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## TURBINE TROUBLES.

$f$ is a matter of common remark that the compara tive absence of any serious check to the steady development of the steam turbine is one of the most surprising facts in connection with the new prime mover. And yet, we doubt not that if Mr. Parsons shall ever give to the world a detailed history of the years of experimental work which preceded the production of his first successful turbine, it will be found that success was achieved, only after the inventor had trod the usual weary way of repeated experiment, frequent disappointment, and occasional success. It is a mistake to speak of the steam turbine as a per fected invention; for it will be many years before it will be developed to its ultimate limit of efficiencya point which has undoubtedly been reached already by the reciprocating engine. In some respects the steam turbine is still in the experimental stage; and the wonder of it all is that an engine of an entirely new type should have shown such high efficiency so early in the history of its development.
Not much has been made known as to the difficulties and aisappointments that have been encountered in working the crude idea into the practical machine; yet they have been many, and in some cases serious and discouraging. Thus, in the case of a large ocean steamship recently equipped with steam turbines, and placed in the Atlantic service, there has been continuous trouble caused by heavy priming. The water came over in large volume from the boilers, and on its entering the turbine its inertia proved too much for the rapidly revolving blades, and many of them were stripped entirely from the shaft. This trouble occurred to the high-pressure turbines and was so serious as to necessitate the presence of a man continually at the main throttle. Another serious difficulty, which has developed in the larger turbines, is the fracture of the blades due to their outer ends coming in contact with the cylindrical casing. Of course, the instant that they touch they are snapped from the shaft, with the result that things are pretty badly torn up in the turbine. For some time it was impossible to discover the cause of this contact, for the blades are always adjusted with sufficient clearance to avoid any contact. Ultimately, it was found on making micrometer measurements, that the blades had appreciably increased in length. After long and costly experiments the discovery was made that under certain conditions of speed, length of blade and steam pressure, an intense vibration may be developed in the blades which may become so violent as ultimately to stretch the fiber and give it a permanent set. Eventually a means was fcund of checking this vibration, or at least of reducing it to a point at which there was no overstraining of the metal. We understand that one of the two firms which are building the 75,000 -horse-power turbines for the Cunard liners has set apart a special shop for experimental turbine work, and that already over one hundred thousand dollars has been expended in this way.
The next important event in the development of the marine turbine will be the maiden trip of the new Cunard liner "Carmania," which will sail for this port on December 2. This great ship will have turbines of over 21,000 horse-power; they will, therefore, be approximately twice as powerful as.any that have been previously built. The experience gained on the "Carmania" will be of great value in the final designs, at least as to details of steam piping, condensers, etc., in the larger ships of 25 knots speed.

## EYESIGHT TEST FOR RAILROAD MEN

We are in receipt of a communication from a locomotive engineer in far-away Australia, asking us to describe the standard tests for eyesight that are now in operation on the principal railroads of the United States. It seems that on the State railroads of New South Wales the standard eyesight test for employes
whose occupation renders it necessary for them to give or receive signals, consisted for many years of color tests made under practical working conditions. The tests were made with colored lights at night and colored flags by day, at an approximate distance of 1,000 yards. Our correspondent informs us, however, that during the present year the following method of testing has been adopted: Vision by Snellen's test type, at a distance of 20 feet; Color Sense by Prof. Holmgren's assorted wools and Dr. Williams' testing lantern; and Hearing, by counting the ticking of a ratchet acoumeter at a distance of 20 feet. It seems that a number of the locomotive men who were unable to pass, and were removed from their engines, failed because they were unable to read accurately the smallest type in the Vision test, namely, "type approximately three-eighths of an inch at a distance of twenty feet." Our correspondent claims that as the eye has been trained to sight signals at a distance both by day and night, it is unpractical to expect that eyesight so developed could sight small objects accurately at a short distance.
Railroad men in this country will at once recognize in the description given of the New South Wales new system of tests, the very methods which have become standard on the leading roads of the United States; and it is evident that the management of these roads are dissatisfied with the present system of long-distance tests, and have decided to adopt the more scientific and carefully-thought-out system which we have found to work so well in this country. While we have every sympathy with the locomotive men who have lost their positions as the result of the change, we think it is probable that the government railroads in New South Wales will be materially benefited by the new rule. That their new system is similar to our own is shown by comparison with that used, for instance, on the New York Central Railroad, which includes first a reading test-three-eighths inch type at a distance of twenty feet; secondly, tests for position or form, consisting of models of semaphores placed in various positions at a distance of twenty feet; third, reading test for ordinary text, such as train orders, at an ordinary reading distance; fourth, color sense, which is tested, first in daylight by displaying strands of worsted of over a hundred varieties of color, and having the men name the colors displayed, and second in a darkened room by displaying glasses of different colors in front of a lantern. Finally, the hearing is tested at a distance of twenty feet by having the men note the strokes of an acoumeter, and repeat (conversation test) words given by the examiner. The men are reexamined at the end of three years from the last examination, and also after any accident in which they may have been present, after illness, and before promotion. The system outlined above, with occasional modifications, has been in force for ten or twelve years on most of our leading roads in this country and on some for a longer period than that. Although it has been the subject of some criticism by practical men who, like our Australian correspondent, would prefer a system of tests under working conditions, the American method has given satisfaction to the railroads, and is believed to provide a surer test for the more subtle defects of eyesight.

## ROBERT WHITEHEAD AND THE TORPEDO.

It is not often that the name of a single individual becomes so exclusively identified with a great invention as the name of Whitehead has with the submarine torpedo. A parallel case is that of Bessemer and his process of steel manufacture, which for so many decades remained in almost exclusive use in the steel mills of the world. The recent death of Robert Whitehead affords an opportunity to answer the fre-quently-asked question as to who he was, and how he invented a device which, it is safe to say, has had a greater influence upon the design of modern warships than any single invention of the past century. Robert Whitehead was an English engineer, who, while he was acting as superintendent at the Austrian government works at Fiume, became interested in the attempts of a certain Austrian officer, Capt. Lupius, to design a self-propelled torpedo. The credit for the root idea is due to the Austrian, but until he became associated with Whitehead he was unable to put it into practical shape. Naturally, Whitehead's first onerative torpedo was a very crude affair, the speed being something less than 10 knots an hour and the range very limited. The Austrian navy, however, perceived the great potentialities of the device, and adopted the torpedo in 1868. Whitehead devoted himself energetically to its development, and one by one the defects of this wonderful little vessel were remedied, until it was brought up to its present high state. of efficiency by the introduction of the Obry steering gear. The latest type of Whitehead torpedo can travel at a speed of 35 knots an hour; it can automatically regulate its own depth and correct its own course; and, under favorable conditions, it will make accurate attack at a range of several thousand yards.
The Whitehead torpedo, we have said, has exercised
a greater controlling influence upon naval construction and tactics than perhaps any other single weapon of naval warfare. At certain periods it seems to have almost absolutely dominated naval design, and there has never been a time when its modifying influence has not been strongly felt. It cannot be denied that the torpedo has, at times, been greatly overrated. Indeed, we believe it is being greatly overrated to-day. The experience of the recent war seems to prove that only under exceptional and very favorable conditions. can the torpedo get in its blow. In the fleet engagements on the high seas it seems to have been a negligible quantity, and to have exercised very little, if any, influence upon battle formations. Consequently, we think it is unlikely that torpedo tubes will be fitted into future warships. Moreover, torpedo warfare will more and more be confined to work in sheltered seas and within easy reach of a naval base. Strictly speaking, the work done by the torpedo in the battle of the Sea of Japan was of this last-named character, for, on account of the rough sea that was running, the torpedo boats and destroyers were not used in the early stages of the fight, and were not sent out until after the sea had gone down. In the defense of harbors, straits, and inland seas, however, the torpedo will ever remain an invaluable factor, and particularly so if its range and accuracy in disturbed water and against swiftlymoving ships can be brought up to th $\ni$ proper standard.

## MODERN PRESERVATION OF RAILROAD TIES.

Within the past twenty-five years the price of all kinds of timber for architectural and structural purposes has advanced nearly 100 per cent, and the burden on the railway, electric lighting, and telephone companies has increased in proportionate ratio. Apparently no satisfactory substitute for wooden ties or poles has been found, and the dependence upon the forests for supplying mature trees is imperative. The planting of large acreages of private forests with quickgrowing varieties of trees has been undertaken by a number of the large western railroads, but the experiments are still too young to demonstrate anything of general practical value. Until such systematic reforesting of our lands can be made, the leading railroads and telephone companies must resort to artificial means of prolonging the life of their ties and poles.
The preservative treatment of ties both for the steam and electric roads has been carried on now long enough to indicate the relative value of the different oils and chomicals employed. The experiences of the steam roads have been that treatment of ties is both economical and desirable, and the results secured far more than offset the initial expense. Nearly all of the railroad ties treated are by the zinc-creosote and zinc-chloride processes. Owing to the comparatively low cost. of treatment with these materials, the ties can be economically increased in durability from five to ten years. More expensive chemicals, such as sulphate of ammonia and sulphate of aluminium, prolong the life of wood much greater than treatment with zinc chloride, but their higher cost makes the question of profit doubtful.
Few accurate records of the relative value of treated and untreated poles and ties date back prior to 1897. To-day, however, the foremost steam and electric railroads mark their treated and untreated ties and poles to ascertain their relative age of usefulness. On most of the western roads the life of the tie that has been treated is ten years, but a few ties put down in 1885 and treated by the zinc-creosote system, have lasted upward of fifteen years.
The railroads interested in the subject now employ dating nails which are driven in the upper side of every tie treated. These dating nails enable the track foreman to keep an accurate record of the age of every tie taken up. Copper nails are sometimes used for this purpose. The early galvanized and steel dating nails rusted so badly that at the end of two or three years the date was destroyed. However, several roads use steel dating nails galvanized with a coating of zinc. Samples of the nails are first immersed in a standard solution of copper sulphate for one minute, and then removed and washed and wiped dry. This is repeated four or five times at intervals, and if the zinc has been removed or a copper-colored deposit is found on the surface the nails are rejected. In this way dating nails are obtained which will last as long as the ties without having the date rusted away.
Ties used on railroads are subjected to much greater wear and tear than those employed for interurban electric railways, for the traffic is much heavier and more destructive to the wood. But few ties are worn out. Decay ends their years of usefulness first, and if decay could be arrested entirely ordinary ties that last ten years now could be made serviceable for twenty and thirty years on electric lines.
The source of decay or decomposition is in the air and water rather than in the wood itself. Minute animal or vegetable organisms floating in the air or water come in contact with the albuminous substances in the wood. Under favorable conditions of heat and moisture they multiply rapidly and destroy the timber. To prevent this it is necessary that an antiseptic with
germ-killing properties be applied to the surface of the ties. Moreover, the organic matter composing the cellular tissue of the wood must be sterilized and rendered inert so that the germs can find no nutrition in them. Theoretically, this can be obtained in a number of ways, but owing to the expense of the different pro cesses it is not always profitable to treat poles and ties. Most of the ties used by the railroads of the coun try are treated by the zinc-chloride process, but a few have tried the zinc-creosote and the zinc-tannin pro cesses. On the Chicago \& Eastern Illinois Railroad about 64 per cent of the red oak ties, numbering 860 , 000 , that were put down in 1899 have been taken out to date. These ties were treated by the zinc-tannin process. It is estimated by the engineers of the rail road, however, that all of the ties of red oak would have been out before this had they not been so treated The railroad owned its own plant for treating the ties, and the cost of tine work for each tie can alone deter mine whether the experiment was profitable. The fact hat all subsequent ties are thus treated before laying ndicates that the railroad engineers consider treated ties more economical than untreated.
The Pittsburg, Fort Wayne \& Chicago Railway ex perimented with ties put down in 1892. A number of white oak ties were used without any treatment, and a similar number of tamaracks and hemlocks treated by the zinc-tannin process. All of these ties hav been removed except a few of the hemlocks, and they are to be removed this year. But the fact that the tamaracks and hemlocks lasted as long as the white cak ties is a sufficient proof of the value of the treat ment. The ordinary life of the hemlock is much shorter than that of white oak, and its cost in New England is much lower also.
The Atchison, Topeka \& Santa Fe Railway treats its ties with the zinc-tannin process, and the records show that treated hemlock had an average life of 10.71 years, untreated white oak 10.17 years, and treated tamarack 8.84 years. Improvements in the processes of reating ties have been steadily made since these experiments were begun, and the life of the treated ties is thus considered much longer to-day than formerly; but as it takes from ten to fifteen years to secure re liable data it is impossible to give figures that will show the difference between the old and new methods.
The question of using higher-priced chemicals for treating ties and poles has been repeatedly brought for ward, and a number of the roads are carrying on experiments on a small scale to ascertain the economy of the different processes. Unless the life of the ties can be increased considerably the extra cost of the chemicals will render the work unprofitable. Each year gained on every tie, however, represents an enormous economy on the large lines. By bringing the average life of the abundant soft woods up to that of the hard woods by using preservatives of a cheap nature, millions of dollars can annually be saved to the railroads of the country. The question of cost of ties for the different systems is largely a matter of location. In the Southern States, where the long-leaf pine and cypress rees are plentiful, they are used in preference to all other woods for ties, and the important question at issue is to find the most satisfactory and economical method of preserving such soft woods so they will last from ten to fifteen years.
In New. England, spruce, hemlock, tamarack, pine, and chestnut trees are most abundantly used, and their relative age of durability is almost in exact proportion to their cost. On the California coast the redwoods are most commonly used, and in the central and prairie States white and red oak, catalpa, tamarack, and hemlock. By treating the softer woods with preservatives most of the roads have succeeded in lengthening their lives so that they can be used almost as satisfactorily as the hard woods. The cultivation of forests of soft woods for railroad ties is an important branch of railroading for the future, for their growth is much more rapid than the hard woods, and if by being treated with chemicals they perform equally good work, the tie problem will be partly solved. Meanwhile, engineers and chemists are busy testing new processes of treatment, and the difficulties now presented in securing ties that will do service for ten to fifteen years are gradually being eliminated.

## FUN WITH THE PHONOGRAPH.

Few owners of the phonograph realize the great versatility of this machine as a source of amusement. By its use the following experiments may be carried out. In addition to the machine itself, a recorder and few blank records will be needed.
"Speech by Tom Thumb." The machine must be speeded up as high as possible, and the above announcement recorded on a blank in a deep, loud voice. The machine should be quickly slowed down to about eighty revolutions per minute, and the speech or monologue recorded at that speed, care being taken to articulate distinctly. When the blank is full, the reproducer may be substituted for the recorder, and the machine be brought up again to high speed at which
the announcement was made. When the record is reproduced at this speed, the result will be the loud voice of the announcement followed by a rapid, pinched-up little voice making the speech.
"A Whistling Duet by John Smith." This startling announcement through the horn would create much surprise.

Put on a blank; and, after the speed is at about 160 revolutions, whistle some popular piece of which you know the second part. When the record is full, set the recorder back to the beginning again without stopping the machine. When the recording point gets to the commencement of the piece, the first part will sound faintly in the recorder, thus giving the cue and the pitch for the second, which should be recorded not quite so loudly as the first.
Several modifications of this experiment will suggest themselves. The first attempt may not be perfectly successful, but that need not be considered a drawback, as a spoiled record can be easily cleaned with a rag and a little kerosene. The rubbing should be lengthwise of the cylinder till the lines are all removed, after which a soft cloth is rubbed around the record to give a polish. Hard or gold molded records may also be cleaned in this way, which fact suggests another amusing trick.

This will call for two records, preferably talking se lections, which are exact duplicates. One of these is "doctored" by cleaning off the latter half, the rest being protected by a piece of writing paper wrapped around and secured by an elastic band. On this blank space various remarks should be recorded, which should be very different from those originally there. The good record is to be played through first. While saying that you will repeat it, the second one is quick ly substituted in the machine, and of course starts off exactly like the first one. When the "doctored" portion is reached, however, a change will be noticed, but cannot be accounted for by the hearers.

By taking two records of entirely different character, cutting each in two, and putting on a half of one and a half of the other, we can often jump from the sublime to the ridiculous by quickly flipping the repro ducer across the gap, from one to the other. With care the thinner half of one of these records may be slipped halfway on, in a reversed position, and when made to run true, will produce everything backward. A curious thing about such records is that the voice one heard in the proper direction is instantly recognized when reversed, but is, of course, unintelligible.

## FREDERIC H. BETTS.

In the death of Mr. Betts, which occurred on the 11th instant in this city, a lawyer of unusual capacity and brilliancy, especially versed in patent law, was removed from the ranks of those prominent in its practice.

Mr. Betts was born in Newburg, N. Y., in 1843, wa graduated from Yale University in 1864, and was admitted to the Bar from Columbia College in 1866 It was shortly after this that he became acquainted with Mr. Alfred E. Beach, then one of the proprietor of the Scientific American, who suggested to Mr Betts the advisability of taking up the study and practice of the patent law, particularly in its higher aspects before the courts. He followed the sugges tion, and soon became prominent and successful in being able clearly to present the salient points of cases committed to his care. During recent years he acted for the American Bell Telephone Company, the West ern Union Telegraph Company, the Edison Electric Light Company, and several other prominent corpora tions.
Mr. Betts was always deeply interested in Yale University. He founded the Betts prize in the Yale Law School, and was for a long period lecturer on patent law in the law department of the university. He was also vice-president of the Yale Alumni Association, and in the eighties was connected with several New York citizens' committees and reform organizations
In 1869 he married Miss Louise Holbrook, a daughter of John F. Holbrook, of New York. The widow and three children-two sons and a daughter-survive him

For the last few years Mr. Betts was connected in a legal capacity with the firm of bankers of J. P. Morgan \& Co., and was regarded as one of the most prominent lawyers in New York. The funeral services were held on the 14th instant in St. George's Church of this city, of which Mr. Betts was a vestryman Many prominent persons were in attendance.
Mr. Betts will be remembered for his sterling ability as an expounder of the principles of patent law, and their application in the adjudication of difficult and uncertain cases.

In a contribution to the St. Louis Medical Review, of October 21, Dr. John Zahorsky protests against the fashion of using no cradle, urges the return of the cradle to the nursery and predicts that this useful article of furniture will be in style again before long. He cites a number of authorities to prove that "the soothing, rocking movements of the cradle are posi-
ively beneficial," particularly when infants are peevish. "The cradle is one of the best therapeutic agents for a nervous baby or a sick one," says he. "It is easier on the mother and preferable to the modern succedanea, pacifier, or paregoric.'

## SCIENCE NOTES.

M. Camille Flammarion has been making some experiments at the station for climatologic agriculture of Juvisy, in the suburbs of Paris, to see whether the moon exerts any influence upon the growth of plants, according to the popular opinion. He made different sets of plantings at dates which corresponded to the different phases of the moon, using peas, beets, car ots, potatoes, beans, and many other vegetables of the ordinary kinds. After some experimenting he found that the results which were observed on the growth of the plants were extremely variable, and no fixed rule seemed to govern them. The plants appeared at periods which had no connection with the moon's phases, so that it was impossible to draw any definite conclusions from the first series of experiments. M. Flammarion is to continue his observations on this subject and sooner or later will no doubt have results which will decide this much-disputed point.
Electric traction on the Teltow canal, which is one of the principal canals in Germany, is shortly to be applied on a large scale, in accordance with a programme formerly decided upon. It will be remembered hat a number of experiments with different forms of ractors were made along the canal, and these showed that the electric system offered many practical advantages. A large central station for supplying the curent has already been erected, and is about completed at present. It already contains a 400 -horse-power dynamo and engine group and two large steam turbine and dynamo sets of 700 horse-power each. The station will be prepared to furnish current very shortly. The extensive system of locks will first have an electric system for operating it. The rails for the electric locomotives have been laid along the canal in the eastern section between Grünau and Britz, on both banks. The verhead wires and the poles are being put in place, so that it will not be long before the locomotives will be ready to haul the canal boats.
Some rather remarkable results which have been cbtained in a series of researches upon the radiation given off from polonium are mentioned by B. Walter, a German physicist. According to him, the $\alpha$ rays of polonium under certain conditions give rise to a luminescence of the air when passing through it. In this case there seems to be an emission of a certain kind of radiation which has a very pronounced photochemical effect, one whose properties are to be compared with those of the spectrum which is included between the rays $\lambda=350$ and $\lambda=290$. This radiation is absorbed by a sheet of aluminium 0.0004 inch thick, but t will pass through a plate of glass 0.006 inch thick. This emission seems to be produced especially in the presence of nitrogen. With hydrogen and oxygen the effect is fifty times less intense. Other researches in the same field bring out some of the oxidizing effects caused by bromide of radium. This action is shown when a tube containing bromide of radium is brought near a solution of iodoform in chloroform. A purple color of the solution is observed in the solution even When it is separated from the radium salt by screens of glass, mica, or cardboard. This chemical action does not result from luminous rays but from the special radiations which can pass through the screens. It eems that the $\beta$ and the $\gamma$ rays are the only ones which cause the oxidizing phenomena.
Delegates from all parts of the world attended the recent Congress of World's Economic Expansion which was held at Mons under the patronage of King Leopold II. International expeditions to the North and the South poles were discussed and these projects were adhered to by many of the most eminent explorers such as Arktowski, Nordenskjold, Brune, Nansen, Von Drygalski, Racovitza, Charcot, Cook, Peary, and the Duke of Abruzzi. The congress will thus be called upon to lay the foundation for an international association for the study of the polar regions. Besides this important work, the congress made the projects for two international institutions which will be of great value. The first of these is an international Bureau of Ethnography which will collect the documents and specimens furnished by explorers of all countries and will publish the needed information at intervals. The second proect is for an international Bureau of Statistics which will centralize all the documents concerning this field and will thus be able to give very important information. Different conferences are no doubt to be held in the future in order to decide certain questions such as an international definition of tonnage of vessels, which is now measured by different methods, also to regulate the speed of ships during fogs and to decide other questions relating to the marine. The statistical section wishes to hold a conference in order to fix the principles of general statistics and to decide other questions of this nature.

AN AUTOMATIC CARTRIDGE-COUNTER FOR MAGAZINE RIFLES
by dr. alfred gradenwitz.
Ever since magazine rifles were introduced into current practice there has been a need for a device en abling the number of cartridges left in the magazine to be ascertained readily without opening any part of the rifle. In fact, numerous instructions issued for infantry troops oblige both the riflemen and commanders to bear in mind at any moment the amount of ammunition remaining in the rifles. Now, if the magazine has to be emptied in order to ascertain the accurate number of cartridges left, there will be a loss of time and, under certain conditions, some danger, quite apart from the risk of losing some ammunition dropping out of the magazine. Moreover, the attention of the men will be diverted completely from the enemy, or from the commander.
An apparatus invented by Dr. Gottardi, of Innsbruck, will doubtless be welcomed in military circles. This cartridge-counter is an extremely simple device, causing a number of checking buttons corresponding to the number of cartridges left in the magazine to project in a readily visible and touchable manner from the right-hand wall of the magazine. This device is readily adapted to any kind of magazine rifles, as also to pistols.
Our illustrations show the cartridgecounter as adapted to type 95 of the Austrian rifles. The supporting spring of the magazine is somewhat modified, and is narrowed toward its end, while its cross-section is increased, so that the power of the spring is augmented. The counter is situated at that point on the rifle where the rifleman, in the "clear" position and in pointing, keeps his left hand, so as to enable him readily to ascertain the condition of the magazine without inspecting or touching the apparatus.
Special advantages will be derived from this device, not only by the men, but also by commanders, who will be able to watch either with the naked eye or with a field-glass the condition of the magazines of their men.

## A NEW TYPE OF ORE-UNLOADING BUCKET. <br> byw. frank m'clure.

The ore-unloading machines most recently installed at the world-famous port of Conneaut, and known as "fast plants," are playing a most important part in the making of the marvelous unloading records which are being chronicled this season at that harbor. There are our of these machines, and in the making of the re cent unloading records they have been used simultaneously with the giant Hulett clamshell machines, which were fully described some time ago in the Scienrific American.
The Brown fast plant is an abbreviated Brown hoist, spanning two or more railroad tracks, with arms or cantilever extending beyond. The storage feature is limited or else eliminated entirely. As will be noted in the accompanying photograph, the machine is very compact in form. Loading, as it does, directly into
cars, the movements of the bucket are short and fast. While Brown fast plants have been installed at West Albany, N. Y., Jersey City, Port Richmond, Cleveland, and elsewhere, they are all of different styles and dimensions. None of them are duplicates of the ones at Conneaut, and none of as great capacity. Those at Conneaut and at Port Richmond are operated by electricity, and all others yet built by steam. The contract for the building of the four fast plants at Conneaut stipulate that each one shall be capable of unloading seventy-five per cent of the cargo of any modern steamer with hatches twenty-four feet center to center, without the aid of hand labor in the hold of the vessel, and at the continuous average rate of 150 tons per hour. The bucket in use on these machines is a patent two-


One Cartridge in the Magazine and One in the Barrel.


Four Cartridges in the Magazine and One in the Barrel. an autom atic cartridge-counter for magazine rifles.
travel 100 -horse-power motor and a speed of 1,000 feet, the bridge travel one 75 -horse-power motor and a speed of 75 feet.
As heretofore stated, a favorite way at Conneaut docks, in unloading the largest ore carriers, on which the world's records have been made, is to operate these machines in the vessel simultaneously with the big clamshell or Hulett automatic unloaders. It will be recalled that the Hulett machines are operated by hydraulic power, that the buckets have a capacity of 10 tons, and that the entire weight of each of these machines is 400 tons. The fast plant and the Hulett machines stand side by side on the docks of the Pitts burg and Conneaut Dock Company, and the large dimensions and number of hatches in the modern lake freighter admit of both styles of machines being in use at once. The first of the recent great records for unloading one of these monsters was made soon after the installing of the fast plant at Conneaut, which made it possible for this dock to operate the two kinds of machines in one boat. This record was the unloading of 9,945 tons of ore from the steamer "Wolvin" in four hours and thirty minutes, which cut the former record at South Chicago square in two. Not long ago this latter record was broken, when the Hulett automatic unloaders and the fast plant unloaded the steamer "George W. Perkins" of 10,514 tons in four hours and fourteen minutes.

While some other ports are handling a larger volume of traffic this year than Conneaut, that harbor still holds all records for fast unloading, and most of the largest steamers still go there to be unloaded.

A fair estimate of the damage done annually by weevils to chestnuts grown in the United States would probably fall little short of 25 per cent, while in some years the percentage exceeds that figure, running as high as 40 or 50 per cent. Growers in some localities report no damage, others place losses
rope grab bucket. It is operated by two ropes, which work around sheaves in the top of the bucket, one operating the shell and the other the spades at the will of the operator. The bucket can thus be lifted and the spades remain open. The bucket can likewise be engaged in digging without being lifted. This style of bucket can be used in coal, limestone, and other materials as well as iron ore. The ones in use at Conneaut, and which are shown in the photographs, each have a capacity of five tons. The weight of each bucket is about 11,000 pounds. The total weight of the trolley and bucket is 59,400 pounds, and the weight of the crane 337,000 pounds.

During one of the tests of this machine, between the 19th of one month and the 27 th of the month following, four machines handled 164,326 tons in 978 hours and 35 minutes, the average number of tons per hour being 167.92 , and the per cent of the cargoes handled exceeding 75 per cent. The hoist on the machines at Conneaut is operated by two 150 -horse-power motors and has a speed of 300 feet per minute, the trolley
as low as 5 or 10 per cent, while instances are cited of whole crops being destroyed. The amount of loss is dependent on locality, season, and to a more limited extent on the variety of nuts grown. The greatest damage is usually incurred in regions where chestnuts have grown wild for many years, and the least where there are no wild chestnuts or chinquapins and the nuts are grown only for market and are carefully gathered. The most extensive losses, judging from available sources of information, appear to be in Massachusetts, Pennsylvania, New Jersey, New York (in the vicinity of New York city), Delaware, Maryland, Virginia, Tennessee, and North Carolina

In view of the many applications of timber and its growing scarcity, matches are now being made of paper, rolled spirally and dipped in wax or stearine, which prevents unrolling and gives rigidity. The roll is cut into lengths, which are then dipped in the phosphorus composition, and the matches are said to burn remarkably well.


The Fast Plant Unloading Ore at Conneaut, Ohio.
A NEW TXPE OF ORE-UNLOADING BUCKET.


The Electrically-Operated Two-Rope Grab-Bucket of the Fast Plant at Conneaut, Ohio.

## $\triangle$ STORAGE-BATTERY LOCOMOTIVE.

by tre english correspondent of the scientific american.
A novel type of electric locomotive has been designed for service upon the Great Northern, Piccadilly \& Brompton Railroad, the new deep-level tube for London, that is in course of construction. In this locomotive the motive power is derived from storage batteries.
This engine has been especially constructed for the transport of the excavated ballast from the railroad head, and the carriage of the constructional materials such as the iron segments for lining the tube, rails, ties, etc., to the point of erection. The general practice of carrying out this work with animal traction proved too slow and laborious. With the aid of this battery locomotive a train of several cars can be hauled simultaneously, thereby considerably facilitating and expediting t h e work. When the railroad is com pleted and opened for traffic the stor age battery locomotives, of which two have been uilt will be bilt, will b requisitioned for breakdown work, such as hauling trains out of the tunnels when the current fails, hunting, hunting, an other side-track work.
The general appearance of the locomotive may be comprehensively gathered from the accompanying illustrations. The total length of the engine is 51 feet 3 inches over buffers and 49 feet 3 inches over the body. The total width is 8 feet and the height from the rail level to the top of the driving cabs 9 feet 6 inches and to the top of the battery tank 6 feet 8 inches. There are two driving cabs, one at either end. Each cab is fitted with a British Thomson-Hous ton master controller, so that the locomotive may be driven from either end. The two driving cabs, how ever, are not of the same dimensions, one occupying only 3 feet 6 inches of the total length of the locomo tive, while the cab at the oppo site end takes up 10 feet 10 inches. The larger dimensions of the latter cab are necessary for the accommodation of t h e controlling apparatus a n d braking equip ment, comprising a i r compressor and receiver. Between the two driving cabs is placed the tank for carrying the storage battery cells, the length of the tank being 34 feet 11 inches The locomotive comprises a main floor or platform built of channe steel $9 \times 31 / 2 \times 1 /$ inches, the side sills being $8 \times 2 \times$ $1 / 2$-inch steel gird ers, and provided with a flooring of jarrah wood.

The frame is
carried upon two four-wheeled bogie trucks, to each of which is fitted a British Thomson-Houston electric motor wound to 160 volts. The driver's cabs and bat tery tank are constructed entirely of steel, and the cabs are so arranged that they join the portion carrying the battery.
The battery equipment is carried on the jarrah wood flcor. The accommodation for the cells is divided into two sections by a lattice girder frame extending longitudinally through the tank and so arranged as to provide a sloping top from the center to either side of the tank. The roof comprises throughout a series of doors placed on either side of the central girder to which they are hinged, so that access may be easily and quickly gained to any separate cell, or the roof may be entirely opened. The battery comprises eighty cells of the C. W. type, each cell containing twenty-one
will now describe the apparatus itself. Both the trans mitting and receiving station are provided with two perfectly synchronous cylinders (i.e., two cylinders running with perfect uniformity of speed and motion, although hundreds of miles may intervene between the two stations), similar to the mechanism already known in connection with the Hughes printing telegraph, and the Siemens telegraphic apparatus. With Korn's apparatus the cylinders at both stations are actuated by shunt-wound electromotors, and an automatic regulat ing deviee is employed to prevent any lack of uniformity in their running. The cylinder at the transmitting station is of transparent glass, and the photograph (which has been copied upon a transiucent film) is wound around it. A casing at the side of this cylinder carries a Nernst lamp, the light from which is, by means of a lens, concentrated upon a small spot on the surface of the cylinder. Now ccording to whether more or less transparent parts of the pho tograph wound upon the cylinder pass the spot of light, can more or fewer rays of ight penetrate the interior of the cylinder. As the cylinder not only rotates but also slowly moves lengthwise, each point of the pho tograph is com pelled to pass un-


Battery Compartment Containing 80 Cells of 230,400 Watt-Hours, or 308 Horse-Power-Hours, Capacity. This battery supplies 40 horse-power normally and as high as 160 horse-power in emergencies.
has been designed for operation with this locomotive. These cars are constructed simply of steel girders and plate floors mounted on wheels, and are fitted with air brakes.

The working of these engines is being closely followed by engineers interested in electric railroad traction, since they should prove of great value for emergency purposes. As their motive power is self-contained they are useful for the haulage of trains that have been brought to a sudden standstill upon an electric system owing to failure from any cause of the current supply.
er the spot of light. a selenium cell, composed of a coil of selenic wire upon which the light penetrating the cylinder impinges. Selenium is a non-conductor when in the dark, but the more it is illuminated the greater does its conductive power become. This cell is in connection with a bat tery, and a wire which leads to the other station. Now when a dark portion of the photo to be transmitted passes the spot of light, no light will be able to pene trate the interior of the glass cylinder at the transmitting station; the selenium cell inside this cylinder becomes non-conductive and no current will be able to leave the battery through the said cell and find its way to the receiving station. The brighter the parts, however, which pass the light spot, the stronger will be the currents passing to the receiv ing station, $v$ iere they (being in themselves too weak to be used for reproducing the photograph) are employed to release other cur rents of greater power.
At the receiv ing station there is another syn chronous glass cylinder, perfectly similar to that at the transmitting station. It is cov ered with sensi tized paper, and facing it there is a small Tesla tube which is made

Korn's System of Electrical Telephotography.
The problem of transmitting pictures, drawings, signatures, and the like over considerable distances is old; in fact, it dates back to the fifties of the nineteenth century. Many attempts have been made to solve it, but with scant meed of success. Now, however, the difficulty seems overcome, judging from a lecture given on October 28, 1905, by Prof. Korn, of Munich, before the Electrotechnischen Verein (Electrotechnical Union) of Berlin, accompanied by demonstrations with the apparatus itself. Prof. Korn's apparatus is able to transmit a perfect copy of a carte de visite within the brief space of ten minutes, and, should it be found practicable. by the German postal authorities, who are now testing it, it will inaugurate a new era in connection with press work, criminal investigation, transmission of photographs of fugitives from justice, etc. We
luminous by subjecting it to Tesla currents. The whole of this tube is covered with indurated rubber in such wise that light can only escape at one point, whence it falls upon the surface of the sensitized paper in the form of a spot of light. The Tesla tube is fed by the already known Tesla inductor, one of which is provided at the transmitting staiion. If left to itself it would, of course, give a uniform light and merely blacken the sensitized paper all over; to prevent this, use is made of the photographic currents coming from the trans mitting station, and to this end they are made to oper ate a sensitive galvanometer. Under the influence of these photographic currents the fine needle of the galvanometer executes a greater or less movement, and acts upon the Tesla apparatus in the same ratio. According to its position it switches more or less resistance into the Tesla circuit, thus causing the Tesla tube
to become more or less luminous. In this manner an exact copy of the photograph at the transmitting station is reproduced upon the printing-off paper.
This process can also be used for the transmission of handwriting. In this case the matter is written with non-conductive ink upon.tin-foil, which is then drawn through a contact device. Closing of the current then takes place upon the surface of the metal, whereas owing to the nature of the ink, the current is broken at the written characters; in this way the above described photographic currents are produced, which are then used at the receiving station as stated above. At present from 500 to 600 words can be transmitted per hour, giving an exact replica of the original; or a stenographed message of 3,000 words can also be telephotographed in the same time.

## Terms Employed by Foresters and Loggers.

"Terms Used in Forestry and Logging," just published as Bulletin No. 61 of the Bureau of Forestry affords the lay reader an insight into a strange vernacular.
The first half of the pamphlet is devoted to forestry. There we may read all the technical terms in good use, from "absolute forest land" to "yield table." Many terms explain themselves, but where they are not so readily understood the short definition makes plain at once the idea conveyed and the need of a special word or phrase to convey it. Perspicuity, precision, and common sense seem to have been the objects sought by the compilers
On turning to the logging terms, which are listed in the last half of the bulletin, we come across some truly remarkable expressions-terms which, though evidently derived from slang, are now in good use among woodsmen either throughout the country or in the region denoted in each case. There the uninitiated may learn the distinction between a "ball-hooter" and a "boom rat," between a "bull cook" and a "cattyman," and find that none of them refers to any lesser animal than the logger himself. Among other creatures of the logging camp may be numbered also the "alligator," the "dolphin," the "dog," the "pig," and the "road donkey," all names of objects endowed with life by the vernacular of the logger. The "alligator" proves to be "a boat used in handling logs;" the "dog" a "short, heavy piece of steel;" the "pig" a "rigging sled;" and the "road donkey"' a donkey engine mounted on a heavy sled, etc. Birds are represented by the "blue jay" and the "rooster" (also called "gooseneck"), reptiles by the "snake," and insects by the "katydid." A tenderfoot intending a visit among the brawny loggers in the North Woods, the Appalachian Forest, or elsewhere, should find it decidedly in order to take along this bulletin.
As the oniy reliable handbook of the kind in the language, Bulletin No. 61 will be in wide request among those interested in forestry and lumbering. It may be secured by application to the Forester, Department of Agriculture, Washington, D. C.

## The Gases Given off by Actinium.

Solutions of radium salts are known to give off continually an explosive mixture, $\mathrm{H}_{2}+\mathrm{O}$, resulting from the decomposition of the water under the influence of radium. Ramsay and Soddy have shown this mixture to contain also small amounts of helium, which, as is generally presumed, is due to the disaggregation of the radium atom.
Mr. A. Debierne, as pointed out in a recent memoir to the French Academy of Sciences, has performed a large number of experiments on a solution of radium bromide and on actinium salts both in solution and in the solid state, when a formation of helium was stated with both kinds of salts. The experimental outfit used was similar to the one employed by Ramsay and Soddy, the gaseous mixture being introduced into a glass tube containing different substances to absorb any gases susceptible of chemical reactions. Such gases as were not absorbed in one of these tubes, viz., those of the argon group, were compressed by means of mercury in a small capillary tube, about 2 cubic millimeters in capacity, and carrying two platinum electrodes. The spectrum of the gas was observed in a direct vision spectroscope of fairly great dispersive power, giving the wave length with an error of 1 or 2 units in the fourth figure. Photographs of the same spectrum were obtained by means of a quartz spectrograph, allowing the wave length to be measured with an error of cne unit in the fifth figure.
The helium gas obtained in the author's experiments was found to be due to the presence of radio-active bodies as borne out by numerous checking experiments made under similar conditions.
In a previous paper, the author has shown that outside of the large amount of rapidly evolved emanation from actinium, there is a rather small amount of emanation which is evolved much more slowly. This latter emanation is found to be identical with the one ter emanation is found to be identical with the one
given off by radium, though the amount evolved be extremely small.

It may be mentioned that Prof. Debierne has found in the spectra of the gases given off by actinium a number of lines which he has not been able as yet to ascribe to any one of the known gases.

## A NEW MEGAPHONE.

A novel apparatus for increasing, the intensity of sounds has been invented by Messrs. G. Laudet and L. Gaumont. The principle underlyirg the construction of this apparatus, which was recently presented tc the French Academy of Sciences, consists in transmitting the sound vibrations concernea to and from a convenient flame. After the first experiments made in this connection, utilizing the human voice, had given satisfactory results, the voice assuming a remarkable intensity, the experimenters continued their investigations, employing sources of sounds of mechanically deterrained intensity, with continued success.
The megaphone (shown in the accompanying engraving) consists of an equilibrated distributor to regulate the amount of the burning gas mixture, and a burner wherewith the gases are consumed in an ignition chamber. The apparatus submitted to the Academy was arranged for registering the reinforcement of sounds of any kind on ordinary phonograms. Air and acetylene were employed as burning gases.
The distributing mechanism consists of a chamber, $A$, into which the combustible mixture is introduced under pressure through a conduit, $B$. A vane, $C$; supported on knife edges at $O$, is mounted at the bottom of the chamber, $A$, an elastic ring being provided to insure airtightness in $O$. Any motion given to the pencil is transmitted to the vane, $C$, inside of the distributor. On either side of $C$ openings, $D$ and $D^{\prime}$, are provided through which the gaseous mixtures are allowed to issue in respectively equal amounts as long as the vane is immovable. Any displacement of $C$ will, however, result in an increase of the amount of gas issuing on one side, while the amount issuing on the other side is reduced. The total amount of utilized mixture remains constant, and the pressure in the interior of the chamber is also unaltered.


## a new megaphone.

The gases are collected and conveyed to the burners through a series of conduits, $E, E, E^{\prime}, E^{\prime}$. The burners consist of a series of disks cooled by an air current, $H H^{\prime}$, the gases jeing expanded and reduced to a temperature such that combustion always occurs in the chamber, $F F^{\prime}$, just at the point where the gases escape from the openings of the burner. The apparatus further comprises two funnels, $G G^{\prime}$. The power of the sounds obtained, which is truly remarkable, depends on the amount of gas mixture used and on the energy expended during its combustion.

## The Current supplement.

The current Supplement, No. 1560, opens with a description of a 50 -ton electric crane having a radius of eighty-seven feet. In a number of papers recently contributed to various scientific publications, Prof. Rutherford and others have made valuable contributions to our knowledge of the properties and life history of radium. These are reviewed in an excellent article bearing the title "Recent Study of Radium." Platinum and its alloys are briefly discussed. Prof. John J. Montgomery writes authoritatively on new principles of aerial flight. Walter J. May contributes an account of metal foundry patterns. Curious optical illusions are described by Arthur K. Bartlett, the chief being the halo of the moon. Mr. J. H. Morrison's excellent series of papers on the iron and steel hull steam vessels of the United States is brought to a conclusion. The last installment of A. Dastre's article on the stature of man at various epochs is presented. R. Kissling contributes the result of his recent investigations in the chemistry of tobacco. There are few more familiar sights than rain, and yet the method of its formation is but little understood by the ordinary reader. For his benefit the current Supplement contains a most instructive article, in which the phenomena of rainfall are simply discussed. Prof. Dr. Hans Molisch, whose investigations on the phosphorescent light of plants have made him a leading authority on the subject, read a paper on "The Radiation of Light by Plants" before the Congress of German Naturalists and Physicians. This paper is published in full.

In considering the proper material for a lagging, the principal elements are nonconductivity, noninflammability, efficiency, economy, ease of application, structural strength to withstand frequent removals and re application, freedom from corrosive agents, ability to withstand indefinitely the disintegrating effect of the action of heat, and the vibrations and concussions incident to locomotive action. In addition, the covering should be only of material which is of a porous or spongy nature, with numerous cells or spaces, which will retain air between the particles of the substance.
As an instance of the rapidly-increasing use of steam turbines in Europe, we may mention the following electric plants, which are either in construction or already running. The plants in question are all under the control of a Franco-Belgian syndicate. The first of these, and the largest, is the new electric station which is to supply an extensive section of Paris with current for lighting and motors. It is now in construction at St. Denis. The power of this station will reach nearly 30,000 horse-power, and an overload of 20 per cent can be kept on for two hours. Next comes the large electric plant of Sclessin, near Liège, which has steam turbines to the amount of 15,000 horse-power The new electric plant of Charleroi, also in Belgium, can furnish 3,500 horse-power, while the new plants which are erecting at Brussels, Ostend, Maubeuge, and at Cairo represent in all about 15,000 horse-power Thus we find that steam turbines to the extent of 65,000 horse-power have been installed within three years by the same company.
The question is sometimes asked whether it pays to reduce the pressure when the load is light. It hardly pays to reduce the pressure on the boiler, except in very extreme cases, but if it can be done by throttling before the steam reaches the cylinder of the engine, it would be an advantage, because this retains the heat units due to the higher pressure in the steam and the throttling has a slight superheating effect. As a mat ter of fact, tests made by Willans \& Robinson, of England, go to show that for light loads and high pressure, a throttling engine may do even better than automatic cut-off. The ideal arrangement is to throttle the steam for light loads up to say near quarter cut-off, and after that, for heavier loads, allow the variable cut-off to come into play. This practice has been carried into effect by the design of Mr. E. J. Armstrong, in which effect by the design of Mr. E. J. Armstrong, in which
he arranges the shaft governor so that there is negative lead up to nearly one-quarter cut-off, after which the lead becomes positive, and this has the effect of throttling the steam for the earlier loads and undoubtedly gives better economy, in addition to making the engine run more quietly.
TThe first tunnel which is to pass underneath the Seine near Notre Dame for one of the new sections of the Paris subway has now been commenced. The Metropolitan had been taken across hitherto upon two bridges. These latter sections have not as yet been completed, however. As to the tunnel under the Seine, the first of the caissons was sunk not long ago. It has the peculiarity that it not only serves in carrying out the work, like an ordinary caisson, but the superstructure forms the walls and vault of the tunnel itself, having straight sides and an elliṕtical arched top. So that it will be sunk on the spot where it is to remain and then will be covered on the inside by an envelope of cast iron and masonry. Each of the caissons thus forming a section of the tunnel is 130 feet long by 33 wide and 29 high. At this point the Seine has 16 feet depth. The lower side of the caisson will be sunk to a depth of 33 feet below the river bed and the upper part will thus lie about four feet below the ground. There will be three of these sections to form the tunnel which passes obliquely across the Seine.
In Switzerland, the number of electric and cable inclined railways for ascending the mountain slopes has greatly increased within the last few years, and when working in connection with the railroads, the system has proved very useful both for tourists and also for the inhabitants of the health-resorts which are placed at elevated points. Among the new inclines which are now in construction we may mention the one which is to be used for mounting the Wetterhorn. It is designed upon the Feldmann system, by the constructor of the well-known Barmen-Elberfeld-Vohwinkel suspended road. The peculiar feature of the new Wetterhorn incline is that the cars are suspended above the tracks upon cables. The overhead cable is made double and there are two cables, one above the other, so as to provide for breakage. The two tracks lie 25 feet apart and the cars are drawn as usual by cable. The descending car helps to draw up the ascending one. The sustaining cables are anchored separately at the upper part and at the lower are stretched by a counterweight. This makes the tension of the cables independent of the value and the position of the traveling weight due to the cars. Steel cables of about 2 -inch diameter are used. The cars are very light, and the system takes less power than usual.

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## Medical Students in Germany. <br> To the Editor of the Scientific American:

In the last number of the Scientific American you make the statement that "the overcrowding of the medical profession in Germany is a matter of grave concern." Allow us to correct this statement through concern. Allow us to correct this statement through
the following statistics. The medical students in Gerthe following statistics. The medical students in Ger-
many reached the numbers stated below in the respective years:

| 1884-1885 | 7,844 |
| :---: | :---: |
| 1887-1888 | 8,513 |
| 1890-1891 | 8,163 |
| 1893-1894 | 7,740 |
| 1896-1897 | 7,785 |
| 1899-1900 | 7,022 |
| 1902-1903 | 6,232 |

-from which figures you will see that rather than in creasing, the number is decreasing.
C. Bischoff \& Co.

## New York, November 10, 1905.

## Soft-Ground Horseshoe.

To the Editor of the Scientific American:
I notice in your issue of the 28th instant a sketch of what you call a "soft-ground horseshoe," recently invented. This reminds me of an appliance used by my father during the 50 's, on mules that were used for plowing and harrowing lowland rice fields on Clarendon Plantation, Brunswick County, N. C., on west side don Plantation, Brunswick County, N. C., on west side
of the Cape Fear River, five miles below the city of of the Cape Fear
Wilmington, N. C.
These lands are so soft in many places that horses or mules cannot walk across them without sinking. The boots, as we called them, were first made of heavy sole leather with wide, round bottoms, and extended up around the animals' fetlocks, where they were made fast with straps and buckles. These were a failure. When the leather became saturated with the water it would double up and not support the weight of the animal. My father then made them of wood-black gum-at much smaller cost, and used them for years with perfect satisfaction. He was the first planter to use them in this State, and I think in the South. There was no patent on them; all who wanted to made and used them. It was the only way that mules could be worked in many of the rice fields.
It was very amusing to watch the antics of a mule with his first "set of boots" on. The modern clog dancer ain't in it a little bit.
The mules intended for this work were fitted with the boots and allowed to loaf on the high ground until they became accustomed to their boots before they were put in the soft land.

John S. Watters.
Charlotte, N. C., October 29, 1905.
The Curious Behavior of an Incandescent Lamp. To the Editor of the Scientific American:
While experimenting with a disconnected incandes. cent lamp bulb last week, I knocked off the tip to note the retarding effect of air on the vibration of its carbon filament, which thus remains active only 1-200 part as long as when in a vacuum. At the moment of the inrush of air, which in this case, due to the size of the puncture, was about a half second in time, I was startled by a shock like a current which passed through the hand grasping the brass terminals, which also continued for one-half second. The lamp was an old one, with a break in the filament, and I subsequently tried a dozen others-all old-to repeat the effect, but only once could another but slight current be perceived. The first lamp had for about fifteen minutes before been charged by an electrified belt, but of course again discharged, certainly absolutely, as must result by handling for some minutes, and therefore this was rehandling for some minutes, and therefore this was re-
peated in some of the tests made afterward. In both successful incidents it happened, therefore, that the lamps were subjected to the influence of static electricity. I had formed the theory that the electricity set free was due to friction of the air current on the filament and that whenever results were obtained it was due to the former striking the latter squarely and when this was nearly complete. The lamps used were of the double-loop kind and of 16 candle-power. The current was of an irregular, vibratory nature, which appears to presuppose that the trembling of the filament loop was concerned in the effect. In exact language, what was the cause of this electricity?
Brooklyn, N. Y.
Albert F. Shore.
Mosquitoes and Yellow Fever.
To the Editor of the Scientific American:
Does the Stegomyia fasciata die or lose its power on the fall of frost?
Does the Stegomyia fasciata lose its prepotency in intervals of years or months (vide the outbreak of fever at the towns in Nicaragua and Honduras)?
Is it not a fact that the mosquito is worse in cool or cold weather than in hot?
Where is the inceptive in yellow fever-in the man or the insect? Is there not a commencement?

Is it not possible for two or more gases, each innocuous, combined to form a third or fourth gas toxic? If filth is no factor, why the preliminary cleaning up, at such a loss of time or money?
Does the difference in atmosphere between closed rooms and open beds play no part in the transmission? Does receptivity of patient count for nothing?
Does the difference in the virulence of the attack under similar conditions amount to nothing?
Finally, is the Stegomyia fasciata more delicate than other species of mosquitoes? If so, what of the ovumor the original fasci in the commencement?
Suppose an unimpregnated Stegomyia fasciata lives through the winter-is he capable of conveyance? His life is at furthest 120 days. In the cold, or semi-cold months, is he incapable of transmission? Does heat, moisture, or other unknown cause play no part? In other words, is the Stegomyia fasciata the sole cause?

I make no comment. I have lived in New Orleans and other Southern cities through fever epidemics; have noticed the bites in epidemics, and when there were none. Know, but will say nothing of the continuous activity of the mosquitoes. Make no postulate, but ask for information. William F. Wilson, M.D.

Port Lanaca, Tex., September 24, 1905.

To prevent the freezing of the cooling water for gasoline motors in temperatures down to 0 deg. F., it is advisable to mix with the water about one-quarter its volume of wood alcohol.

By his arrival in San Francisco at 9 A. M. on October 30, W. C. Chadeayne broke the transcontinental motor bicycle record of $481 / 2$ days, originally made by George A. Wyman. Chadeayne left New York Septemper 13, at 9.25 A . M., and taking into consideration the difference in time, he was just 47 days, 11 hours, and 35 minutes making the trip. The machine he rode was a Thomas "Auto-bi" with a belt drive. On ac-' count of snow and sandy roads, he was obliged to ride over the railroad ties a good part of the way during the last two weeks of his trip. He also rode several nights by moonlight in order to gain time. His experience at this time of the year was a particularly trying one, and both he and his machine deserve great credit.

The postal service is using a form of electric automobile mail wagon in Milan, and it appears to be quite an improvement. The new postal car, following the lines of the Paris system, which we illustrated not long since, runs between the central post office and the branch offices and boxes in the different districts of the city. The car is built by an Italian firm, but it differs considerably in construction from the Paris car, in the fact that the main part of the automobile is of large size, on the style of an omnibus, and is fitted out so that the mail can be sorted by the employe while the car is running. The car stops at each letter box to collect the mail, and between the boxes the employe sorts and stamps the letters and passes them in packages to a second man who puts them in a series of compartments corresponding to each postman's route. All the boxes are collected within an hour and a half, with a total run of 14 miles. It is proposed to extend the use of these cars all over Milan.

A new electro-chronograph for timing races has been devised by Mr. D. Owen, lecturer in physics at the Birmingham Technical school. The apparatus comprises a revolving drum which rotates at a uniform speed. The surface of the drum is smoked, and on it presses a style in connection with an electro-magnet which travels parallel to the axis of the drum as the latter revolves, thereby supplying a spiral trace on the drum. The electric circuit includes a target switch and a tape switch, which are united by a metallic lead and return wire. The starting pistol is fired at the target on the target switch, thereby opening the circuit and lifting the style momentarily from the drum. When the tape is reached and broken the same action takes place, and the number of revolutions of the drum between the two breaks is then read off. The timing of the speed of the drum is made electrically under the actual conditions of the race by placing the electro-magnet of the chronograph in connection with a pendulum or clock, which is made to give a mark on the revolving drum at intervals of one second. A ten-second race can thus be timed with certainty to one-fiftieth of a second.

The Bishop of Salisbury has lateiy adopted the automobile, and not long ago he was seen on his way to the assembly at Weymouth in his new car. Following his example, no doubt many other members of the clergy will take up the modern method of locomotion. One case we may mention at least. It seems that at Liverpool the members of the congregation have raised the sum of $\$ 6,000$ by subscription, for the purpose of allowing their pastor, Mr. Chavasse, to purchase an automobile. This will enable him to visit the outlying parts of his district very easily. Among the sovereigns who have taken up the automobile late-
ly is the King of Siam, who after taking his ministers around in a car over the rather rough roads of the country, has now made the purchase of a De Dietrich 16-horse-power chassis at Paris. Upon the chassis he will have mounted a special carriage-body according to his ideas. The Prince of Bulgaria, who does not hesitate to go in for all kinds of sports, even riding on the locomotives, is a fervent admirer of the automobile, and when last at Paris was often seen driving about the boulevards and parks.
The automobile appears to be making considerable progress in India and Indo-China. This was brought out in a striking manner by the great touring race from Delhi to Bombay over an 850 -mile course. In Indo-China the cars are coming into use in many places, especially in the large cities. The wealthy residents of Kuala-Lampur, one of the principal cities of the region, lying toward the south in the state of Selangor, now own a number of cars and they are very popular here. But the greatest future lies in the direction of industrial cars. The region possesses large gold mines, also an abundant supply of iron and tin. The principal exportation products are spices and gum. But owing to the lack of railroads, which are difficult to construct, little has been done toward utilizing the riches of the country. Industrial cars are now being introduced in the region and they will no doubt be of great value. The De Dion-Bouton hauling car which takes a $11 / 2$-ton load has already proved a favorite and before long we may see many of them in use. Should a public service of automobiles be organized, this would bring about a considerable importaized, this would bring about a considerable importa-
tion of rice, cotton goods, coal and oil, etc., into the region.
At a recent meeting of the Académie des Sciences M. D'Arsonval gave a description of a new device for observing the speed of a motor. This apparatus, which is simple and practical in its character has been brought out at Paris by the Richard firm, the well-known instrument constructors. Unlike most speed-indicating devices, it is intended to show the variable change of speed which a motor may have from the normal at any instant, comparing it with the speed of a standard motor which has a uniform movement. The standard of comparison in this case is a clockwork device which is provided with a speed regulator, so that its movement is practically constant. A uniform rotation is thus communicated to a pair of friction plates mounted on a shaft and acting on a roller whose distance from the axis of the plates is regulated by a milled screw. The friction roller gives a greater or less speed to one of the wheels of a differential mechanism. The other wheel of the differential is operated by the motor which is under trial. By regulating the position of the friction roller by the hand screw we can bring the first wheel of the differential to the mean speed at which the second is running, and for the standard speed of the trial motor the two wheels of the differential will run at the same sreed and the apparatus itself will then remain at rest. Variations of the trial motor from the standard speed are seen by an indicating needle which is placed on the movable part of the differential. The Richard apparatus in its present form is so designed that an angular displacement between the motor shaft and the clockwork shaft represented by 1-250 of the circle is shown by a movement of 0.12 inch of the needle upon the dial, but the scale can be read down as close as 0.02 inch. Such an instrument will no doubt be valuable in different kinds of testing work, especially as it is of simple construction and easy to operate.

## Temperature and weight.

L'Illustration (Paris) propounds and solves the following little problem in physics: Does any body whatever, warm, weigh as much as, more, or less than the same body cold? Note that this may have importance in the physics of the globe. The attraction between bodies which is shown in gravitation might change and vary. The ideal would be to be able to measure this attraction between identical bodies at very different temperatures; but the experiment can hardly be made, so an English physicist, Mr. Poynting, proceeded otherwise. He sought to see if a body whose weight we have taken in the scales at a given temperature preserves the same weight at another temperature, much lower or higher. The experiment is delicate and demands great care. It showed that the solid body heated to more than 100 deg . C. is a little lighter than the same body at 15 deg. The difference is very slight- 0.003 milligramme in a solid of 208 grammes weight. In a general way, the difference in weight is not even as 1 to the tenth power of 10 for a difference of one degree in temperature. The difference exists, but it is infinitesimal. During the heating or the cooling of the body experimented on, there occur pretty considerable (apparent) variations in weight; but this is ephemeral. The heated body, which at first seems to lose a pretty important proportion of its weight, recovers the greatest part of it and shows itself, once heated, to have a weight only very slightly inferior to that which it had at low temperature.

## THE ORINOCO-A WASTED WATERWAY.

 by g. L. m. brownOf all the great rivers of the world, with the exception, perhaps, of the Zambesi and, of course, those emptying into the Arctic Ocean, the Orinoco is the least known to commerce. Less remarkable for its length than its volume, in which it is exceeded by only eight other rivers, it has half a dozen tributaries compared with which the Susquehanna or the Potomac are mere pigmies, and drains a territory of 360,000 square miles, more than half the surface of Venezuela, or equal to the combined area of Italy, Spain, and Portugal.
Its actual length is estimated at 1,450 miles to its source in the sierras of the mysterious Guiana region; but to the head waters of the Guaviare, one of its upper branches, the distance is perhap 1,600 miles or more. This tributary is about the size of the River Loire in France, but the Meta, the Arauca, and the Apure-the latter of which is regarded by some authorities as the true upper course of the Orinoco-all exceed the far-famed Rhine both in length and volume, and in the rainy season in volume, down a vast flood such as few rivers of
their size have ever been known to discharge. The Orinoco itself average more than twice the volume of the Danube, and could gain or lose a dozen Hudsons without appreciably affecting its regular rise and fall. On the other hand, it must be remembered that two rivers on the same continent greatly surpass it both in length and volume-the La Plata and the Amazon, the volume of the latter being estimated at six times that of the Orinoco.
Apart from its size, the Orinoco is remarkable for several peculiarities, notably for its communication with the Amazon system through the Cassiquiare, which, it may be noted here, is not the sluggish canal at one time described, but a swiftly flowing river which divides its waters in the ratio of two to one, the Orinoco receiving the lesser current. The famous delta with its thirty-six channels is also an interesting feature, though less unique than the in land delta formed by the Arauca and the Apure where they join the main stream. This has been caused by the enormous force of the "winter" floods, which break through the soft mud banks, forming a confused network of "caños," or channels, which relieve first one and then the other of the streams they so intimately connect.
Like most rivers that flow through vast alluvial plains, the Orinoco is wide and shallow, and contains many shift ing sand-bars which hinder the summe navigation; but this is not true of all of its course, for hills of blackened granite are seen at places with here and there a huge boulder projecting above its muddy surface. At the port of Ciu dad Bolivar (formerly Angostura) the
river is so constricted that it attains great depth, and in the wet season sweeps through its narrowed chan nel with such force that "lanchas," or sailing barges, have sometimes been known to take a week in passing this point. Its average rise at the narrows is between 40 and 50 feet, but in 1892 it attained the incredible height of 75 feet above low-water mark, and actually flooded the city, which in the dry season is perched high on the hillside, making a prominent landmark for approaching vessels.
The Orinoco is navigable at all seasons from the Atlantic (including even of its mouths) $t$ the Atures rapids, a short distance above the mouth of the Meta. A specia lass of steamer has to b lass of steamer has to b sed, of course for thi up-river navigation, and the vessel in the accom panying illustration wil serve as a type of all the steamers plying west of Ciudad Bolivar, except on recently added to the flee which is an exact copy of the boats of the upper Nile, and draws jus twelve inches. This latter is designed for the river Meta, the navigation of which has heretofore prov-
en difficult for boats drawing three feet or more, except in "midwinter" (i.e., July and August), when it is easily navigable to the edge of the Colombian highlands. The Arauca presents conditions similar to the Meta, and receives one steamer during the rainy seascn, which ascends to the village of Arauca, situated


A Scene in San Fernando During the Rainy Season.
on the boundary between the two republics. The Apure, however, has a more uniform course, and is said to be navigable for more than 600 miles; but regular steamers certainly do not ascend that distance, the traveler being fortunate if he can get comfortable passage above San Fernando. Even this important town is frequently isolated during February, March, and April, as the writer learned to his dismay on his arrival from the Llanos. The stranger, to be sure, will


Live Stock Ready to be Shipped to Trinidad.
suffer no great hardship by the delay, since the town contains many well-appointed stores and can boast of an ice factory, a Chinese laundry, a small daily bulletin containing foreign cablegrams, and for his entertainment a primitive bull-ring! But even these attractions and the charming hospitality of the people pall upon him, and he constantly watches the sluggish current, hoping against hope that a rise may occur. Fate was kind in the writer's case; a tropical storm in the


The Narrows at Ciudad Bolivar.
THE ORINOCO-A WASTED WATERWAY.
far-distant Andes gave the necessary increase, and the own, one morning, was awakened to activity by the whistle of a small stern-wheeler which carefully felt ts way over the bars, and crept in to the bank. Six months later, I reflected, as I watched this diminutive craft, the greatest vessel afloat could be made fast at the selfsame spot, and the ground on which I stood and, indeed, perhaps the whole town, besides countless leagues of savannah, would lie several feet below the onrushing flood.
A short distance above the Atures is another rapids, the Maypures, these two forming the only obstruction to the navigation of the Upper Orinoco, the Cassiquiare, and thence through the Rio Negro to the Amazon, as well as of the Guaviare, already mentioned, which drains the vast and otherwise inaccessible region southeast of Bogotá, and is said to be navigable for 500 miles.
The navigation of these waters was attempted about fifteen years ago by a French company which had acquired valuable rubber concessions in the region of the Cassiquiare and the Rio Negro (known as the Rio Negro district), where extensive forests of the very finest Pará rubber exist. The company, at great cost, transported a small steamer in sections to the foot of the rapids, and thence overland to the Upper Orinoco (their intention, I believe, was ultimately to build a connecting railroad here), lunched the vessel, and began to exploit these price less forests. Unfortunately, however, as has been the case with so many French companies on this continent, the project failed through gross extravagance and mismanagement, and the little steamer was soon abandoned to the mercy of the floods. The present Orinoco Line of Steamers," who own or control all vessels on the entire Orinoco system, informed the writer that they intend repairing this boat and encouraging trade with the upper river; but until this is done, we have the astounding spectacle of more than a thousand miles of navigable inland waterways undisturbed except by an occasional canoe or lancha.

The lancha is simply a light scow, or flat-bottomed boat, fitted with a single mast, from which, however, an enormous sail can be spread. With the summer trade-winds blowing from the Atlantic, good progress up-stream is often made, but for the return trip the mast and sails are stowed away, and the force of the current is depended upon, aided in the dry season by the use of poles or oars. If the westerly winds have set in, of course, it can sail back as well, and at times a little craft may be seen with sail set, tacking down stream in the teeth of an easterly wind; but this is sorry work. On my trip from San Fernando de Apure, indeed, we picked up a passenger from a lancha hailing from the town of Arauca, who informed me, with no little disgust, that the voyage had already lasted two months, and Ciudad Bolivar was still far distant. The lancha, if I remember correctly, reached port just two weeks after we did, and, of course, by no possible good fortune could the owner sell his little cargo of hides so as to make the trip profitable.
Speedier and more picturesque than the lanchas are the "bongos," or large dugouts, one half of which is sheltered by a wicker or palm-thatched canopy; and a sight never to be forgotten is the passing of a bishop or faithful "padre" with his Indian boatmen, making a round of parochial calls requiring, perhaps, several months' almost constant travel. The instant this craft is recog. nized ; the steamer or lancha slackens speed, and when the padre glides alongside he solemnly blesses the voyagers, then thankfully accepting such contributions as are of fered him, and exchanging a courteous farewell, resumes his solitary way. His garb, his half-naked boatman, and the primitive bongo make the traveler wonder for a moment if he has not beheld a vision of
early colonial days when the hardy fathers fearlessly set out to plant the cross in the remotest regions of the interior, and a glance at the shore line of tangled primeval forest and the still, lifeless track of waters in his wake, almost confirm him in the strange fancy. The history of the navigation of the. Orinoco is a sad recital of government monopoly and official corruption. The only port open to foreign vessels is the city of Ciudad Bolivar,* a restriction that has wrought untold hardship to mining and trading companies, who often lose on the extra transportation to and from this
service exists between Trinidad and Ciudad Bolivar, and that at least something is being done to better the communication with up-river points.

The outlook, however, is not very promising, and it is doubtful if the Orinoco country will be properly opened up during the present generation unless a radical change of administration takes place. Its population to-day is believed to be actually less than it was nearly four centuries ago, when the Spanish explorer Ordaz ascended to the mouth of the Meta; and the Indian stands in such fear of the Venezuelan and his
which are about the same distance apart as are Minne apolis and St. Louis, it is estimated that there are less than 2,000 permanent settlers, apart from the inhabitants of Caicara and one or two other small villages Most of these settlers, moreover, live among such wretched surroundings that one wonders that they find life endurable. The only evidence of modern progress that I witnessed during the entire trip was a windmill, and of the various craft we sighted not one was propelled by steam.
Yet the natural wealth and fertility of this region


Among the Hills on the Banks of the Orinoco.
city the small profit necessary for the working of their concessions, and innumerable enterprises have failed owing solely to this short-sighted policy. The exclusion of all vessels but those of the river fleet from the Macareo channel of the delta, the shortest and safest route to Trinidad, is equally absurd; but these abuses are insignificant compared with the absolute monopoly of the up-river steam navigation, which is in the hands of the company already referred to, the "Orinoco Line of Steamers," who are the successors of the famous Orinoco Steamship Company, an American flrm which was accused of aiding Gen. Matos in his ill-fated revo-
government that he frequently prefers to follow the smaller waterways of the Guiana region, or take overland trips through the virgin forest rather than use the broad highway that is his rightful heritage from countless ancestors.
This disappearance of the Indian has greatly impeded the gathering of rubber, tonca beans, and other natural products, and since immigration is not encouraged and continuous revolutions have scattered or killed the settlers of European and mixed descent, it would seem that the country is steadily retrograding. There is a project on foot at present to establish a col-


The Ancient Fortress of San Feliz.
is boundless. The cattle of the llanos, as is well known, yield the finest hides that the shoe manufacturer can procure, and with cheap river freights, the traffic in hides from San Fernando alone should employ a fleet of steamers. During my visit to that town, however, the cattle industry was so depressed that animals on the hoof brought only $\$ 5$. The rubber forests of the upper Orinoco are as yet almost untouched except on the margins of the streams, and the valuable balatá rubber, which is comparatively new to commerce, is found at various points from the delta to the Rio Negro. Hardwoods of an infinite variety, dye-


Carib Indians of the Lower Orinoco.


## A Typical Upriver Steamer.

## THE ORINOCO--A WASTED WATERWAY.

ony of Boers upon the "llanos," and Gen. Castro is said greatly to favor it;* but the Venezuelans assert that this is because he sees a chance to augment his army with tried fighters, not because he favors foreign colonization.

The writer sailed 200 leagues down this giant water way, and was amazed at the primeval condition of the country. : Between San Fernando and Ciudad Bolivar,
*Gen. Pierson, the Boer representative, who recently returned to South Africa, states definitely that plans are completed to bring 8,000 Boers to Venezuela not later than 1906.
woods, medicinal plants, vanilla, tonca beans, turtle oil, and alligator and crocodile skins, will all in time become important exports, as will rice, sugar, tobacco, cacao, and many other agricultural products when the land is taken up and cultivated.
To-day, however, the Orinoco country remains a veritable wilderness, and the Orinoco can best be described as a wasted waterway. Were it not for the attractive little city of Ciudad Bolivar and the enterprising town of San Fernando de Apure, one would not hesitate to call it one of the most backward territories of its size
in the world. Yet the climate is healthful; the forest mineral, and agricultural resources are limitless; and the whole region, with the exception of the highlands and sierras of Guiana, is rendered easily accessible by a magnificent river system. The only drawback to its development is the corrupt and inefficient government of Caracas-a drawback, judging by the past decades that seems destined to outlive the century.

## EXTRAORDINARY EFFECT OF WATER EROSION CAUSED BY THE ASSOUAN DAM.

by the english correspondent of the scientific american.
One of the most perplexing problems to the engineer when dealing with the control of large masses of water is the liability of erosion arising from the discharge of the water through a limited space. Occasionally the nature of the surface upon which the released water pours under great pressure and velocity is rugged and broken. Should a crevice exist the checking of the released water thereby is accompanied by a vio lence almost explosive in character, and the effects of this erosion are often of a remarkable nature.
One of the most extraordinary examples of this action is that shown in the accompanying photograph, kindly loaned to us by Sir Benjamin Baker. In this instance the rush of the water through the sluices of the Assouan dam has dislodged a huge bowlder from the rocky bed of the river. As is well known, this barrage extends right across the Nile just above the first cataract, and the flow of the river below Assouan is completely controlled by this dam, the water passing through a series of sluices. At times a huge volume oi water is banked up behind the barrage to a height of 60 feet above the level of the down stream. The sluices, however, are built at different levels in the barrage so that $i t$ is barrage, so that it is possible to control the velocity of the discharge. The maximum head of water allowed is 29.5 feet and this enables the velocity of the released water to be controlled within 36 feet per second.
The bed of the river is solid rock, yet the rush of the water has dislodged this huge piece of rock measuring 17 feet long, 12 feet wide, and 7 feet thick, and has thrown it against the masonry face of the dam. The weight of the bowlder Sir Benjamin Baker estimates to approximate 60 tons, yet it has been torn from


THE EXTRAORDINARY EFFECT OF WATER EROSION CAUSED BY THE ASSOUAN DAM.
itself to my attention. I could join them so that the crinkling would be avoided absolutely; and the band was in one moment perfected, practical, and complete
It would be difficult to describe the exultant feelings and triumph of that hour! It was almost a wild joy to have won the victory over all the perplexing obstacles which had arisen, and to see the pretty band of steel, with its ingenious curves, lying like a lady's bracelet, so artistic and beautiful before me! I felt that it would mean fame for me. And there was the genuine usefulness of the invention! It would fill a real want, and obviate the inconveniences of the imperfect article which it was intended to supplant. I saw the windows of the stationers filled with varied and exquisite designs of the elastic metal band; and offices equipped with an abundant supply, on the tables and desks and in the filing cabinets of lawyers, bankers, shippers, merchants, and manufacturers. The government would undoubtedly require immense quantities of these bands in all its offices. And I thought of the vast market for this indispensable novelty in the great cities and in every town and home in our broad land.
I will not deny, also, that golden visions came into my mind of rich pecuniary reward to myself from this important invention. I had before, when the article seemed ready to be patented and manufactured, consulted with a friend who was in the novelty line; and he had named a figure which seemed to me to be very conservative and safe on his side for the invention, and a very modest royalty after the manufacturers had reimbursed themselves for their outlay. But after all, it was a very snug sum in my circumstances; and there was the certainty that the royalty would surprise my friend when the orders from the whole country began to tax the capacity of his works! In the meantime there was an investment right at hand, in a neat row of cottages, suitable for the skilled mechanics of our city, which would bring a good 10 per cent on the whole sum, while I would have an unexpended part of it still in hand for personal use.
These golden visions filled my imag. ination with intense satisfaction, until my silent alarm, which was my own invention, awakened me by blowing a current of cool air upon my face; and with returning consciousness I realized that the difficulties were not yet fully solved, which barred
the rocky bed and hurled backward by the water with the greatest ease.

## An Inventor's Fantasy <br> by t. a. reeves.

I have always been fond of inventing. There is no pastime more fascinating and satisfying to my mind. Others may while away tedious hours with books or cards; but I enjoy a stimulating and unfailing pleasure in fixing my mind on some problem of mechanics, or some of the infinite possibilities of contrivance, and while I am engaged upon it the time speeds away on lightest wings.
Sometimes it is a long railway journey which is thus beguiled and shortened. Sometimes it is one of those irksome half-days of waiting which fall to one's lot in making connections at some cross-country junction, in the midst of a wilderness of scrub-oak; or at some tiresome country tavern, with nothing but the neighboring blacksmith shop to afford relaxation or interest!
Under such circumstances the hours have no horror for me. I seek a quiet corner, and open my design book at some rude sketch of a mechanical idea, and am soon lost to the dullness of the situation, to leaden footed Time, and to every other annoying circum stance. I have even allowed a slow train to pass the station, while I continued at my problem and awaited a later express.
In the case of sickness, and the necessity of watching and carefully administering medicines, or rendering other attentions to the patients by night, it has been no trouble for me, with an interesting idea re-
volving in my mind, to remain awake, and to care for my loved ones. And often, when wakefulness pos sensed me, and sleep refused to be wooed, I have com posedly resigned myself to the situation, ceased fret ting and tossing, and taking up one of my varied inventions, either quieted myself to slumber, or forgot the worry of wakefulness in the delight of its pursuit. One of the happiest of these devices, over which I spent far more time than the simplicity of the article would seem to demand, was "The Elastic Metal Band." It was intended to replace the rubber band which is so unsatisfactory from its rapid deterioration. The lawyer, author, or business man takes from pigeonhole or desk a package of papers, or the lady a dainty bundle of letters from her secretary, only to find its rubber band as brittle as clay, and perhaps stuck fast by warmth and moisture to the documents or missives which it bound.
My problem was to create a strap or band which should be perfectly flexible, and at the same time reasonably elastic. If it would stretch one-third its length and return, it would answer every practical demand. Its links must freely move, and there must be no rough ends or open joints to mar the appearance of the strip. It must be flat and neat, and then, when nickeled or plated, it would be an attractive and desirable article. The attainment of all these features gave me no end of trouble. The pesky thing would tangle and hitch in the most unexpected and contrary ways! When adjusted around a bundle and automatically clasped to one's great satisfaction, on turning the bun dle over there would be half a dozen links fouled and
$\qquad$


























 crinkled into an obstinate knot, that tried patience from completion "The Elastic Metal Band."

## almost to the parting point.

I am myself a man of correct language. I do not swear, never having practised, or even learned the rudiments of that accomplishment. 'When my temper is tried to the last notch, and the expletives seem bound to come as a relief to the pressure within, I simply assure myself that there is need of more thought. Another difficulty has shown itself which must be overcome. If it had been easy to construct this article, it would not have waited for me, but would have been on the market, doubtless, long ago; and some other man, of less patience than myself, would be enjoying the fruits of it. With these philosophic and moral reflections I usually put the article away until with fresh mind it can be taken up again; or, as indeed sometimes happens, until at some unexpected moment the mind, dwelling unconsciously upon the difficulty, flashes out its solution in a moment of inspiration and almost superhuman insight.
Such was the point reached in designing "The Elastic Metal Band." It had been laid aside for a considerable time, as presenting almost insuperable difficulties; when one night I seemed to awake from a refreshing slumber. Never was my mind clearer or keener in grasp of mathematical or mechanical problems than in that hour. I glanced at my clock upon the wall, which I had designed, showing in phosphorescent figures the time, $2: 45 \mathrm{~A} . \mathrm{M}$. Immediately the elastic band came into my thought, and was pictured before my imagination as vividly as if I held it in my hands. And what is still more to the point, the solution of the difficulty of the entangling links presented

## Violet and Uitra-violet Rays Given off by Metals at Ordinary Temperatures.

Those who have seen a winter night in the North will probably remember the brightness of the landscape even though the sky be covered with thick clouds. This pheiromenon suggests the hypothesis that the snow has some luminosity of its own, and this problem is treated by Prof. Melander, of Helsingfors, in a recent paper published in Annalen der Physik.
After experiments made with a photographic camera imbedded in the snow failed to give any satisfactory results, the author eventually observed a very striking photographic effect of the snow cover. As, however, the photographic plates were covered with metal plates, Mr. Melander thought it necessary, first of all, to ascertain whether these did not exert any effect of their own.
Experiments made in this direction showed all metals to give off violet and even ultra-violet rays even at ordinary temperatures, though these rays are too weak to be noted by our eyes. As the temperature increases, this radiation becomes more and more intense until even our eyes are affected by it at a white heat. This radiation is possibly produced by certain chemical processes which occur at the surface of the metal, though the effect on sensitive plates seems to be due immediately to the surface rather than to any emanation. The ionizing power of these rays may play an un-thought-of part in nature, and the author suggests that such animals as see in the dark may have eyes especially sensititive to them.

## the felling of the concrete column at NIAGARA.

The concrete column erected in Victoria Park, Canadian side, at Niagara, designed to make a dam in its prostrate form, was successfully tipped over into the river from the trestle on which it stood on the afternoon of Thursday, November 9 , in the presence of between one and two thousand spectators. The trestle oli which the column stood was 20 feet high above the ground level. The column was 50 feet high and 7 feet 4 inches square. Every 8 feet of its height a wooden wedge 12 inches thick at the outside and tapering to 6 inches at the center of the column was inserted for the purpose of breaking the column into sections when it fell, while a hain ran through the enter. of the column to hold the sections together when he column broke.
required about an hour and a half to tip the column. Three jacks were operated under the timbers at the base of the restle. For the first few inches of elevation of the imbers, hardly any slant was visible in the olumn, but soon the great shaft was seen to incline toward the river, and it was felt that it would all very soon, but almost unexpectedly it oppled over nto the river with great rapidity, makng a mighty splash. The ends of the column disappeared under he water, but at the center he broken blocks or sections were elevated, but may settle down later. The trestle was intended to fall with the column for the purpose of throwing the nner end of he colum about 15 feet ut from the shore in order that an ice run might be left between the shore and the end of the colmn. This worked successfully. Af-
er the column was in the river the water in the in take was increased $101 / 2$ inches in depth, which it is believed will give sufficient depth to afford a full supply to the pumping station of the city of Niagara Falls, Ont., and the Niagara Falls Park and River Railway for power purposes, as the intake is used jointly. Supt. James Wilson, of Victoria Park, states that the results obtained are satisfactory, and he reports Engineer Isham Randolph, who planned the tower-dam, as being well pleased.

A well-made maple wheel may be run with safety at a rim speed of 154 feet per second

Sea-Gulls as a Commercial Asset.
In the immediate vicinity of the small town of Lieg nitz, in Silesia, lies the village Kunitz, which is the proud possessor of a small lake, having a rush and reed covered island nestling cozily in its bosom. This sheet of water has been selected by a shrewd gentleman as a breeding ground for sea-gulls, and thousands may now be seen there. This idea was inspired not only by a poetic spirit, but also by a sound commercial mind, as the eggs of these birds are held almost in as much esteem as those of the lapwing or pewet as a dainty. The demand is so large, and the quantity a ares. is in question is making money quickly, although he has
date them. Most gulls would, doubtless, at once recognize the necessity for emigration to other less overpopulated islets; but the gulls of Kunitz think otherwise. As the water of the lake is now incapable of providing all they need, they have decided pro tem to seek what they require in the neighborhood; and the visitor, on arriving at Liegnitz railway station, is much astonished to see (provided, of course, his advent takes place by day) flocks of these beautiful white navigators of the air come swooping down around the train in search of biscuits, buns, or what not, while housands of others sit preening their feathers upon the roofs of the sheds, offices, and other station buildings. However, they have still other ways of getting a living, this being merelya kind of sportive branch of their victualng department The real andtrue struggle for exstence commences directy the peasant puts his hand o the plow, and turns up from the warm earth thousands of fat, juicy worms, beetles, e a rwigs, and othr delicacies for which competition is $\alpha$ keen among the gulls as buying and elling are mong men hough the methods of the stronger gulls are often sharper and sterner - yet perhaps in the end the more merciful of the two. They follow the plow n their thousands, picking and scratching up the rich brown earth and collecting (to the farmer's great delight) myri. ads of insert for themselve and their hun gry little ones. To watch them at work, it would be hard to believe that they were aquatic birds, so kindly have they become at h m e with Mother Earth as the source and origin of their supplies. Were it not for their peculiar and characteristic flight, and for their reat number he stranger might easily assume that he white ravens.

A bridge of unusual dimensions has lately been constructed at Vauriat, in the Puy de Dôme, on the western side of the high plateau country of Auvergne. It carries a single line of railway over the river Seoule by three lattice girder spans, the central one being 472 feet 6 inches and each of the two side ones 377 feet 5 inches long. The two river piers of granite masonry are each 303 feet high, and tapered from $761 / 2$ feet $\times 432-3$ feet at the bottom to $69 \times 183 / 4$ feet at the abutment level.

## Pat <br> Patent Department

## TOOL FOR BORING RECTANGULAR HOLES.

A decidedly novel tool has just been invented, by which a hole may be bored having square or rectangu lar walls. The accompanying illustration of the tool


TOOL FOR BORING RECTANGULAR HOLES. clearly reveal it s construction. A frame is provided which is designed to be held rigidly in a lathe or the like. This frame comprisestwo arms which, at their upper ends, termi nate in cross bars. The overlapping edges of the latter are riv eted together, and they are formed with an opening which provides a bearing for the rotary spindle of the tool. The head of the tool is pivoted to the
frames by means of trunnions formed at the ends of the arms. This head, as shown in perspective in one of our views, is formed with a rectangular recess of greater length in the line of the trunnion bearings. The recess is adapted to receive the lower end of the rotating spindle, which it will be noted is bent, so that as the spindle rotates, the tool head will be given a rocking movement on the trunnions. As a bearing for the lower end of the shaft, a plate is secured to the top of the head by means of angular flanges. The flanges on two sides are formed integral with the head, and on the other two sides are fastened to the head with screws after the plate is in position. This plate is formed with a central conical boss, through which is an opening large enough for the spindle to freely operate within it. A collar is threaded on to the spindle, and at its lower end is recessed to receive the conical boss on the plate. In channels formed in the head of the tool a number of blades are fastened, certain of which have a saw edge, as shown, for cutting or boring into the wood, and the others have a smooth dge for clearing away the fragments cut out by the saw blade. In the operation of the tool the spindle is to be engaged with the chuck of a lathe, and the frame held stationary. As the spindle rotates a rocking motion is imparted to the head, so that a rectangular hole may be formed in the wood. The spindle is prevented from longitudinal movement with relation to the frame by means of lugs, which engage with the under side of the cross bars. Miss Clara Smith, of Thomaston, Conn., is the inventor of this improved boring tool.

## AN IMPROVED BOTTLE CLOSURE.

A patent has recently been granted to Mr. Charles M. Daly, of 538 West 29 th Street, New York, on an improved closure for bottles, designed to take the place of a cork and adapted to prevent refilling of the bottles after they have been emp-

tied, thus preventing their reuse after the original contents have been removed This bottle closure is shown in the accompanying illustration. The parts are such that they can be very easily
spun out of suitable metal. A casing, $A$, fits snugly into the mouth of the bottle, and is formed with a petticoat flange cemented to the exterior surface of the bottle neck. The inner end of the casing is rounded to form a valve seat for a ball valve. The ball valve operates within a cylindrical casing, $B$, which is closed at the top by a cupped member, $C$. These parts are all covered by a conical cap piece, which is cemented to the neck of the bottle, and further held by bending it over a shoulder formed on the bottle neck. It will be noted that the upper end of casing $B$ is: formed with a flange, which fits against the inner wall of the cap piece. Perforations are provided in the flange, also in the main body of the casing, $B$, and in the sides of the cupped member, $C$. When the bottle is tilted the ball valve will roll out of its seat, permitting the contents to flow out of the casing, $B$, then back through the flange into the cupped member, whence they will pour out of the opening in the top of the cap piece. The purpose of providing such a tortuous channel for the liquid is to prevent anyone reaching the ball valve with a wire, and by lifting it to refill the bottle. The opening in the top of the cap piece is closed by a sealing disk provided with an annular flange, which is turned under against the inner face of the cap piece, and thus made fast before the cap piece is applied to the bottle. A rubber washer between the disk and the cap piece insures a perfectly tight joint. The sealing disk may be readily pried off with a suitable instrument.

An ingenious system of resoling a boot when the existing sole is worn out has been devised by a London inventor. In this boot the outer sole is attached to the inner sole by means of brass screws inserted in a series of eyelet holes round the welt. When it is required to attach a new sole the worn sole is simply unscrewed and the new one substituted. In the case of the heel the screws are driven into holes in the under surface of the heel so that not only do the screws fulfil the function of attaching the new heel, but constitute efficient protectors as well. The attachable soles and heels are standardized in various sizes and can be placed on the market ready for instant attachment. The process of soling and heeling a boot can be accomplished in five minutes. The idea is especially applicable to soldiers' boots where the foot covering is subjected to constant and heavy wear. The main advantage of the device is that no time is lost during the repair of the boot. The American military department has ordered samples of the new boot and proposes to subject them to severe trial by men on active service.

## QUARTZ MILL FOR DRY-GRINDING OF ORE.

An improved quartz mill adapted for grinding of ores preparatory to cyaniding, to extract the gold values, has just been invented by Mr. Robert A. Vaughn, 601 Colman Building, Seattle, Wash. In our illustration portions of the mill are broken away to show details. Supported on the lower members of the frame is an annular mortar in which a die is fitted. This die is provided with an annular V-shaped groove. A plate fastened to the inner periphery of the mortar prevents overflow of the material. The outer wall of the mortar is extended by a sectional screen, which may be of any desired mesh. The rollers which operate in the mortar are driven by a vertical shaft, which is journaled in a spider at the upper end and an adjustable step bearing at the bottom. This shaft carries a head from which four arms radiate. Hangers at the ends of these arms and a block on the vertical shaft provide suitable bearings for the shafts on which the rollers are mounted. Each roller consists of a central core, to which annular shells or shoes are keyed. These shoes have inclined faces, to correspond with the die in the mortar. The vertical shaft is driven by a power shaft to which it is geared. By adjusting the step bearing of the vertical shaft, the space between the rollers and the die may be regulated to a nicety. In use the material is fed into a hopper at the top of the mill, whence it passes through a delivery funnel to a feed receptacle, which is keyed to and rotates with the shaft. The conical inner wall of this receptacle directs the material to four chutes, which deliver it to the mortar at the extreme inner edges of the rolls. As the feed of the material progresses, the pulp will rise in the mortar until it passes through the screen, whence it is sucked through a conduit pipe to the cyanide tanks. In use the mill will be inclosed either with matched lumber or metal covering, and a stuffing box will be put around the driving shaft. By this means the air passage is confined to the feed receptacle in such manner as to cause all the fine ore to be lifted or forced out of the mortar, and carried by the conduit pipe to the cyanide tanks. Each tank is closed with canvas except for a central pipe, which leads to the dust room of the mill building. The inclosure of the mill is so constructed that it will be put up in sections, sc it can be removed where necessary for cleaning; up amalgam. This construction makes it easy and simple to operate without having the nuisance of dust
and loss of values in the mill, and prepares the pulp in a thorough and complete condition to get the quick est results and highest saving of values by use of the cyanide. The mill does away with two-stage grinding,


QUARTZ MILL FOR DRY-GRINDING OF ORES.
as it is capable, at all times, of grinding to any desired fineness for a high extraction of the values.

## machine for molding plastic materials

Pictured in the accompanying engraving is an improved machine for molding articles from plastic materials, such as concrete blocks, bricks, ornaments, and the like. The construction of the machine is very simple. It can be easily operated, and is designed to carry on the work very rapidly. It comprises two large wheels keyed to the same shaft, and having their rims connected at intervals by transverse strips $A$. In this way the molds are formed, with the rims serving as the side walls and the transverse strips as the end walls. The bottoms of the molds are formed of plates, $B$, which are adapted to rest on shoulders on the rims, as best indicated in the section view. These bottom plates are adapted to be moved into the mold, to force out the material after it has been molded. To guide the plates in these movements, they are provided with pairs of screw rods, which pass through guide strips attached to the inner periphery of the rim. Firmly secured to each pair of screw rods is a bar, $C$, which is provided with rollers at its outer ends. These rollers are adapted to engage one or the other of two guide tracks, $D$ and $E$, which are bolted to the main frame of the machine. Arranged above the molds is a pressing roller, $F$, which is geared to the main mold wheel. This roller is designed to press the material tightly into the molds as they pass under it. As this roller would give a slightly convex outer surface to the material, a second roller, $G$, of oval section is provided, which may be used when desired to give the material a flat surface. In operation as the machine rotates, the plates will be hold in their lower or inner positions by the track, $D$, engaging the rollers on the bars, $C$ As each mold reaches the lowest position of the mold wheel, the bottom plate is forced outward by the track, $E$, which forces the molded material out onto an endless traveling belt, and the latter carries the blocks away. Mr. George Stewart, of 433 Fifty-first Street, Brooklyn, New York, is the inventor of this machine.

machine for molding plastic materials

RECENTLY PATENTED INVENTIONS.

## Electrical Devices.

Electric PUMP.-J. C. Stokes, Mans field, La. In this patent the improvement has reference to pumps, but is of peculiar applica-
tion upon reciprocating pumps and upon pumps of other types in which it is desirable to have the current reversed by means of a quickly operating switch.
AUTOMATIC ELECTRICAL SIGNALING APPARATUS FOR RAILWAYS.-A. H. BINyon, 100 Kenilworth Court, Putney, London, S. electrical block-signaling whereby upon a train entering a block-section the signals controlling that section are automatically put to "danger," and when (but not until) the entire train has passed within the section the signals controlling the preceding section are automatically put to "line clear," the inventor's object being to proclearing of the signals.

## Of Interest to Farmers

FENCE.-J. E. Tyler, Roxobel, N. C. In connection with a post, means are provided
whereby the lower end of the post is supported whereby the lower end of the post is supported
clear of the ground, thus avoiding rotting the clear of the ground, thus avoiding rotting the
lower end. The base is formed so it can be lower end. The base is formed so it can be
manufactured at any suitable point on a farm and then planted in the ground wherever desired and will form a firm solid base for supporting the fence-posts through the medium of the intermediate foot-piece detachably con-
nected with the base and which is secured in connection with the fence-post proper by means of the fencing material. Posts and their foot-
pieces may be lifted from the base and shifted pieces may be lifted from the base and soint to point. Means provide for holding the lower edge of the fencing material close to the ground.

## Of General Interest

HEAD FOR WATER CONNECTIONS.-B. Rubispierre, New York, N. Y. The purpose RUbISPIERRE, New York, N. Y.
of the improvement is to provide a head for
leaders or other water connections which will leaders or other water connections which will
be exceedingly durable, being constructed of but be exceedingly durable, being constructed of but
two pieces instead of the many parts usually two pieces instead of the many parts usuany
employed, and to provide a construction wherein employed, and to provide a conomically made and connected and with the least possible expenditure of labor
Class-register.-J. S. Price, Atlanta, Ga. The register is particularly adapted to serve as a permanent class record ocieties. The
schools or other classes or socien schools or other classes or societies. The
book is composed of two parts-namely, cards or leaves having rigidity and a cover for the
same, which is constructed in $U$ form and to same, which is constructed in $U$ form and to
which the leaves are pivoted so they may be which the leaves are pivoted so they may be
folded within it. The inventor has sought to folded within it. The inventor has sought to
combine maximum compactness with perfect combine maximum compactness with perfect
security and protection for the leaves and insecurity and protection for the leaves and in-
scribed matter, as well as ready access tc and manipulation of the cards.
DISPLAY-STAND FOR HEADWEAR.-O. Pfleger, New York, N. Y. This improvement refers to means for supporting male and
female headwear, such as hats and bonnets, in a show-window, a case, or other exhibition place, and has for its object the provision of novel details of construction for a portable
stand which adapt it for a reliable support of a hat or bonnet in any one of different positions for its attractive and prominent display.
THERMOMETER ATTACHMENT FOR WATER-bAGS.-Rachel Meyer, New York, N. Y. The invention pertains to vessels, such as
water-bags or similar articles used in medical water-bags or similar articles used in medical vide means for determining the temperature of the contents. A special object has been to
improve the accuracy of the thermometric reading without introducing the thermometer or its bulb into the interior of the vessel. PROTRACTOR-RULE.-C. W. Lines, N York, N. Y. In this patent the invention has reference to combination-rules and protractors,
and has for its principal object the provision and has for its principal object the provision
of a simple organization which may be effecof a simple organization which may be effec-
tually used to perform both functions. Its many capabilities render it extremely con-
venient for use of carpenters and other workvenien
men.
annunciator.-C. W. Lebeis, Yonkers N. Y. The annunciator comprises a changeable
sign of novel structure, the sign showing one sign of novel structure, the sign showing one
word, symbol, or device in one position and another word or words or symbols when in the other, and said sign is actuated, preferably, by an electromagnet forming part of a circuit
which is made or broken by the action of a person leaving or entering an apartment, or by
a special switch, or by other means not maa special switch, or by other means not ma-
terial to the invention. terial to the invention
SANITARY COMMUNION-CUP.-O. V. L. Harbour, Fairmount, Ind. Wine is placed in
an inner cup, the central opening permitting an inner cup, the central opening permitting
introduction thereof. When the cups are tilted, introduction thereof. When the cups are tilted,
a small amount passes through a series of tubes, and when the cup is returned to its
regular position the shield prevents the return of unconsumed wine to the inner cup, and it passes downward through another series of tubes into the space between the cups, from After wine is partaken of, a slight turn of the
cups within the holder presents a fresh surface
for the next communicant and passes a section cups within the holder presend
for the next communicant and passes a section
of the flange through the antiseptic solution in of the fla
the pad.
TROUSERS-PRESS.-A. E. Happel, Elmhurst, 11 . The provision of a form of trousers press is the object of this invention. The press
is adapted to be placed under the bedclothes mattress on which the person lies, so that the weight of the person in sleeping will supply the necessary pressure and warmth to neatl DRENCHING-BIT.-J. HInEman, Irondale, Ohio. It operation the bit is introduced int bit-bars in juxtaposition, the nose-strap bein bit-bars in juxtaposition, the nose-strap being
over the nose. The yoke is then depressed by means of the handle, extending the toggle and injury is minimized, since the force is equally exerted on both sides of the mouth and at a point removed from the lips.
SCAFFOLD-HANGER.-M. Cody, New York, N. Y. The object in this instance is to provide
a hanger so constructed that in addition to the usual hoisting and lowering tackle employe auxiliary tackle may be suspended therefrom and engaged with the scaffold and serve not
only to hold the scaffold close to the wall, but only to hold the scaffold close to the wall. but
also serve as a safety device should the ropes of the hoisting or lowering tackle be broken or become loose.
ATTACHMENT FOR PHOTOGRAPHICPrinting frames.-F. B. Core, New York,
N. Y. The aim in view of this inventor is the provision of a new and improved attachment for photographic-printing frames arranged to insure a uniform printing of a number of pho-
tographs from one negative, so that the photographs are practically alike both as to light and shade.
METALLURGICAL FURNACE. - H. H. Goodsell, Leechburg, Pa. In the present
patent the invention relates to furnaces used patent the invention relates to furnaces used
for treating iron and steel, but more par for treating iron and steel, but more paring certain features in common with the in-
ventor's former application for a furnace for treating sheet iron and steel. By the means employed the plates of iron and steel are given
such a color at the start as they ultimatel acquire when heated up under atmospheric conditions, so they are afterward unable t
change color, nor are they easily disfigured.
ROLL-PAPER HOLDER AND CUTTER.-J. F. Finan, Cumberland, Md. In this case the invention is in the nature of a paper holder
and cutter for holding upon a store-counter or elsewhere a roll of paper from which sheets of varying size may be cut off a
the size of package to be put up.
woven FABRIC.-h. Saraf
WOVEN FABRIC.-H. Sarafian, Yonkers, N. Y. In the present invention Mr. Sarafian
has aimed at producing a fabric which combines a body or ground portion having maximum cheapness, strength, and durability, with a top or surface portion formed of better ma-
terial, which may be attached to the body in terial, which may be attached to the body in
the process of weaving the latter without the process of weaving the latter without any
special manipulation of the loom. DISPLAY-HOLDER FOR HANDKER CHIEFS, ETC.-G. W. Ebright, Xenia, Ohio
This holder displays in suspended position This holder displays in suspended position
handkerchiefs, neckties, ribbons, laces, and othe handkerchiefs, neckties, ribbons, laces, and othe
similar articles in stores in such a way as to exhibit the patterns of the same in an attrac available position for sale, and to so secure them as to permit them to be inserted and of tearing or soiling the delicate fabrics.
MEAT-TENDERER.-D. B. DATE, North F'ranklin, Conn. The purpose of the invention
is to provide a meat-tenderer of exceedingly simple, durable, and economic construction and which can be conveniently and quickly manipu lated and which will effectually sever or break
down all sinewy particles in the meat and yet leave all sinewy particles in the meat and yet
leaterial in a connected, compact, M tender condition.
METHOD OF PRESERVING AND WATER York, N. Y. The invention in this imper York, N. Y. The invention in this improve-
ment is to so prepare wood that it will resist attacks of animal. and vegetable life, and penetration of water, and to thereby especially adapt it for use in the manufacture of paving

MINER'S CANDLESTICK.-T. W. Conkiti Mullan, Idaho. The invention pertains to an mprovement in candlesticks or holders in-
tended more especially for use in mining, its tended more especially for use in mining, its will be simple, consist of few parts, one which in which the necessary parts can be locked in pen or closed section.
EDUCATIONAL APPLIANCE. - J. H. improvement in educational ine invention is an in the nature of clock-blocks. It gives suitable problems to a child and affords amusement and nstruction. By the use of the blocks a child of proper age can quickly learn the Roman as indicated by the hands on the blocks; also months, number of days in the same, and the oasons. Blocks carrying the representation ate time in hand may be arranged to indi is ordinarily the first step taken in learning to tell the time.

Household Utilities.
FOOT-REST FOR CHAIRS.-W. L. Hoffan, Jersey City, N. J. This improvement per-
ains to attachments for chairs, the object being to provide a device which may be con veniently applied to a chair so as to constitute a foot-rest. It also affords a convenient rest for blacking shoes, tying shoe-laces, etc., and ealea position when not in use
curtain-pole socket.-J. Kroder, New York, N. Y. The object in view of this invenion is to provide a new and improved curtain pole socket arranged to permit convenient at-
tachment of the socket to the sides of the winachment of the socket to the sides of the wion
dow-frames close to the top cross-bar and to give
ture.

Machines and Mechanical Devices. BOTTLE-CORKING MACHINE. - J. B Davis, Gainesville, Fla. The machine is espe "spring-stoppers" into bottles and it is so constructed that it will be simple, effective in operation, and capable of being quickly and
readily operated. The machine includes a pedal-controlled adjustable plunger and a tubular tension-controlled guide member adapted for
directing the stopper to the mouth of the bottle, and a plunger which operates upon the stopper in the guide member.
MACHINE FOR MAKING COTTER-PINS.F. D. Coppage, Terre Haute, Ind. In this chines for making what are known as "cotterpins" or devices formed by bending a wire lank midway of its length to form an eye, the two arms or legs being brought together and heir ends pointed.
LUMBER MEASURER, MARKER, AND RECORDER.-C. G. Blades, Newbern, N. C.
It is the purpose of this invention to provide n apparatus for automatically measuring the superficial area of boards or other lumber hav-
ing a flat face and for recording and marking the number of square feet thus a scertained, oth upon the lumber itself and upon a band responding to the aggregate width of the boards asured.
TRUCK FOR MOLDING MACHINES.-W ieber, Henderson, Ky. This improvement re and other articles which has for its basis the use of a series of pallets located along the
loor of the plant and the transfer of the mold from one to another and leaving the molded articles upon the pallets after the mold is re noved. Especially it relates to means for su porting and moving the mold from one pallet
to another along the tracks, said means being provided with a tamping device and a moldremoving device and means for centering
WIRE-WORKING MACHINE.-A. H. NI Son and M. Olson, Bridgeport, Conn. While the machine and the several features thereof o capable of performing certain operations
o manufacture various articles from wire, it is designed especially for forming continuous zigzag pieces of wire, having hooks, a number of aid wires being capable of being connected to for beds and other purposes.

## Prime Movers and Their Accessories.

ROTARY ENGINE.-P. Bartoletti, Brown ville, Pa. The object of the invention is to which is simple and durable in construction, ery effective in operation, and arranged to ermit quick and convenient reversing and to tilize the motive agent to the fullest advan tage.
ORALVE-GEAR AND AUTOMATIC CUT-OFH his, Tenn. The phis, Tenn. The invention consists in the
novel construction and arrangement of parts operating in conjunction with a rotary valve made in three parts arranged in axial aline-
ment, the middle part of which forms the ex-haust-valve and rotates continuously in one direction and the two outer end parts of which form oscillating induction-valves and are op
ated by separate coacting cut-off devices.
accumulator.-R. W. Wilson, Noblesville, Ind. This improvement refers to ap-
paratus for storing energy, and regulating its pplication, it being particularly adapted for se in connection with such motors of irregular peed as windmills, which are applied to the provide automatic means for controlling the to eption and delivery of energy by the accumulator and to generally improve the construction of apparatus of this class.
ENGINE.-C. V. Frisk, Chicago, Ill. In this case the invention relates to improvements ng type, the object being to provide a novel steam may be first directed into the low-pressure cylinder for starting the engine, thereby iving a much greater power than that of a mot ingle-cylinder engine.
Rotary engine.-I. Davis, New Haven, conn. This invention is an improvement in larly adapted for use of steam or compressed
air. The pressure upon the piston is continu air. The pressure upon the piston is continu-
ous in one direction, and, the exhaust taking
place at the time a charge is admitted there is place at the time a charge is
no possibility of back pressure.

## Railways and Their Accessories.

 RAILROAD-TRACK.-E. F. Seider, Upper Sandusky, Ohio. The invention relates gener-ally to that class of rail-securing devices shown in Mr. Seider's former application for patent In the present invention he employs a paw arranged at its free end to lock the spike, and pawl and clasp having a portion passed through an opening in the rail-supporting plate and provided with upper and lower portions, the upper engaging the rail-base and the lower engaging below the rail-supporting plate, the spike being arranged to secure the rail-clasp in engagement with the rail and its supporting-
plate. This inventor has obtained another plate. This inventor has obtained another
patent on a railroad-track, in which he is able patent on a railroad-track, in which he is able
to release one or both of the pawls from ento release one or both of the pawls from en
gagement with their respective spikes when removing the spikes. The pawl-carrying plates and their hooks and pawls being alike, they may be used interchangeably and no necessity of making them in rights or lefts, thus dispensirg with unnecessary duplication of patterns and the like in the manufacture of the device. Furthermore, by engaging the hooks
of the plates directly with the rail-base and of the plates directly with the rail-base and
utilizing the spikes in securing the hooks in utilizing the spikes in securing the hooks in such engagement and the pawls for locking the
spikes he is able to reduce his rail-fastening spikes he is able to reduce
to the simplest possible form.
FLUID-PRESSURE BRAKE.-M. F. Volk MANN, Santa Monica, Cal. The invention re-
lates to fluid-pressure brakes of the Westinghouse type; and its object is to provide a brake arranged to permit the engineer to d to recharging the auxiliary reservoirs without first releasing the brakes and to allow of in creasing the pressure in the brake cylinders
after the auxiliary reservoirs are recharged. METALLIC RAILROAD-TIE-A M. BAIR topeka, Kan. The object of this invention is to provide a metallic railioad-tie which is
simple and durable in construction, cheap to mimple and durable in construction, cheap to
manufacture, and arranged to combine the ut most strength with lightness. In the manu facture of the ties and tie-plates it may be desirable to have the same mill-rolled, hydraulic pressed, or bulldozed from steel plates; but
other methods of making them may be ployed.
RAIL-JOINT.-G. T. Joseph, Covington, Va Mr. Josep
rail-joints. applied, and The construction is simple, easily the meeting ends secure connection betw the various advantages are the following: When a rail has been worn on one side, it may be
reversed in order to bring the other side into reversed in order to bring the other side int to determine at a glance whether the connect ing-bar is fractured or the integrity of the connection has been disturbed. Limited longi tudinal movement of the rails is permitted fo expansion and contraction in use. Means are provided to prevent any twisting of the base positions in the use of the invention. Als means for bridging the space between any
two ties and forming a firm support for rail two ties and forming a firm suppo
ends in all positions of the parts.

## Pertaining to Recreation

table.-I. Mason, New York, N. Y. This invention relates particularly to improvement in card or similar game tables, the object being
to provide a table of this character with a top having receptacles for conveniently holding cards, counters, and the like, the table also
having a pedestal in which various articles having a pede
may be stored.
BILLIARD-TABLE.-G. A. Elliss, Lithgow and P. J. McGuire, Goulburn, New South vided for conveying the balls from cushion pockets to either end of the table and for con veying the red ball from the "balk" end to the low the cushions an inclined race is be structed, into which balls pass from the pock ets and along which they roll by gravity to an other race along the balk end and thence int a receiver medially placed therein. Extending from this central receiver beneath the table center is another race for carrying the red
ball from this central receiver to the spot end ball from this
of the table.

## Pertaining to Vehicles.

CUSHION-TIRE.-C. G. SHAW and W. J Shaw, Los Angeles, Cal. This invention has of automobiles, bicycles, and the like, though applicable to the wheels of other vehicles; and one of the principal objects thereof is to pro wearing qualities of the tire generally, but more especially the thread or bearing portion WHIFFLETREE-COUPLING.-G. L. MiI Ler, Socialville, Ohio. One purpose of the in vention is to provide a simple, durable, and
economic form of swingle and double tree irons adapted especially for pivotally connecting the doubletree of a whiffletree to the pole or tongue of a vehicle and also for pivotally connecting ings may be to a doubletree; but the coup ings may be employed with equally go
sults in connection with kindred articles.
DUMPING-WAGON.-T. J. Cope, Philadel-
hia, Pa. There is provision in this vehicle
for discharging the load of the body at the side of the wagon, thus avoiding obstruction of the made for placing the body in inclined position, so as to elevate the place of discharge, and,
furthermore, to elevate the body to a greate furthermore, to elevate the body to a greater
degree and permit inclination of the body at degree and permit inclination of the body at
its highest point, so as to dump the load at its highest point, so as to dump the load a
different altitudes relatively to requirements due to different positions of the place designed
truck.-E. F. Sherrill and B. R. Sher-Truck.-E. F. Sherrill and B. R. Sher-
rill, Moline, Ill. In this patent the invenkLL, Moline, III. In this patent the inven
tion is an improvement in trucks and especially in that class of trucks designed for use in hand ing baggage, bricks, and the like, wherein it is desired to raise the articles to a higher level in some instances and to lower them from a higher level in other instances.

## Designs.

design for ruffling.-C. Seidel, New York, N. Y. The designer has invented a new, original and ornamental design for ruf-
fing which represents a width: of material made up of comparatively heavy and light double and singie cross-lined strips. Single and
double cross-waved patterns run through the double cross-waved
cross-lined portions.
Note.-Copies of any of these patents will be furnished by Munn \& Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper

## Business and Personal wants.

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ventilators.
Drying Machinery and Presses. Biles, Louisville, Ky. Inquiry No. 7515.-For makers of typewriter
parts, such as machine parts. Handle \& Spoke Mchy. Ober Mfg. Co., 10 Bell St.,

Inquiry
ers made of wood.
N516.-For makers of garment hangSawmill machinery and outfits manufactured by the
Lane Mfg. Co.. Box 13, Montpelier, Vt. Lane Mfg. Co.. Box 13, Montpelier, v
Tnquiry No. $551 \%$. -Wanted. makers of an article
for waterproofin sill . without injuring the fabric or
lessening the flexibility of same. I sell patents. To buy, or having one to sell, write
Chas. A. Scott, 719 Mutual Life Building, Buffalo, N. Y. Inquirv No. 9518 .--Wanted, catalogue of latest
machinery for making peat bricks for fuel. The celebrated "Hornsoy-Akroyd" Patent Safety Oil Engine is built by the Inguiry No. Y519.-For makers of bare and insu
lated copper magnet wire. Wanted.-Young man experienced in drafting and
designing textile machinery " New England." Machinry, Box 773, New York.
Inquiry No. $\mathbf{7 5 2 0 0}$.- Wanted, machinery to make
briquettes from sawdust. Wanted.-Ideas regarding patentable device for
water well paste or mucilage bottle. Address Adhe sive, P. O. Box 773, New York.
Inquiry No. 9521.-Wanted, makers of metal Latest ADVERTising novelities.-High-grade Il-
lustrating, Designing and Printing. Catalogues a Spelustrating, Designing and Printing. Catalogues a Spe
ciaity. Smith \& Berkley, Holland Bldg., St. Louis, Mo. Inquiry No. 752 seg - Wanted. a saw operated by
electricity, gas or steam for sawing trees. Manufacturers of patent articles, dies, meta
stamping. screw machine cork, hardware specialities, machinery tools and wood fibre products. Quadriga
Manufacturing Company, 18 South Canal St., Chicago. Inquiry No. 7523.- For im im porters or makers of
collored glass bead fringe used in making lamp shades;


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moderate terms from the Electrical Teesting Labor-
atories, 548 East 80th St., New York. Write to-day. Inquiry No. Y5:24.-For makers of high resistance
Wire ot small size, suitable for hot wire electrical
instruments. Inventions Wanted.-Undersigned will consider
one or two good patented or patentableinventions to one or two good patented or patentableinventions to
manufacture on royalty. Something in popular demand ville Company, Grand Rapids, Mich.
Inquiry No. $9525 .-$ For makers of postofice
aves.
Wanted.-Competent man who has knowledge of
Mechanical Engineering, to take a position as traveling Malesman for the selling of construction material used in Insulating Refrigerating Plants. Apply by mail to
the Bruening Cork Company, Oakdale, All'y Co... Pa. luquiry No. 7526 . - For parties to manufacture
motor cars for street car service, gasoline system. Inquiry No.
forming machinery. Inquiry No. F528.-For makers of tape measures
in metal boxes, having springs inside for winding.



HINTS TO CORRESPONDENTS

Names and Address must accompany all letters or
no attention will be paid thereto. This is for
our information and not for publication is References to former articles or answers should give
date of paper and page or number of question. Inquiries not answered in reasonable time should be
repeated; correspondents will bear in mind that some answers reeuire not a little research, and,
though we endeavor to reply, to all either by
letter or in this department, each must take Buyers wishing to purchase any article not adver-
tised in our columns will be furnished with
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price. Minerals sent for examination should be distinctly
marked or labeled.
(9844) C. E. D. writes: In your an(9844) C. E. D. writes: In your an-
swer to J. S., No. 5703, September 23, 1905, you say a person is no heavier while going up an
elevator than going down, and explain the effect of inertia on the matter. It seems to me this does not cover it. Either the attraction of gravitation must be considered as a fixed something which exerts its pull without moving (an inconceivable thought to me) or else it must have a speed at which it pulls, just as light or electricity has a speed at which it travels.
If it is admitted to have a speed, then this speed If it is admitted to have a speed, then this speed
must be between 0 and infinity, and therefore must be between 0 and infinity, and therefore
measurable. If it had an infinite speed of measurable. If it had an infinite speed of
action, any mass multiplied by this speed of action would be infinitely heavy, and therefore impossible to weigh. It would seem, theremeasurable speed, and that if we could find an elevator with a constant speed, one would weigh as much less when coming down as the speed of the elevator takes from the speed of gravi-
tation, while in tation, while in going up the conditions would be reversed, and one's weight would be in-
creased in the proportion that the speed of the creased in the proportion that the speed of the
elevator adds to the speed of gravitation. Is elevator adds to the speed of gravitation. Is
not this correct? A. The theory of the innot this correct? A. The theory of the in-
trinsic nature of gravitation is not by any means settled among scientists. Indeed, there can hardly be said to be such a theory. There would seem, however, to be a substantial agreement that gravitation acts instantaneously
through space. That gravitation has a velocity would hardly be considered a suitable expression of this fact. Nor do we see how the velocwith the weight of bodies. This is determined by the relative amount of matter in the earth or major body and the body to be weighed, as we call it, and the distance between the centers of gravity of these two. It is not involved in tion. Even if it were, the speed of action of gravitation is so enormous that any change of
velocity in a moving body cannot affect the velocity in a moving body cannot affect the
actual weight of that body, and all weighings at the same distance from the center of the earth are affected by it to the same extent, so that, like every other constant, it is omitted in
considering the changes of value of the variables in an expression.
(9845) D. E. F. writes: I note the inquiry of L. A. H. (9779) in a recent issue quote: "Is there such a thing in the here of science as flame or combustion without emit ting light?" I take it that he means rapid combustion. That even in this sense the answer is "yes" you can really demonstrate in the following manner by means of the inclosed
cards of thin, transparent celluloid. Soak the cards of thin, transparent celluloid. Soak the
celluloid over night in water. Take them out celluloid over night in water. Take them out
of water and wipe dry and let dry an hour of water and wipe dry and let dry an a moderately warm room free from
or two. In a cally ing draits, hold the card of celluloid vertiwith a match. When it burns down about half an inch blow it out. Thereafter there will be no light or incandescence even in the darkest room, but the charring of the celluloid will continue to run downward and disappear, leaving only a trace of ashes. The samples which I inclose herewith do not work as well as some which I have heretofore tried, which continued to disappear until the whole card
was consumed, but these suffice to completely was consumed, but these sumice to completely think this celluloid is a little too thin to work well. I also inclose several white celluloid washers, which seem to be more efficient in transparent celluloid. Let about one-third of the disk burn before blowing it out. Soak these in water as indicated, then at once dry
by pinching between blotters and burn. A by pinching between blotters and burn. A.
We have been interested in burning the pieces of celluloid you send us, as well as other pieces. They smoulder after the flame is ex-
tinguished, as do other combustible materials, tinguished, as do other combustible materials,
until the substance is cooled below the temperature at which combustion ceases. We are not able to make the thin transparent celluloid burn any after the flame is extinguished. The white, thick disks contain some paint-like material, used for filling, which carries on the
combustion longer. We are Just as successful combustion longer. We are just as successful
without soaking in water as when the pieces
are soaked. This is just as we should expect since celluloid does not contain any ingredient
which is soluble in water and it is impervious to water.

## NEW BOOKS, ETC.

Machine Shop Tools and Methods. By W. S. Leonard. New York: John
Wiley \& Sons, 1905 . 8vo.; pp. 554 689 figures. Price, $\$ 4$
This is a very complete textbook of machineshop tools and methods, which was written for ase in connection with lectures on this subject
given in the Mechanical Department given in the Mechanical Department of the
Michigan Agricultural College. The book deMichigan Agricultural College. The book de-
scribes in detail all the various tools, both large and small, used in the modern machine shop. While necessarily somewhat elemental in character, it nevertheless contains a deal of information valuable to the ordinary machinist. It is very thoroughly illustrated with diagrams and half-tone plates. The present is the third edition, which has been thoroughly evised and enlarged.

Stillman, M.Sc., Ph.D. By Thomas B. Chemical Publishing Caston, Pa.:
8vo.; pp. 597. Price Company, 1905
8 vo.; pp. 597. Price, $\$ 4.50$
In this, the third edition of a well-known has tal on quantitative analysis, the author has taken note of the rapid changes during various products of chemical technology and materials of construction, and he has completely revised that portion of his work that has to do with these subjects. Much additiona matter has been included, especially informa ton pertaining to asphalt, lubricating oils, Portland cement, and the technology of th products of the blast furnace. The book is fully illustrated, and is quite up to the stanvaluable to all students, chemists, and engineers.
Commercial Economy in Steam and Robert H. Smith. With numerous
diagrams by H. Malcolm Hodson.
Philadelphia: J. B. Lippincott Com
pany, 1905. 8vo.; pp. 291. Price, $\$ 7$.
The main idea of the author in writing this work was to persuade the mechanical engineer to advance from the primitive view that engineering science can guide him only in the
physical construction and dynamics of his ma chinery to the more complete idea that scien tific method must also be applied to his reck onings of cost and value produced. The ulti
mate triumph of practical science must, the author believes, se evidenced in its demonstration of the mean, o attain maximum economy An exact measure of economy is the first essen tial in any section of technico-commercial science. The author, therefore, discusses an
"Economy-Coefficient" applicable to all kinds f productive industry and also probably to the industry of distribution and exchange. By a simple combination of the three factors of efficient aims at giving due value to all essenauthor also deduces other coefficients which are of value in the discussion. The book goe into commercial steam-power economy in a very thorough manre, and has numerous charts relating to inis and kindred subjects It is very complete and will be found to con-
tain many usefu! ideas regarding economy in tain many useful ideas regardi
the operation of power plants.
Practical Kites ind Aeroplanes. By Frederick Wis ser, C.E. London Guilbert Pitman, 1903. 16mo.; pp. 78 Price, 60 cents.
The kite, from the toy of a schoolboy, has by the ordinary laws of mechanical evolution,
developed into the aeroplane, capable of carrying loads vertically, and sustaining them at a certain altitude by the ordinary wind currents, but so far the airship of the future as a problem admits of no solution by the aeroplane happen curve surface alone; unless it may disk, of ${ }^{\text {a }}$ ressure shall impinge upon the inner surface of an aero-curve and by diversion overcome This may and thus cause a vertical ascension This may occur in the future, but acording be only used for raising a single passenger to the height permitted by the tension rope or cord and the pressure of the air current pre
vailing in the atmosphere. The author desire to create interest in the subject by a timely little book.
foustral and Armsic Technology Horton Sabin, M.S. New York: John
Wiley \& Sons, $1905 . \quad 8 \mathrm{vo}$.; pp. 372 Price, $\$ 3$.
This is a very complete technical work on
the subjects of paints and varnishes. A brief the subjects of paints and varnishes. A brief ciples involved in their fabrication and application, will be found within its pages. Among facture: Linseed Oil: Tung Oil. Rosin. Japans and Driers: Varnish or Enamel Paints; Chi hese and Japanese Lacquers; and Spirit and Pyroxylin Varnishes. A chapter on the protection of metals against corrosion is one of the
most useful in the book. Other chapters dea with Water Plpe Coating; the Painting of with Water Pipe Coating; the Painting of
Ships' Bottoms, and Ship and Boat Painting
s well; Carriage Painting; House Painting; trated with a number of half-tones, and will be found interesting reading by all who have to do with this industry.

INDEX OF INVE
For which Letters Patent United States were Issued for the Week Ending November 14, 1905

## ND EACHBEARING THATDATE



 Airship and propeller therefor, J. C. Clanc. $804,8,8$
Automobile steering mechanism, H. H. Buf-
fum


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804,199
80,62
804,662
804,570
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Boats, automobiles, and other vehicle............
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Calculating device, C. M. Young. 804.563
Calculating machine, H. E. Gold
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ofor bending，
Milk heater，H，J．Gennedy ．．．．．．．．．．．．．． Milling machine，co
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Millstone，A．Kreps．
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Molding machine，H．A．Walter．．．．．．．．．．．
Music Teaf turner，E．Bryon
 Nail cutting die，wire，J．Wikschtrom．
Nail driver，magazine，M．Hindmarch．
Necktie fastener，J．Nutry $\because$ ．．．．．．．．．．．
Nitroglycerin，makking，C．L．Reese．．． Nut lock，C．W．Burn
Nut lock，T．O．Garrett
Oil cup，L．Gleason
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 Paper refining engina， $1 \dddot{\mathrm{I}} \dddot{\mathrm{P}}$ Dilio．．．．．．
Paper weight，J．B．Williamson．．．．．
 Pencir sharpening machine，Go W．Wright
Perforating machine，R．A．Jonas．．．．．．
Perforatin machine，R．H．Little．．．．．．．．
Phonograph repeating device，E．Fletcher







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Rallway signal，J．Irwin
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Range，knockdown，C．L．Gohmann．．
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