up thei minds to the new order of things, for there will be no return to the old. The true philosopher under the new conditions was the watchmaker of the rural New
York village who, when he found the demand for watches falling off, gave up dealing in them and wen into the bicycle business.

## THE SKIRT DANCE

The famous skirt dance may be defined as peculiar in the sense that it is not a dance as generally understood in stage parlance. The performer standing on the stage and dressed in voluminous attire, requiring, it is said, over a hundred yards of material, by slow motions comprising more arm movements than foot movements causes the light drapery to wave about in most graceful curves. The variety of shape and contour that can be produced by a skilled performer is endless. To add to the effect wands are used to extend the reach in the direction of the lines of the arms, and the greater control thus obtainable adds immensely to the effect. This dance was made famous by Miss Loie Fuller, whose reputation is now world wide. During the past season refinements and improvements introduced in it have made of it a new thing.
Our illustration is designed to show the methods adopted to produce the wonderfully beautiful effects which have charactenized the dance. The performance is executed in a darkened theater. A number of projectors are dis tributed, four in the wing and one below the stage, so as to be adapted for flooding the figure of th danseuse with light pane of heavy plate glass set in the floor of the stage permits the projector be neath it to produce its effects. Each projector has mounted in front of it a disk about three feet in diameter, perforated near its periphery with a number of apertures. Colored gelatine is fastened over most of these apertures, different color being used for each opening, excep where one may be left for white light. The operators at the projectors follow the movements of the per former, and can produc an almost infinitely extended range of effects by varying the colors thrown by each projector.

The theater being pitch dark, the figure can be brought slowly into view and can be made to slowly disappear by manipulation of the projectors. She can appear in any color or combination of colors and can die away in similar manner. It is needless to say that it is a composite performance, in the sense that the dancer fills only a part of the functions; skilled operators are absolurely essential at the projectors.

One of the prettiest effects is produced by a magic lantern operated from the front of the stage and shown in the cut on the left hand. The operator projects upon the drapery different figures and designs, using regular lantern slides, making the flowing, misty drapery act as the screen for his projections. It is obvious that he must give great attention to his focusing.
The skirt dance has won the attention of artists, and some very beautiful statues have been based upon its cloudlike variations of form. The slight idealiza tion required in representing the soft forms of waving drapery in the solid material of the sculptor's art has given most graceful and characteristic effects.
One of the most startling effects is the flame dance The filmy veil is pure white, but as the dancer approaches the opening in the stage floor the veil turns to a fiery red and the flames wave to and fro as if they were being blown by the wind. Shadows are then thrown onto the veil which produce and exact reproduction of heavy black smoke, which suddenly changes to an ardent flame again, as if the fire had broken out anew

The Chemiker Zeitung states that according to Max Hagen the smoke of wood fires is not in the slightest degree injurious to vegetation.

Foundations of Heavy Buildings.
Several modes by which heavy buildings, such as those built in New York City, fail are described by Mr. Charles Sooysmith, M. Am. Soc. C.E., in a paper read before that society. The upper material of New York is mud, silt and sand of varying degrees of fineness and gravel. The hard stratum below, if not rock, is what is known as "hardpan," which contains stones of various sizes, is made up of silt, clay and gravel, and is firm and compact like rock in hardness and can only be dug out by pick and chisel. This hardpan is unyielding and can be trusted under the heaviest building. The Manhattan Life Insurance building, built on fifteen cassions proportioned to carry a pressure of 108 tons per square foot, is built on this material and has not yielded. It is said to be able to bear, by means of a concrete base, 150 pounds per square inch or 10.8 tons per square foot.
Mr. Sooysmith observes that buildings of the ordi nary height seldom put upon the earth greater weight than three or four tons per square foot; their wall
times caused settlement, owing to this tendency of the soil to escape.
Settlement of buildings is frequent in the vicinity of ivers, where there is often a movement of the entire ass of soft material going on, and an instance is given of one building which has been wrecked by the subsidence of the piers, the entire mass of the subjacent material or silt having slipped toward the river Driving piles is one of the best preventives, especially where they are wholly submerged. The New York building law allows a load of twenty tons per pile. The author refers to the mistake of taking the aggre gate bearing capacity of pile foundation to be the sum of the safe loads on the individual piles. In some case the piles only displace the material and transfer the oad direct to the stratum beneath them, which may be of a vielding kind

The author also speaks of the risk of lowering the water level by pumping and so exposing the piles, which then soon decay; also of the raft method of foundation, which is employed largely in New York


THE SKIRT DANCE-THE MAGIC LANTERN PROJECTORS AND ARRANGEMENTS OF THE STAGE. in which steel beams are used to spread the bear ing to a sufficient depth.
Reference is also made to the use of steel caissons sunk by the pneumatic process, employed by the architects of the Manhat$\tan$ Life building, Messrs. Kimball and Thompson and to the foundation of the new Johnston building by means of open wrough iron cylinders sunk by the water jet process. The pneumatic process, say the Building News, is one of the safest methods for deep excavation, and the author appears to favor it.

## Electric Lighting by Artesian Wells.

One of the novel elec trical developments of the West has been the opera tion of electric lighting plants by means of artesian wells. The latest of thes is at Chamberlain, S. D situated on what is known as the artesian well basin, embracing over 20,000 square miles in the centra portion of that State Throughout that region one can bore into the earth at almost any spot, and a a depth of about 2,000 feet obtain a constant flow of water to the surface, aver aging about 1,000 gallons per minute. These under ground waters may be re garded as a new resource and in Brule County where Chamberlain is sit uated, there are now ove thirty such wells, yielding $70,000,000$ gallons every twenty-four hours. At Chamberlain the well is 8 inches in diameter and 675 feet deep, and the wate rushes up through section of iron pipe, which pene trate through the strata o granite to the underlying body of water. The pres sure is so great that reduced to a $21 / 2$ inch stream by a nozzle, th were spread over the surface by the means of footings $\mid$ water shoots up to a height of 262 feet. In the Chamber and concrete. With the greater increase of the height of building, these methods became quite inadequate One of the great dangers or risks from overloading the soil is lateral flow, and this has to be prevented by various means. When the foundations are not carried to the substratum of rock or "hardpan," it is necessar o discover what vent, if any, may be given for the underlying material by excavation or drainage near The danger of the material squeezing out under the pressure, as in the case of buildings resting on sand is very obvious, and the author alludes to the serious danger or disastrous settlement of heavy buildings, which may take place at any time, by excavation near them, even such as putting in foundations of buildings and in pumping operations, especially if ac companied by jarring, vibration or by hoisting. Under uch conditions the material under the heavy building is likely to squeeze out toward the excavations. Pump ing water near a heavy building from a well has some-
water shoots up to a height of 262 feet. In the Chamber lain plant, the volume of water is reduced to a stream about 3 inches in diameter, which impinges on th buckets arranged radially on the rim of a well known type of Western wheel. This wheel is mounted on a shaft which carries a large driving pulley, and the pulley belts to a five hundred incandescent light al ternating current machine. The power is more than sufficient to run the plant at its full capacity, and the five hundred lights are all in use. The regulation is simple, and is dependent upon raising or lowering the water nozzle at the wheel, and the power is thrown off entirely by swiveling the nozzle, so that the wate discharges altogether under the wheel buckets, and runs out through the waste pipe. There is no reason why every one of the wells should not thus be made to yield its power for electric light and motor servic as well as for irrigation. - New York Evening Post.

A Pasteur Institute has been established at Athens

MOSCOW AND THE CORONATION OF THE CZAR. (Continued from first page.)
Resurrection, according to the immemorial custom, in order to venerate the picture of the Iberian Madonna, which is kept in a chapel at the side of the gate. Here their Imperial Majesties were met by the Metropolitan of Moscow, and after kissing the crucifix and making the sign of the cross with holy water, they entered the chapel and knelt before the sacred picture. They then passed through the Holy Gate of the Saviour into the Kremlin. (For our engraving of this event we are indebted to The London Graphic.) The imperial party prayed in the cathedrals and after a short rest left for the suburban palace of Alexandria. The next day their Imperial Majesties received the envoys of France, Spain, Japan, Corea and the United States, and that evening the foreign minister, Prince Lobanof, gave a reception to the foreign guests. On Saturday, May 23, the Czar received the representatives of Holland, Por tugal, Turkey, Servia and Mexico, and Sunday the Czar and other members of the family were present at the consecration of the banner of the empire. On Monday the Emperor and Empress attended privately at the Church of the Saviour, in the Kremlin. On Monday afternoon, the transfer of the regalia from the armory of the Kremlin to the throne room of the palace took place. The regalia were carried in procession and reverently deposited on a table at the right of the throne, where they were guarded by high officials.
Very early on Tuesday, May 26, most of the inhabitants of Moscow were moving toward the Kremlin. The weather was glorious; the sun pouring upon the many gilded cupolas of Moscow and the Kremlin produced an indescribable effect. The regulation twentyone gurs announced the approaching event, and the signal was taken up by the bells of the cathedral, which was followed by all the other bells of the city. The Cathedral of the Assumption, in which the coronation took place, is unfortunately very small, eight hundred people standing elbow to elbow in a place intended for one hundred. Many of the costumes were superb. The coronation took place at ten o'clock in the morning; but long before that hour the Church of the Assumption had been filled with the distinguished guests and representatives who had come from the four quarters of the globe to do honor in the name of their respective countries to the young Emperor and Empress. The United States were represented by Clifton $\mathbf{R}$. Breckenridge the American minister, Gen. A. G. McCook, special representative of the American government, and Admiral Selfridge. At nine o'clock the imperial party approached the church amid the pealing of bells and the thunderous applause of the multitude. The first to enter the portal was the Dowager Czarina, mother of the Emperor, who ascended her throne on a dais level with the throne of the Emperor. Behind her came the Emperor and Empress, who were
received at the portal by the clergy and escorted to the altar.
The Metropolitan of Moscow addressed a brief allocution, while that of St. Petersburg held a jeweled crucifix to their lips, and that of Kieff sprinkled them with holy water. After a few prayers the Czaf stood to read his confession of faith. He was dressed in the uniform of the Preobragensky regiment. Then the actual coronation ceremonies began. One by one the Czar took the various papal insignia and the stat mantle from the ecclesiastics. The crown was handed


BESSIERE'S HYDRAULIC VENTILATOR.
to the Emperor by the Metropolitan of St. Petersburg. Standing forth before the congregation and in front of the altar, he with both hands placed the crown upon his head: then taking the scepter in his right hand and the globe of empire in his left, he ascended the dais and seated himself upon the throne to the united accompaniment of salvos of artillery, martial music and the clash of the city's bells. He then arose, took off his crown, and touched the forehead of the Empress with it, after which she knelt before him and he placed her own crown upon her head. The Metropolitan then stepped forward to the foot of the dais and made a short address to the Czar on the importance and duties of his office, ending with these words: "With this visible and corporal adornment of thy head is clear proof that Christ the King of Houors invisibly crowns thee head of the Russian emnire."

Family congratulations followed and a salute of 100 guns were fired. Next, mass began, and the Czar and Czarina went to the gates of the altar, where both were solemnly anointed with the holy chrism. The Czar was anointed in seven places, the Czarina only on the forehead. The Czar then used his privilege as head of the Greek Church and entered the sanctuary to receive the holy communion, the Czarina communicating outside the gates, like the ordinary laity. After the service was finished the imperial party left the cathedral, the Czar and Czarina going to pray at the tombs of their ancestors and various important shrines. At night the illuminations were on a magnificent scale. A bouquet was presented to the Empress at 9 o'clock, and, on her Majesty taking the pressure of her hand on the stem, instantly illuminated the flowers and simultaneously the whole Kremlin with electricity. Towers, cupolas, and walls of the palaces were ablaze with many colored lights till long after midnight, and search lights from towers threw their rays far over the city. Then followed a succession of fêtes, banquets, and receptions such as even Russia has rarely seen, and the congratulations of the foreign nations poured in.
Unfortunately, the round of festivities which followed has been marked by one of the most tragic calamities of the century. The popular fete of the coronation ceremonies was heid on the Hodynsky Plain, opposite the Petroffsky Palace, where a free distribution of food and drink was made to the peasants. It is estimated that several hundreds of thousands were present, and in their eagerness to get near the distribpresent, and in their eagerness to
uting booths, the crowds surged forward, crushing uting booths, the crowds surged forward, crushing
those in front against the barriers, whick yielded to the enormous pressure and were swept away. Hundreds of men, women and children were thrown down and trampled to death beneath the immense throng as it rolled forward. Including those who have since died in the hospitals, the fatalities will run into the thousands; and it is thought many have dragged themselves off the field to die, or have been carried a way by their friends, of whom no account will ever be taken.

## BESSIERE'S HYDRAULIC VENTILATOR

Ventilation in premises inhabited by a large number of persons in common has for a long time occupied the attention of hygienists as well as of very many eminent scientists and distinguished investigators, and the problems that it involves have been well studied. In manufactories, barracks, hospitals, schools, and private houses, even, the air vitiated by respiration and all sorts of emanations must be constantly renewed ; but it is also necessary that such renewal shall be done judiciously, and that in winter it shall not be attended with a lowering of the temperature. Many systems have been proposed-some of them automatic and based upon the difference of density of warm and cold air, such, for example, as perforated or movable panes of glass, etc. Others lay mechanical methods under

contribution. In many theaters the air is now re newed by electric fans. All such methods are good, and it is solely a question of selecting the one that is best adapted to the place in which it, is proposed to establish the ventilation. Despite the already large number of processes known, however, it is often found difficult to effect a constant renewal of air at slight expense, either because automatic methods do not give an adequate movement or because motive power is lacking. It is in order to obviate such difficulty that Mr. Bessiere has devised the system which we figure herewith and which operates through a simple water cock arranged in the form of an atomizer which consumes very little liquid.
As seen in the figure, the apparatus consists of a tube, B, open at both ends and inclosed in a second tube, C, closed at each extremity, from which start one or more exhaust conduits.
An atomizer, A, situated near the top of the inter nal tube projects a thin sheet of water having the form of an inverted funnel whose edges come into contact with the walls of the tube. The result is that there occurs a forcing of the air contained in the lower part and a section of that contained in the upper. The cur rent of air thus established, finding no other outlet, escapes through the conduits starting from the outer tube, and is naturally proportional to the pressure and to the velocity with which the water flows. The ordinary pressure of city mains, which always reaches from two to three atmospheres, is sufficient. The water that has been used flows out through a siphon, $D$, and may, if desired, be employed for other purposes.
It will be seen that it is possible by this means, at will and according to circumstances, to suck the air from a room and force it out of doors, or, conversely, to suck in air from the exterior in order to introduce it into a room. Fig 1 represents the first arrangement and Fig. 2 the second.
It will be remarked that, by its very principle, when the apparatus operates as indicated in Fig. 2, it sup plies air that is slightly moist, which, moreover, is de sired in the majority of cases. But if it were necessary to have dry air, nothing would be easier than to obtain it by causing the current to pass over desiccating substances, such, for example, as chloride of calcium. If it is a question of purif ying the air of a room, some such disinfectant as formol may be so arranged that the current shall pass over it.
The apparatus may be installed in each room to be ventilated by counecting each of them with the water conduit of the house, and, when the room is of very large dimensions, it is possible to install a battery of several ventilators placed side by side. The essential and even indispensable condition for obtaining a good rendering is to have an adequate pressure of water at hand. In case this did not exist in the city mains, it would be necessary to create it artificially, either by means of a p
of the house.
The starting and stopping of the ventilators of this system are very simple matters, since it suffices to open or close a cock in order to effect one or the other. It is, therefore, possible to intrust the manipulation of them to anybody.-La Nature.

## Concerning Crookes Tubes.*

We would offer the following contribution to the rapidly increasing literature on the $X$ rays of Roentgen. It has to do with a part of the subject upon which very little has been written, and for that reason may be helpful to other experimenters.
One of the chief difficulties in the way of experimenting has been the cost of the bulbs or tubes. We have proved to our own satisfaction that the making of them need not be beyond the resources of the ordinary laboratory, for within a few weeks time we have made and tested more than one hundred tubes, and have frequently made one and exhausted it and used it, all within an hour's time. All that is required is some little skill in gas blowing and in the manipulation of the pump.
The Glass.-A hard German glass or its equivalent, free from lead, has proved the best. It gives a strong green fluorescence under the action of the current, and, what is of great importance, resists without soft ening the heat generated by the cathode ray at its point of impact. Unfortunately it is not to be had free from bubbles, and these are the cause of the destruc tion of many tubes, the glass being chipped away into the bubble by the action of the current and the tube ruined. It is also rather difficult to put in the electrodes so that they will stay, and it may be necessary to use three kinds of glass-first the tube itself, then a bit of softer glass, and upon that very soft lead glass for the seal.
Shape of the Tube.-A good tube should throw shadows as sharp as possible and develop the rays as powerfully as possible. It should easily appear that the ordinary spherical form meets neither of these conditions.
To produce a sharp shadow the radiant must be *By C. O. Hatching and F. O. Robtmson, in American Journal of
small. It was found that a picture could be taken upon any side of a spherical bulb, making it prob able at
diation.
In the matter of strong action also the spherical form is inferior. This is for two reasons. First, glass more or less extinguishes the rays, according to its thickness, therefore the larger the bulb the more opaque it must be, for it must be thick enough to stand the atmospheric pressure.
Secondly, there is a comparatively large amount of radiant or conducting matter within the spherica bulb which diffuses the energy of the discharge.
Proof of the second point was obtained as follows A moderately thick bulb about three inches in diame ter was blown, and upon this a spot one inch across was blown out very thin, forming a smaller hemi spherical bulb upon the first. Opposite this thin win dow was the concave cathode. This bulb proved bet ter than the ordinary sort, but far inferior to tubes about to be described. A second experiment was made with a tube blown thin along one side for a space of three inches, and opposite to this was the cathode in the form of a quarter cylinder. 'The performance of this was also inferior.
Without going into the details of many similar experiments, it will be sufficient to say that we have found that a simple straight tube from one-half to one inch in diameter, having a small and very thin bulb or a cathode window, has given the most satisfactory results. In length it may be from four to eight inches The bulb may be blown at the bottom of the tube, the cathode placed at the top and the anode across the ube just above the bulb. Better results are, however, produced by using a bit of platinum foil for an anode, inclining it about forty-five degrees to the cathode ray In this case the small bulb may simply be blown out upon the side of the tube and the electrodes put in at the two ends, so that the cathode ray will be reflected into the bulb
Shape and Disposition of the Electrodes.-We have made the cathode in the form of a wire, a flat plate, convex plate and a concave plate. The concave form proves the best in every case. We have made it of have no size up to an inch or more ohich is best It is very difficult to have other conditions sufficiently uniform to enable one to judge where differences are small.
We have made the anode in the form of a wire of aluminum, a flattened strip of it, and, as stated above, in the form of a platinum reflector. As yet we have got our best results from the platinum. One rathe interesting result obtained was that when the anode was in the form of an aluminum disk parallel to the cathode and nearly large enough to close the tube, it gave little or no interference with the $\mathbf{X}$ ray. $\mathbf{W e}$ made one on a hinge so that it could be swung out of the path of the ray or in at pleasure, and the effect on the photographic plate was the same in eithe position.
Source of the Rays.-Being able to construct tube of any form, we have made many experiments as to the source of the rays, whether from the cathode or anode. One was in•this way: Two tubes were joined together parallel so that they were exhausted together. The cathode rays could be made to pass down one tube and the anode rays (if such existed) down the other, and either screened off at will. We found that the anode rays affected the plate but slightly, and that practically all the effect came from the cathode.
Intensity of Effect.-We do not intend to convey the impression that these home-made tubes we have valuable from their cheapness. We believe also that they are more effective than others. We have made good negatives of bones of the hand, arm, including the elbow, foot, ankle, etc., all with remarkably shor exposures; have taken impressions perfectly distinct through nine inches of wood in less than five minutes; have taken perfectly the bones of the hand through thin sheet zinc in two minutes and through the slide f the plate holder in five seconds. The ordinary coin and key impression requires not over one or two sec nds with our-best tubes
Remarks upon Pumping.-The interest in the subject at present may make some remarks upon pump ing here in place, most of all, since many have found great difficulty in this respect.
It is here supposed that the pump has a three-way cock above its bulb, opening in its two positions be ween the bulb and fork and the bulb and outer air and that above this three-way cock are one or two be called A, the others B and C in order. Let the be called A, the others B and C in order. Let the
position in which A puts the bulb in communication with the fork be position 1; and that in which it puts the bulb in connection with $\mathrm{B}, \mathrm{C}$, and the outer air, position 2. The ordinary process of pumping with the use of A alone is supposed to be understood. After no more air is obtained. The pump contains air, how-
ver, condensed upon the glass walls. To remove this A is put in position 2, and the mercury raised until a drop passes B. B is then shut and the mercury dropped until only a drop remains above $A . \quad A$ is then shut and the movable mercury tank dropped to its lowest point, when $A$ is put in position 1. Pumping now goes on as before only with B shut, and the tank i raised only a third as high as before. After four or five strokes it is well to pass the mercury again above $B$.
If the highest possible degree of exhaustion is desired, this process can be repeated between $\mathbf{B}$ and , but this is not necessary in exhausting a Crooke tube.
As soon as the stage of pumping with $B$ shut is reached, the tube which is being exhausted must be strongly heated, woving the lamp flame over every part of it, and after two or three strokes more the cur rent from the coil is turned into the tube. By the combined action of the heat and current the occluded air is driven from the glass and exhaustion proceed rapidly. It should not occupy over twenty or thirty minutes for a moderate sized tube.
Allowing the tube to cool, if short sparks can be drawn from the bulb and there is little or nothing to be seen in it except green light, the exhaustion is com plete. There is danger of carrying it too far, for the vacuum very much increases during the first hour that he tube is used; but of these matters a little experi ence is the best teacher.

## Notice to Our Readers.

In order to obtain the opinion of the readers of the Scientific American as to what invention intro duced within the last fifty years has conferred the reatest benefit upon mankind, we publish the accompanying card, which please cut out and return to the ditor. Those who preserve the paper for binding and do not desire to deface their files, or who read thi notice at a library, will please answer by postal card t is desired to get as full a vote as possible. Th result of the vote will be published in the Special 50th Anniversary Number of the Scientific Ameri CAN on July 25.

Editor of the Scientific American. Dear Sir :
$\qquad$
invented by......................................... kind.

Name.
Address

## A Dog Iron Worker

Keys, the canine employe of the Union Iron Works, met with an accident recently by which his front right eg was broken, says the San Francisco Examiner Keys has been looked upon by the officers of the iron works as one of the regular workmen for about fou years. He is a dog of no particular beauty, and his yedigree would not be considered by dog fanciers, but he possesses wonderful intelligence. He makes the Potrero Police Station his home, and he is the pet of Lieut. Bennet, but nearly every w~;kman in the ship building concern claims the friendship of the dog.
At the first tap of the gong every morning Keys has reported for duty at the gates of the Union Iron Works, and he has never left until a full day's work had been accomplished. He was particularly useful in the ship yard and in the boiler shop, and the foremen of these departments say he was more valuabl to them than a man for doing certain kinds of work He could crawl through small holes in boilers and about ships, and his particular work was to carry tools, bolts, nuts, rivets and other small articles needed by workmen who had crawled into such places, and to have them creep back and forth for which would have caused considerable loss of time. Key thoroughly understood his work, and he was always on hand when needed. Recently a steamer was placed on the dry dock for repairs, and the dog, re alizing that his services might be needed by the workmen, was climbing a ladder to the deck when he slipped and fell about twenty feet. The men picked him up, and making a stretcher of some pieces of canvas carried him to the police station and sent for a physician to set the broken limb.

According to Mr. Dewar, a liter of liquid air placed in a globular silver vacuum vessel and subjected to exhaustion, will produce as much as half a liter of solid air, which can be maintained in this condition for half an hour. In its solid state air is comparable to a jelly. When examined in a magnetic field, the liquid oxygen is drawn out of it to the poles. If pure, the jelly is clear and transparent. If it contains car bonic acid, it is milky.

A great deal of ingenuity is devoted to the production of entertainment devices, and many most ingenious ones have been illustrated in our columns, but it is seldom that one more interesting, from the scientific as well as amusement standpoint, can be offered to our readers than the one we here illustrate. It is termed the viviscope. Supported on a standard is a circular stage. Concentric with the stage a circular block about eight inches in diameter is rotated by a hand wheel. This block is surrounded by a cylinder secured immovably to the circular stage. Attached to the disk are two wires projecting nearly radially from it and carrying at their outer ends a block of crescent shape and which depends directly over the perimeter of the stationary cylinder. As the hand wheel is rotated this block whirls around and around the cylinder.

With the viviscope are supplied a number of endless bands of paper with colored pictures of figures in progressive stages of movement, drawn on the zoetrope principle, the same as is followed in securing the photographs for the kinetoscope and vitascope. These bands have their ends pasted together and are of such length as to fit rather loosely over the stationary cylinder and the depending block. A screen with a hole is provided which is mounted on the perimeter of the circular stage, and through this aperture the spectator is supposed to see the figures. One of the beauties of the instrument is that the screen is not really neces sary and that without it the movements can be seen by an entire room full of people. When the hand wheel is turned, the block whirls around between the stationary cylinder and the endless band with the figures on it. As the block passes under each figure, by a very peculiar principle of wave motion, the figure is shifted one space forward. Thus, for each rotation of the block, every figure on the band, which of course means the whole band, is shifted one space ahead, so that a perfect zoetrope effect is produced and the figures seem endowed with life
'The easiest way to figure to one's self the mechani cal principle evolved is to imagine a rope secured to the floor at one end of a room and reaching clear across it exactly to the door sill opposite the wall, near whose base it is attached. Now let a footstool be placed beneath the rope near the fastened end. It is obvious that the free end will be drawn back, say a foot, from the door sill, and, of course, all the rope in front of the footstool will share the same displacement. Now let the footstool be moved forward toward the door. The rope will pass over it, and, as it is left behind by the footstool, it will regain its original place upon the foot. Each particie of the rope is left one foot in advance of the position it occupied when in front of the footstool. As the footstool is pushed out of the door the end rope will leave it and regain its original position with its end at the door sill a foot in advance of its position when the footstool was beneath the rope back footstool was beneath the rope back of it. The difference between the rope illustration and the mechanism
of the viviscope is that in the viviof the viviscope is that in the vivi-
scope an endless band takes the place of the rope.
It will be obvious, we think, why this ingenious toy seemed worthy of a far more than passing consideration. It represents a most ingenious mechanical movement, one which may be termed paradoxical and which really is a good subject for the exercise of ingenuity in for the exercise of ingenuity in reaching a full and satisfactory ex-
planation of its principle. Indeplanation of its principle. Inde-
pendent of this feature, it forms an excellent entertainment device, one whose principal charm consists in the fact that the figures are directly seen without the intermediation of ary slot. The band, it will be noticed, is perfectly fixed in position, except such parts of it as the block passes under; the block being but one-seventh of the circumference of the cylinder, the band is stationary six-sevenths of the time. This gives the requirements for a kinetoscope, and the viviscope must, we think, be recognized as such. It is peculiarly timely now when the public has been so much interested by the exhibitions of the kinetoscope and vitascope, which have been witnessed by so many. Considered as a toy, it marks the only radical advance ever made on the construction of the old slotted zoetrope. It is manufactured by E.B Koopman, 33 Union Square, New York.

Next October a scientific jubilee will be held in honor of the fiftieth anniversary of first application of ether in surgical operations.


## THE VIVISCOPE.

those upon paper, and tend to become more and more popular among amateurs.
Messrs. Carpentier \& Gaumont have very recently constructed a style of stereoscope that permits of see ing the normal relief without making the inversion. To this effect, they utilize two small total reflection prisms, A, which they place in front of the lenses of the apparatus, as shown in the accompanying
figure. a lapse of time.

## AN INVERTING STEREOSCOPE.

A photographer who, provided with a stereoscopic apparatus, should take it into his head to make a positive upon glass directly by contact with his nega tive would be much surprised upon afterward looking into his'stereoscope to see the foreground transferred to the rear, while the background would come to the front. He would obtain what has been called pseudoscopy This fact is well known to stereoscope amateurs, who also know that when they print a positive of thei negative it is indispensable to put to the right the image that has been obtained to the left, and vice versa. The necessity of such inversion is demonstrated geometrically in taking as a basis an examination of


AN INVERTING STEREOSCOPE.
two truncated cones; but such demonstration would be too lengthy to reproduce here, and we refer those who desire to make themselves acquainted with it to pecial treatises.
However it be with theory, the fact is, nevertheless quite annoying in certain cases. When a print is made upon paper, nothing is simpler, in order to con form to the rule, than to remember that it is necessary to separate the two images and to invert them upon the support upon which they are pasted; but if we print a positive upon glass, there is a slight complication, for it is then necessary either to cut the negative and after ward unite it in the proper direction or else make use of a special frame (of which there are several models) that permits of doing the printing in two operations, but without cutting anything. Now, stereoscopic view upon glass are from every point of view preferable to eyd wax interposed between hi eye and his hand." It does not seem possible, says Mr. Moss, to doubt that the extraordinary result of Mr. Hawkesbee's experiment originated from the same natural law that produces the photograph ic effects which have recently so startled the scientific world, but we fail to follow the logic of Mr. Moss. In connection with the $X$ rays, says Industries and Iron, a curiou reference to a new light is made in the course of a lengthy paper on magnetism, by Baron Reichen bach, of Vienna. The date of thi is 1846. The paper itself can hard ly be said to call for much atten tion, but the curious part of it is the assertion of a " magnetic light" proceeding from the poles of a mag net, which could actually be seen by some peculiarly constituted in dividuals. In the account appear ing in the Dublin Journal of Medi cal Science, at that time, it is stated that Baron Reichenbach, " in order to be certain that there was actua light given off in these cases, made some very careful experiments with the daguerreotype, the result o which was that an iodized plat was acted upon when placed op posite the poles of a magnet. He was also able to concentrate it with a lens, but the focal length was found to be 54 inches, while, for candle, it was only 12 inches. He could discover no action of heat with the most delicat thermoscope. When the hand was laid before the thermoscope. When the hand was laid bef
poles, the light streamed through the fingers."

According to Nature, the phenomenal Eichene Lake, in the Grand Duchy of Baden, which has th peculiarity of appearing and disappearing at uncertain periods, has recently again made its appearance afte

RECENTLY PATENTED INVENTIONS.

## Railway Appliances.

Car Fender.-Sylvanus D. Wright New York City. The object of the invention is to pro-
vide a new and improved car fender which is compara vide a new and improved car fender which is compara-
tively simple and durable in construction, very effective or the up and downgedion of the car to hold the gate all times in proper relation to the track. The inven ion consists principally of a fender platform mounted to slide vertically and lock normalls in an uppermost position, and a gate in front of the said platform and dapted to unlock the same to permit the latter to drop by its own weight into a position to receive an object in
the path of the car. The invention further consists of a the path of the car. The invention further consists of a gate always in proper relation to the track, irrespective of the up and down motion of the car.
Car Brake. - Jefferson U. Elwood, McKeesport, Pa. This invention relates to certain imach brakes wherein the brake especially that such brakes wherein the brake shoes are adapted to be
forced into engagement with the track rails when it is esired to stop the car to which the brake mechanism ppied. It consists principally in certain improvement in the arrangement and operation of the brake shoes,
whereby the same are arranged to bear in diagonally opposite directions against the track rails, so that the powe required to stop the car is considerably lessened, and liability of breaking, the rail tread or spreading the rails,
so as to throw the car from the track. is greatly reduced

## Mechanical

Barrel Forming Machine.-John Hauenstein, New Ulm, Minn. This invention relates to
machines for forming barrels, kegs, and other casks in achines for forming barrels, kegs, and other casks in ter. It comprises a carriage adapted to support a barrel
and to receive a hoop, a vertically movable contractible ring, means for raising and lowering said ring to engage he barrel staves near the ends resting on the carriage, and mechanism for operating the contractible ing to when the staves are bent inward being adapted to be when the staves are bent inward bein
forced into the hoop held in the carriage.
Weather Board Clamp.-William Kinderman, Troutville, Pa. The object of the invention which is simple and durable in construction and more es pecially designed for drawing tongued and grooved weather boards together preparatory to nailing the same
in place. It comprises a head adapted to engage the top edge of a weather board, the said head being provided near each, extending downwardly from the said lugs and screw threaded at their lower ends, a frame extending between
the said rods and adjustable thereon, nuts screwing on the rods and adapted to engage the said frame to hold it in the adjusted position, a rack guided in the said frame and carrying a foot piece at its lower
imparting movement to the said rack
Sash Balancing Device. - Porter Marshall, Fair Play, Mo. This invention relates to delarge size. It provides a means whereby the upper sash of a window frame may be raised and lowered by correspondingly operating the lower sash, whereby also the
lower sash may be operated independently of the upper ash. In brief, the invention consists of strips angular
in cross section and having sliding movement in the frame and of a connection between these strips and the
upper sash, and gravity latches carried by the lower sash upper sash, and gravity latches carried by the lower sash
and adapted for locking engagement with the aforesaid ertured strip
Steam Engine Governor.-George W. Grimes, Bluffton, Ind. The object of this improvement is to provide a new and improved steam engine
governor, which is simple and durable in construction and very effective in operation, and arranged to regulate the admission of steam to the engine steam chest according to the actual requirements, so as to maintain a uni-spring- pressed bracket mounted to turn and carrying the spring- pressed bracket mounted to turn and carrying the
drivog shaft, and a locking device held on the said bracket, and adapted to lock the admission valve stem

Boiler.-Charles O'Toole, Dubuque, a. The object of the invention is to provide certain new and useful improvements in boilers, whereby all leakage is prevented and the tubes or flues are securely
held in place in the boiler head, even should the held in place in the boiler head, even should the usual
beads be destroyed by the heat. The invention consists beads be destroyed by the heat. 'The invention consists wall of the tube or pipe opening and adapted to receive a bead formed on the tube or flue.

Automatic Feeding Apparatus. Charles E. Doster and William N. Fisher, Converse, Ind. proved automatic feeding apparatus more especially designed for use on gas and other supply pipes to regulate
the amount of gas passing to the burner, rrrespective of the amount of gas passing to the burner, rrespective of
the normal pressure in the main, and to cut off the burner the normal pressure in the main, and to cut off the burner
from the main in case the pressure is reduced or the supply ceases entirely. The invention consists principally and fitted to slide in said casing, said stem carrying the burner.
Shuttle Worker for Looms.-Lewto looms, and its object is to provide a new and improved
shuttle worker which is simple and durable in construction, very effective in operation, and arranged to insure a positive transmission of the shattle through the open shed
The device is provided with shottle carriers moving in The device is provided with shuttle carriers moving in a longitudinal direction and carrying latches for securing the
shuttle, the said shuttle carriers having levers arranged to release the said latches, the levers being actuated by revolving cams for the purpose mentioned.
Lantern.-John T. Casey, Philadel phia, Pa. In this invention the object of the inventor is vice and in which it will be possible to readily change
the color of the light, combining in one lantern the capa-
bility of shedding a red or white light. This object is atained by providing the lantern with a body portion ca pable of receiving a red shade which is vertically mova-
ble above the body portion so as to embrace the light ble above the body portion so as to embrace the light.
By these means it is possible to easily cover the light with a red shade so as to change light from white to red or vice versa. The red shade is provided with a rack and pinion device by which it may be operated, and the lanure by which the advantages of the invention are en hanced.
Guide for Sashes. Partitions, etc. -Leonard L. Bishop, Montclair, elates to guides or devices for doors, sashes, partitions, etc., and it has for its object to provide a means which will enable wide, heavy sashes, doors, partitions, or any anced by weights or otherwise, to be raised easily and
and anced by weights or otherwise, to be raised easily and
noiselessly, and to prevent the sash, when the device is used thereon, from catching or sticking, andllikewise from rattling from wind or other causes. It consists of
a plate for supporting a sash cord pulley provided near its upper end with an inwardly extending housing for he sash cord pulley, the portion of the plate above the ousing being flat and the portion below the said housng being of much greater length than the upper portion, the plate is applied, forms a guideway for a roller on a

## Electrical.

Electro-Therapeutic Apparatus or Treating Deafness.-Samuel J. Collier, Chicago, aratus for treating catarrhal and nervous deafness, and consists in the peculiar.construction and arrangement of an electrically operated apparatus designed to supply a mechanical massage to the ear drum, muscles and small ones of the ear, and at the same time to stimulate the
nerves and muscles with a secondary current of nerves and muscles with a secondary current of elec-
ricity, both of said agencies being so arranged as to be made use of independently or conjointly, as may be de ired. It comprises a box or case, a galvanic battery, an Induction coil and an electro-magnetic sounder, both the
coil and sounder being arranged in the box and in a circoil and sounder being arranged in the box and in a cir-
cuit of the same battery, a switch for sending the current o either the induction coil or sounder, or both at the with the interior of the box, and wires leading from the

Thermometric Circuit Closer or Larm.--Richard Pearson, London, England. This inwhich contact is effected by the contact of the mercurial column with platinum contact wires, one of which has cury. The objection to this arrangement is that the platinum wires become destroyed. In brief, the invention consists of a thermometer containing a mercurial column, two platinum wires forming the ter-
minal contacts of the circuit and both entering the thermometer bore at such a point that neither is in contact with the mercury column at normal temperatures, and mercury and the said contacts, said insulating fluid consisting of creosote free of fatty matter and
boiling point of about 400 degrees Fahrenheit.

## Agricultural

Caster Attachment for Plows.George W. Waters, Corpus Christi, Texas. The object of this invention is primarily to provide a practical at-
tachment for a sulky or other plow which enables the operator to readily turn the plow at any point where it may be desired, when the plow is in service; furthermore, will be especially well adapted to facilitate the turning movement of a disk plow and dispense with the use of a tongue to guide the plow. A further object is to provide a plow attachment of the caster type which is adapt-
ed for quick and reliable adjustment to turn the plow while moving, and which will be capable of holding the plow from turning until such a movement is neces-
sary. Hand Garden Plow. - Launy Van Horn, Letts, Ia. The object of the invention is to con-
struct a hand garden plow in such a manner that it may be utilized as a marker, a coverer, and a cultivator, and, handle of the plow relative to the shanks thereof, the adjustment being accomplished in an exceedingly simple and expeditious manner and so that the plow will be
thoroughly under the control of the operator. The invention consists in a hand garden plow, two beams of different lenghths, pivotally connected and provided with
a locking device at their pivotal point, and interlocking a locking device at their pivotal point, and interlocking shovels or above the said shovels.

Miscellaneous.
Trace Holder. - Reuben H. Ewing Mondamin, Ia. This invention relates to whiffletrees, and its object is to provide a trace or tug holder for se-
curely holding the trace or tug in place on the end of a curely holding the trace or tug in place on the end of a
singletree or whiffletree. It comprises a pin projecting from the end of the singletree or the like and a stirrup a free space between its members to receive the end of the trace, and being further provided with a slot or recess

Condensed Milk Can. - Arden A. Smith, Brooklyn, N. Y. This new condensed milk can provides a receptacle for condensed milk, and one which
may be used on the table, and which will be incapable of leaking, and will also be susceptible to ready operation, and, above all, may be easily cleaned. It consists
of a cup having an outlet opening, a slide by which to close the same, a spring in the rear of the slide and a connecting plate secured at its front end to the slide ex
tending rearwardly and connected at its rear end to the
spring, and having its portions in line with the rear edge
of the slide deflected laterally to a point at one side of of the slide deflected laterally to a point at one side of connecting plate in the rear thereof will not be exposed
below the outlet opening.

Composite Musical Instrument. William Laugenfeld, Halbur, Iowa. This invention relates to musical instruments of the orchestrion type. Its
object is to provide a composite wind instrument which is adapted to mechanically play musical composition by jointly blowing and moving the keys of a number of different wind instruments so as to produce harmon bratile reeds, others being blown by the projection of an air jet directly into a perforation of the instrument. The wind for blowing the different instruments in concert supplied by bellows, and the keyE of the several instrumoved flexible sheet, having projections a ongtudinally vals on its surface which engage and rock levers that are connected with the keys and valves of the different instruments. Devices are provided to sound the instruments in concert and for producing graduated pressure the red
Garment Locker.-John Peter, New York City. This invention relates to devices for temporarily supporting hats, umbrellas, canes, etc. It con-
sists of a supporting rod having a locking bar which capable of being secured to the door or wall, of a hat securer comprising a horizontally extended rod, a spring clip moving longitudinally for engaging the rim of the
hat in connection with an adjustable supporting rod. A hanger for umbrellas is also provided, comprising a strip of flexible material having apertures in its ends and adapted to be bent around a handle or stick and an apertured handle on the ends of the said strip.
Garment Supporter. - George B. Nichols, Little Rock, Ark. This invention relates to certain improvements in garment supporters and espe-
cially to devices of this nature adapted for use as skirt cially to devices of this nature adapted for use as skirt
supporters; and the object of the invention is to provide a eupporting device of this character adapted for use by ladies as a skirt supporter, the device being of such place to prevent the same from slipping down, so as to expose the waistband below the basque and to remove the weight of the skirt from the hips of the wearer.
The invention consists of a triangular or three-armed frame provided with hooks at the ends of its arms, tw of which are adapted for attachment to the waistband of the skirt on opposite sides of the placket and the other
hook being adapted for attachment to tapes secured to the rear of the corsets.
Combined Trap and Grappling De-vice---Austin B. Clayton, Dover, Mo. The object of the grappling device which is simple and durable in construction and designed for use in fishing and trapping anmals and grappling lost or other objects in cisteris, wells, lakes, pally of stocks pivotally connected with each other and carrying at their free ends hooks, a central coil spring connected at its ends with said stocks and means for engaging the stocks at their pivots to cause the latter to

Planetarium. - James M. Chaney, Independence, Mo. The invention relates to educationa
appliances, and its object is to provide a new and im appliances, and its arranged to show at a glance the cation of the planets and stars as seen from the earth a any time or place. The invention consists of a revolu-
ble disk set to the angle of the lattude of the place of observation and adapted to receive rods, each carryin at its outer end the representation of a planet or star
the rods being inserted in the periphery of the disk to

Miner's Candlestick. - Samuel Nas eoorgetown, Colo. This invention relates to that claes
of candlesticks which are employed by miners and others for supporting a candle, and the object of the invention is to provide a device of this character formed from a single piece of wire, having a socket to receive
the candle, a spring section in combination with sai socket to hold the candle in place therein, means fo breaking off the drippings collected at the sides of the candle and supporting devices whereby the candlestick may be carried about. The invention consists of a wire
candlestick formed with an arm for supporting it in position, the wire being formed into bends for receiving a candle, the wire further being crossed and formed into yielding handle loop which is complementary to two op-
posite bends of the socket, a contraction of the handle serving to sef the socket, a contracts oposite bends for releasing the andle.
Kitchen Cabinet.-Henry C. Wheeler, Carbondale, Pa. The invention relates to certain im
provements in kitchen cabin ts such as are employed for holding cooking utensils and the like, and the object of the invention is to provide a device or this character of a
simple and simple and inexpensive constraction, wrovided with re
compact and neat in appearance and ceptacles for holding utensils of different kinds, and which shall be adapted for use as a work table or knead-
ing board in making bread. In brief, the invention consists of a kitchen cabinet, of a combination of a casing having a series of cross pieces arranged across its upper
part and provided in its wall with a series of openings, a part and provided in its wall with a series of openings, a
leaf hinged to the casing above said openings, a bar extending along the top of the casing and arranged to slide on said cross pieces, arms projecting from said bar and adapted when the bar is moved to pass through said openings in position to support the leaf when lowered,
levers pivoted on the cross pieces and coupled together levers pivoted on the cross pieces and coupled together
at their adjacent ends, one lever having its opposite end at their adjacent ends, one lever having its opposite end
connected to said bar and the other lever having its end connected to said bar and the other lever having its end
connected to the hinged leaf and also to the extended onnected to the hinged
nd of the said lever.
Smoking Tube.-Lewis H. Sondheim, New York City. The invention relates to that class of
smoking tubes in which the tobaccois fed the tube as fast as it is consumed, and the object of the
invention is to improve smoking devices of this charac
ter in several particulars. In brief, it consists of a smok-
ng device having a central chamber for receiving the to-
bacco, the forward end of the smoking device forming a combustion chamber, said device further having a smoke passage exterior of the tobacco chamber, and a longituand fitting into the tobacco chamber, and having an axial

Freight Car Roof. - Alfred P. Le provide a new and improved freight car, which is simple and durable in construction and arranged to prevent moisture from penetrating into the interior of the car by car roof, compr. The invention consists of a feight grooves at the sides to form recesses between adjacent
boards, top boards each formed with a bevel at its sides boards, top boards each formed with a bevel at its sides
and longitudinal grooves in its top, and a layer of fabric op and bottom layers of
Fastening Device for Window Guards.-Lawrence F. Ryan, New York City. This window guards and similar objects, providing a means whereby the window guard may be quickly and securely locked in place in a window frame and beneath the sash, and furthermore to provide a latch connectio he guard and the window sash, whereby the sash canmade. In brief, it consists of a window guard having
spring controlled locking members arranged for locking spring controlled locking members arranged for locking engagement with the window frame and a window sash
serving to prevent the sash being raised or lowered, uness purposely intended, from the position in which it is Toy Furniture.-James Edward Wilment in the class of toy furniture, such as chairs, bed steads, etc., which is constructed of blanks cut from flat sheets of thin caraboard or sheet metal, and adapted to
be folded into the required form or shape. The furniture being composed of a thin, semi-rigid, but foldable material, and including a central portion, a back portion downward and serve as copportions adapted to fold tached to the back and having tenons or points adapted to enter the slots in the central portion.
Line Indicator hor Copyists. ates to that class of devices known as "line indicators," for copyists. The main object of the invention is to provide a line indicator with a pneumatic operating me-
chanism. It consists of a portable pneumatic line indichanism. It consists of a portable pneumatic line indi-
cating apparatus, an air cylinder provided with a piston cating apparatus, an air cylinder provided with a piston and adapted for attachment to a copy holder, a line indi-
cator, connected with the piston rod ; an air compressor, cator, connected with the piston rod; an air compressor,
composed of a cylinder and base adapted for self-support, and a spring-supported piston working therein and having a projecting head, and a flexible tube which conTAck Lifter. - Henry O. Detert, Louisville, Ky . This invention relates to tools for draw-
either ordinary tacks or the double pointed tacks ing either ordinary tacks or the double pointed tacks generally employed for securing matting to a floor. This tack lifter comprises a laterally curved shank portion, a
vertical blade at the end of said shank and extended to a point, and a horizontally disposed blade having a notch in its forward end, one edge of said notch being at substantially right angles to the other edge, whereby a broadly diverging notch is formed.
NoтE.-Copies of any of the above patents will be
furnished by Munn \& Co., for 25 cents each. Please send name of the patentee, fitle of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.
The Dynamo: How Made and How USED. By S. R. Bottone. Ninth edition, with additional matter and
illustrations. London: Swan Sonnenschein \& Company, Limited. nenschein $\& \quad$ Company, Lim
1896. Pp. 116 . Price 90 cents.
Mr. Bottone is nothing if not practical. Those who practical possible description, the theory being omitted by the author. Dynamo calculations are generally more or less complicated and somewhat difficult for the practical man to cope with, so it is hoped that in the present book the rule of thumb workman may find his peculiar methods of work assisted. It does, however, seem a pity for any-
one to attempt to build a dynamo without investigating

## the practical mathematics of this subject.

How to Make and Use the Storage BatTERY. Embracing its history theory, maintenance, and the instal
lation of plants. By P. B. Warwick Illustrated.
Lynn, Mass. :
Publishing
Company.
Bubier
Pb 140. Price $\$ 1.50$.

Various storage batteries are here treated in series formulæ are given, and much useful data will be found embodied in the work. Quite a numerous list of "basic
patents," as the author terms it, are given. Everything patents," as the author terms it, are given. Everything
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(6879) C. L. says: Can you give me the ormula and method of preparation of the so-called fir materials to experiment with? A 1. Fire Extinguishin Powder.-Wight parts common salt, 6 parts sodium b arbonate, 2 parts Glauber's salt, 2 parts calcium chloride parts sodium silicate. 2. Common salt, 60 per cent sal ammoniac, 60 per cent; sodium bicarbonate, 80 per ent. 3. Sal ammoniac, 100 per cent ; sodium sulphate
(6880) A. B. C. writes : 1. I have built dynamoon linesone-half size of 8 light dynamo, using No. 14 wire on field and 19 on the armature. The mahine works nicely and will quickly melt a piece of fine amp it will not even make a spark The lomp is on sed on alternating circuit. Can you tell me what is the cause of failure? A. The voltage of the lamp is probaby too high. Try a lamp whose voltage is adapted to our machine-say twenty volts or perhaps even less. How much wire and of what size would be required to make an induction coil to give a $1 / 4$ inch spark? A. In
our Supplement we describe a coil which will at its best give a larger spark than the one you specify. One of about three-quarters the lineal dimensions of this ne should answer your purposes.
(6881) J. R. T. asks : What number of heat unitsare given off by the combustion of one pound ordinary kerosene stove? What number of heat units are given off if the pound of kerosene is converted into gas and burned as in an ordinary gas jet? And what inumber are given off if the gas, instead of being burned in an ordinary gas jet, be mixed, with the necessary quan-
tity of air and burned as in an ordinary Bunsen burner? A. The same quantity of heat is produced irrespective of conditions of burning, provided perfect combustion is produced. Allow 27,000 heat units per pound. The units will vary for different oils.

## INDEX OF INVENTIONS

For which Letters Patent of the
June 9, 1896,
AND EACH BEARING THAT DATE.

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