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engines of the spanish torpedo-boat destroyer "terror."


SPANISH TORPEDO-BOAT DESTROYER • TERROR.-[See page 391.]

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## TRADEMARES AND PATENTS AND THE WAR

 REVENUE BILL.As we are going to press, the War Revenue Bill is eported to have been favorably acted upon by the conferees, and it is probable that the bill will be passed and be put in the hands of the President by the time the present issue is published. It is with a great deal of pleasure that we have to announce that the socalled Chilton amendment, which has caused so much consternation among manufacturers, has been eliminated from the bill. This bill was originally passed by the Senate, and, in justice to that body, it must be said that we believe such a bill would not have been passed under ordinary circumstances; but those who were unable to offer such opposition to its passage as they deemed necessary, owing to the urgent nature of the bill as a whole. The object of the bill was to place a graduated tax on all articles sold in boxes or other parcels, which had been prepared or manufactured under letters patent, or which were sold under trade marks.
In the first place, the joinder of patents and trade marks had nothing in reason to justify it. They have nothing whatever in common. The amendment was evidently based on the supposition that both inventors and owners of trademarks depend for their property rights on the national government. This is in no sense true of the owners of trademarks, and if inventors receive rights it is simply as an inducement to disclose a knowledge of their inventions to the public. As to trademarks, it would seem that their very na ture and purpose had been lost sight of. A merchant or manufacturer adopts a mark solely that his good may be identified by the purchaser, and it is a guar antee of good faith. If the goods turn out to be of iu different quality, the purchaser can thus avoid buying again. To tax them, therefore, would only invite omis sion of the use of the trademark, and this would mean simply the suppression of any guarantee or any mean by which the purchaser could guard against a second deception, and would give the advantage to the dishonest and unskilled merchant or manufacturer, who puts out goods without a mark of identification, to the detriment of the public. Reputable manufacturers and merchants would, therefore, have been compelled to use their marks only to such a nominal extent as would preserve their property rights.
Trademarks do not depend on statutory enactment They primarily are protected by common law. Indeed, only trademarks in use in foreign trade or trade with Indian tribes are registerable. So sacred have trademarks been held from medieval times, that even the marks of foreigners have been upheld in the lead ing countries of the world (of ten without registration) even when astate of war existed with the country of which the foreigner was a subject.
Clearly a tax should be impartially fixed on the goods of a certain character or description, and not on the mere trademark, which simply stands for the good name of the reputable merchant, otherwise the man having no reputation and no trademark can undersell him who honestly and fearlessly puts on his personal mark guaranteeing his goods.
A tax on patented goods also would be prohibitive in most cases, because the patentee could not compete with the unpatented and untaxed goods of his rivals. The proposition must be looked on as. a strange one indeed that discriminates against honesty, enterprise and inventive talent.
The great speech of Senator Platt, of Connecticut, in 1884, showing the necessity of encouraging inventors, may be read with profit by his fellow legislators. It would be indeed strange if the present period, in which we are reaping the reward of having encouraged inventors, should have been selected as the appropriat time to place a fine on the maker of patented goods.
It is gratifying to note that the conferees were led to perceive the mischievous consequences of the bill before it was returned to either House for consideration. We have to congratulate ourselves upor the very sensible stand which has been taken in regard to what would have been a most harmful measure.

## COMMUNICATIONS DURING THE SIEGE OF PARIS.

 Among the most interesting subjects connected with the siege of Paris, in 1870-71, was the method by which the Parisians communicated with the outside world, and the story of their trials and triumphs never ceases to be interesting. Even after the war had begun, the Parisians delighted to demonstrate to each other the mathematical impossibility of the investment of the city; but in a few short weeks they were shown their error, and they were surrounded by an impenetrable line of German soldiers. Paris was well fortified, armed, garrisoned and provisioned, but they now had to solve the problem of communi There were within the fortifications about $2,00,00$ people, a quarter of whom were under arms, and it wasremarkable that the beleaguered capital should have succeeded in obtaining almost constant communications with the departments during the siege-a circumstance
which was only rendered possible by the rapid ad
vance made in the few preceding years in science. The stubborn resistance which Paris offered to the enemy was due to a considerable extent to the facility with which they communicated with the outside world, for the mental anxiety consequent upon the complete isolation of huudreds of thousands of human beings unfits them for resolutely engaging in a struggle of engthened duration
On September 18, 18\%0, the last regular dispatch of letters from Paris was sent, and at 5 o'clock P. M. the early mail train was forced to return: but on the 20 th, the post office authorities attempted to send out the mails in three light-colored vehicles, drawn by three horses and accompanied by horse and foot couriers; but, with the exception of one of the latter, they were all driven back by the bullets of the German sentries. Up to the 24th of September, a number of couriers were sent out, but only a few succeeded in passing the German lines. The majority of these messengers carried with them dispatches in cipher, which were carefully secreted. At last the plan of sending out these men was abandoned. Paris, at this period, was far from depending exclusively upon the postal couriers. After the time when the land route became practically closed, and water communications being impossible, course to the air was taken.
Naturally the idea of employing balloons to take out letters early suggested itself to every one. On September 21, the director of the Paris post office gave notice to the public to write their letters on extremely thin paper and to dispense with the envelope, and it soon transpired he had made arrangements with Nadar, the well-known aeronaut and photographer, to establish a regular balloon service.
On September 23, the "Neptune," in charge of $M$. Duruof a well-known aeronaut, ascended with three mail bags containing 25,000 letters. The Prussians pointed cannon at the balloon, but the balls exhausted their impetus before the balloon was reached, though some of them arose sufficiently high to cause the balloon to vibrate perceptibly. The infantry peppered a way with their rifles, but did no damage, and the aeronaut amused himself by showering down a quantity of Nadar's address cards upon the heads of the Prussians. In three-quarters of an hour he alighted near Evreux, and his mail and official dispatches were promptly delivered. The departure of the next balloon, the Citta di Firenze, took place on September 25, carrying 104 kilogrammes of letters, and with great difficulty the balloon succeeded in making a successful voyage. From that day the transit of Paris mails through the air was an accompished fact and by degrees the weight of all letters was limited to one-eighth of an ounce.
Energetic steps were at once taken to construct a number of balloons for postal purposes. All of the balloons in the city were utilized first. An aeronautic company was formed for the manufacture of the balloons. The cost of each was to be $\$ 800$, including the cost of gas for its inflation. The aeronaut was to receive $\$ 40$ for each ascension. A number of small paper balloons 18 feet in diameter were also constructed which would be capable of raising rather more than a hundredweight. These "free balloons," as they were styled, were abandoned to the mercy of the winds without any aeronaut, and they only carried newly authorized postal caids, the contents of which were to be read by the postal authorities before being dispatched, so as to make sure they contained no information likely to prove serviceable to the enemy. The cost of transmission was fixed at two cents each. A regular system of lookouts were organized in the departments to watch for these free balloons. They were only sent up when the wind was favorable.
A balloon factory was organized at the Gare d'Orleans and under the vast iron and glass arched roof of this railroad station the balloons were built. Sailors balanced themselves on the metal girders and trusses and suspended long strips of colored calico reaching almost to the ground, and from the girders already hung wickerwork cars, trailing ropes and grappling irons. A score of women were either occupied in straightening out and ironing long pieces of material or else soaking the calico to get rid of its stiffness and dyestuff. Having been hung up to dry, the material was then cut to the various patterns, and after a preliminary varnishing, a hundred or more girls seated at long tables and superintended by Madame Godard proceeded to sew the seams with mathematical exactitude. Then came a second coat of varnish both inside and out. The balloons were then inflated by means of a metal fan which caused the varnish to dry quicker anc facilitated the detection of any holes that might hitherto have passed unperceived. The netting. ropes and other tackle, together with the cars, were all made by sailors. The balloons were 51 feet 8 inches in diameter, 162 feet 4 inches in circumference and had a capacity of 72,234 cubic feet. Each balloon required twelve days to manufacture. The total weight of the balloon, independent of passengers and cargo, was 2,200 pounds. The balloon itself weighed 450 pounds, and was tested after inflation and held captive until the test was completed at an altitude of 655 feet.
For a time France was really governed by balloons,
and M. Gambetta was conveyed over the Prussian lines in a balloon. He had a most exciting trip. The first attempt of ascent was relinquished at an altitude of 600 yards, for some Prussian soldiers were perceived immediately underneath. Their arms were piled, and while they rushed to these, ballast was thrown out, but the balloon did not mount sufficiently fast to prevent several balls penetrating it, one of themgrazing Gambetta's head. The ascent was safely made near Montdidier. Subsequent to Gambetta's departure from Paris, says Mr. Vizetelly, "the government decided on dispatching other ardent republicans through the clouds to arouse the provinces from their lethargy. Louis Blanc was asked to proceed to England to awaken the sym pathies of the British nation in favor of France Victor Hugo was also offered a commission to the departments, but both of these illustrious democrats declined, the former on the plea to a particular aversion to balloon traveling and the latter on the score that his mission' was to consecrate himself exclusively to the defense of the capital."
Of all the balloons which left Paris at this time, by far the most successful voyage was that of the "Wash ington," which took out no fewer than 120,000 letters. Military balloons were also used in Paris for obtaining a view of the enemy. The Germans had Herr Krupp cast special cannon of extremely small caliber to de stroy the balloons.
Carrier pigeons were also used to a considerable extent, and 1.100 trained birds were brought in before the siege and lodged at the Jardin des Plantes. Pigeons were dispatched with balloons to bring back word of the safe descent of the balloons, these pigeons being furnished by several carrier pigeon societies. Not infrequently the pigeons, when they returned, were found to be wounded either by some bird of prey or by shots from the German rifles. The Germans brought birds of prey to the environs of Paris in order that they might pursue the carrier pigeons. The dispatch was generally contained in a quill fastened to a tail feather that remained immovable when the pigeon spread its tail to fly. Very many of the messages were ost, however
With an aerial fleet at their disposal, there had never been any difficulty in getting letters out of Paris in a reasonable time, but the means of obtaining news from the provinces were limited in the extreme, and at last the people had to fall back to the employment of pigeon messengers. Originally the latter were only employed to convey government dispatches to announce the safe arrival of some balloon in the provinces, but in the month of October it was also suggested that they might be used to convey the correspondence of the general public. At first the messages had to follow a fixed form, the words being limited to "no" and "yes," to questions such as "Are you well?" "Do you want money?" etc., which had been previously asked in letters sent out of Paris by balloon. The charge for conveying these messages was one franc. The messages were sent to the postal delegate at Cler-mont-Ferrand, where they were copied on a single sheet of paper and then reduced by photography to the most minute proportions and sent by pigeons into the capital. On the arrival of these dispatches, the characters were enlarged with a microscope and each message was copied onto a card and forwarded to the person to whom it was addressed. The plan was found to be rather inconvenient, and at last ordinary messages were allowed to be sent. A charge of half a franc was made for each word contained in the dispatch and the limit of the message was twenty words. The messages were set up in type and printed; they were then photographed, thus rendering them a great deal more legible. When reduced, they occupied a piece of paper $11 / 2$ by $11 / 4$ inches, having the appearance of a diminutive journal of four columns. One message followed the other without interval of any kind. The reverse side was also filled with messages. Three of
the first birds sent off carried nearly a thousand dispatches by means of this arrangement. Post office orders to the value of 300 francs each could be forwarded in a similar manner, and photographic reproductions were sent into the capital. The films used were of col lodion. A suitable number of copies were made of each sheet. They were then rolled and inclosed in a small quill, which was sewed on the tail feathers of as many pigeons as could be procured. The employment of thin films of collodion instead of paper was a great improvement, for these films were ten times thinner and lighter than paper, so that a pigeon was able to carry an in-
creased budget of news with a diminution of both creased budget of
weight and volume.
On the arrival of the pigeons in Paris, the quills containing the microphotographic dispatches were split open with a penknife and the films were rapidly unrolled in water containing a few drops of ammonia The films were then dried and inclosed within two plates of glass. They were then ready to be de ciphered by the microscope. This mode of reading proving slow, recourse was had to the projecting lantern, using the electric light. The thin film of collodion containing the message was placed in the proper
part of the apparatus and the message was thrown on a large screen, so that four transcribers could work at
once on different parts of the dispatch sheet, each square of which contained some 1,600 messages. At a later time the dispatches were photographed on collodion films on the scale of the original printed matter so that each section was enlarged from the most minute dimensions to the size of an 18 mo page : the characters, being in good, bold type, could thus be read off with perfect ease. The collodion film was, moreover, raised from the glass and transferred to a sheet of black oiled cloth dresîed with gumarabic. Finally, the telegrams were separated from each other by means of scissors, and each person received his dispatch in facsimile of
the originial printed matter. This system proved to be very satisfactory, and when the pigeons escaped the hawks and guns, the Parisians were tolerably sure of obtaining information from their friends. Many of the dispatches have been transferred and are now exhibited as specimens of microphotography, thus afford ing a unique microscope object. Other means that were tried was to tie messages onto dogs and have them penetrate the German lines, but the scheme was no found to be satisfactory.

## departure of troops for manila.

The Presidio, the military reservation of California and headquarters of the department of the Pacific, is just now the scene of active military operations occa sioned by a large concentration of Western troops designed for the occupation of Manila. It occupies 1,600 acres which front upon the Golden Gate, in a situa-
tion wost charming in natural picturesqueness, about tion most charming in natural picturesqueness, about
four miles from the Pacific Ocean. A peninsula exfour miles from the Pacific Ocean. A peninsula ex tends into the strait, contracting the entrance of San
Francisco Bay to less than a mile in width, wher the channel is deepest and the currents most strong. At the extremity of this peninsula and guarding the narrow passage stands Fort Winfield Scott, an im mense pile of brick and mortar, and mounting a hundred guns. The fort is now an abandoned struc ture, its strength in a military sense having departed A 13-inch shell dropped inside the fort would imme diately demolish it. The government no longer maintains a garrison here, only a sentry, to keep the too curious from depredation, being maintained at the present time. The situation, however, commands the channel, and upon the bluffs above the fort and on the hills which rise precipitously on the opposite shore are seventeen mortar batteries, dynamite guns and monster cannon.
The Presidio is regarded as a sort of sanitarium for the department. where soldiers fresh from the arid plains of the interior can there recuperate in a climate remarkably genial and temperate. The governmen has spent large sums in beautifying the place, in lay ing out roads and planting trees and flowers. Practically, it is an addition to the park facilities of San Francisco, and at all times its magnificent views of ocean, bay and shore collectively form one of the most superb attractions that can be found upon the continent.
Until Dewey's victory at Manila the chance of West ern soldiers being needed on the opposite side of the globe had, apparently, never occurred to the military authorities. The reserves from the regular army were dispatched to New Orleans bound to Cuba. and the sudden demand for troops for Manila found the post almost denuded of available forces. Orders were hast
ily sent to concentrate in San Francisco the quota ily sent to concentrate in San Francisco, the quotas from Washington, Oregon, Colorado and California and in a few days 7,000 of the finest, lustiest and mos magnificent specimens of manly strength to be fous of
in the whole world were encamped on the slopes of in the whole

Accommodations had to be improvised to some extent and the government's resources were severely taxed in supplying rations, uniforms, tents and blankets on such short norice. San Francisco, though always an im portant military station, had never before seen war on such a scale.
The whole population flocked to the Presidio, and in one day over 100,000 people were on the grounds The sudden call for troops found the government un prepared with transportation for so large a force, but the resources of the port are so great that no inconveuience or delay resulted. The first troop ship to be chartered was the "Peking," one of the best steam-
ships of the Oriental and Occidental fleet. The "City of Sydney," belonging to the Panama line, and the "Australia," of the Oceanic Steamship Company both vessels of the first class, were afterward engaged. On May 25 this flotilla sailed for the East under circumstances most impressive.
A new chapter of history began as the three grea vessels passed out of the Golden Gate. The "Peking" bore a regiment of the First California National Guards, and was crowded to the last inch. This regiment is composed of the flower of the youthful man-
hond of San Francisco, and the march from the Presidio down Van Ness Avenne and Market Street to the dock was one of the most impressive of scenes. The ave
nues were crowded with people, among whom not one but had some personal tie with the departing troops Such a vast crowd, controlled by emotions that could not find expression, was never seen before. The gravity of the occasion was felt to its fullest extent.
The regiment marched to the dock and was hastily put aboard the ship. The "Peking" then drew nto the stream and real military discipline commenced. The steamships "City of Sydney" and the "Australia," with the Fourteenth regiment of United States infantry and volunteers from Oregon, were next to load, and at five o'clock in the evening the thre steamers started for Manila. The bay was alive Every tug or steamer, every rowboat, was pressed into service and as long as possible kept the steamships in

## singing flames.

In a recent number of The American Journal of Science, Mr. H. V. Gill has an interesting paper on "The Theory of Singing Flames." The phenomenon of a ga jet burning inside an open tube emitting a musica note is one of those facts which, although known fo many years and much written about, has never been fully explained. Among the more interesting theories was that of De la Rive, who supposed the sound to be due to a periodic condensation of the water vapor produced in the combustion of hydrogen gas. Faraday showed the inadequacy of this theory by the use of a flame which did not form water vapor, and proposed in its stead the theory that the so called singing was caused by successive periodic explosions of a mixture of gas and air. This was accepted by Tyndall. Another theory which has been proposed is that the sound is produced by vibrations maintained by heat, the heat being communicated to the mass of air confined in the sounding tube at a place where, in the course of vibration, the pressure changes. Sondhauss performed a series of experiments, his chief conclusion being that the condition of the column of gas in the supply tube had an important influence on the phenomena. Mr. H. V. Gill sums up his conclusions as follows: "We think we have made it clear that the pressure on the gas plays the important part in this phenomenon, and that a consideration of the reactions we have described will be found to explain the many facts noted in the case of a singing flame, some of which we have alluded to. We look, therefore, on the chief cause as a mutual reaction between the pressures in the tube and on the gas, the energy necessary to sustain the note being supplied by the pressure on the gas and the action of the flame. We may compare the singing flame to the siren, in which the current of air causes the disk to ro tate, the note being produced by the reaction of the disk on the current of air

We have, then three kinds of singing flames, one depending on change of pressure, another on air currents, and a third deof pressure, another on air currents, and a third de-
pending at once on both changes of pressure and on air currents."

## ANALYSIS OF AIR BY A MUSHBOOM.

By causing various green plants to vegetate in nitrogen gas containing some carbonic acid, 1 became convinced that they are essentially anaerobic, that they can vegetate without free oxygen, that they are the means by which nature has provided the atmo sphere with free oxygen, and that as the composition of the air gradually changed, becoming more and more oxygenated with the lapse of centuries, plants of aerobic nature and animals appeared.
If I place over water in a glass bell full of nitrogen containing some carbonic acid, a green plant such as Lysimachia nummularia (moneywort), for instance, the atmosphere of the bell soon will be proved to con tain oxygen, and in a few months it will be even richer in oxygen than the external atmosphere.
In Agaricus atramentarius, on the contrary, we have he example of a plant (animal?) composed of aerobic ells which cannot vegetate without free oxygen, and which is capable of analyzing the air as completely as does a stick of phosphorus.
Thus, if I place over water in a graduated glass bell full of air (that is nitrogen containing some oxygen) one of these mushrooms which is entirely plunged in the air, i. e., not in contact with the water, and ex pose it to the solar light, as I did with my green plants soon apor, and then all the oxygen is absorbed. The car bonic acid produced being dissolved in the water, the atter rises in the bell glass. For instance, in a smal bell glass of 200 c . c. capacity, the level of the water in a few days will be 160 c. c., and remain there. The bell glass contains then only nitrogen, and the mush room will dry up in it, and can thus be preserved, for its vegetation has ceased. It is, in fact, mummified in nitrogen.
If I immediately place a green plant, such as the Lysimachia already mentioned, alongside of the Agaricus, I find that in a few days the latter will some times recommence slowly to vegetate; but the green plant providing more oxygen than the mushroom can utilize, the level of the water will soon stand at about 180 c. c.-D. T. L. Phipson, in Chemical News.

## AN EFFICIENT WOOL-DRIER.

The wool-drier which we illustrate is, in general, characterized by a casing in which a series of endless carriers or aprons are arranged mounted on rollers, the casing being heated by steam pipes, so that the wool, in circulating, is dried by the action of the radiating heat. The apparatus is the invention of James W. Spencer, of Olneyville, R. I.

The casing of the apparatus has a projecting lower portion provided with a feed orifice, which may be closed by a hinged cover. An endless apron, with two horizontal runs, is mounted in the lower portion of the casing and extends beneath the feed orifice. A second endless apron is mounted in the casing above the first apron, and has three runs, one extending upwardly from the first apron, another extending horizontally, and a third extending diagonally between the first and


## SPENCER'S WOOL-DRIER

second runs. At the rear of the casing a third endless apron is vertically mounted and passes in close proximity to the vertical run of the second apron. This third apron is so mounted that it may be raised or swung aside to permit the discharge of the wool through a door in the casing. Steam-heating pipes are horizontally placed between the runs of the first and second aprons. An observation opening is cut in the casing above the forwardly projecting portion.
In operation, the wool is fed through the proper orifice, until the machine is sufficiently charged. The cover is then closed. The wool passes along the top run of the lower apron, up between the vertical run of the second apron and the front run of the third apron, then forward on the horizontal run of the second apron, to fall back upon the lower apron, whence it is carried rearward again. The operation is repeated until the wool has been sufficiently dried. The wool is then discharged by opening the door in the rear and swinging the apron aside.

## a novel valve for pnedmatic tires.

A valve for pneumatic tires has recently been pat ented by William G. Urmson, of New Brunswick, N. J., which is so constructed that all the parts may be readily replaced when necessary. The valve casing is de signed to be inserted through the rubber nipple ex tending from the tire, and is provided with exterior ribs to retain it in place. An outwardly extending flange on the upper portion of the casing obviates the danger of forcing the casing too far into the nipple On the outside of the nipple a supporting and strength ening thimble is fitted. The casing is interiorly threaded, and at the base of the threaded interior a


## drmson's valve for pnevmatic tires.

valve seat is formed. A valve carrier having an ex terior screw thread is received within the casing and carries an inner flexible tube having an integral flap valve which, normally inclined, takes a firm seat against the valve carrier. The plug or cap for closing the valve casing is threaded and longitudinally slotted. Pivoted near its end in the slot is a tongue which may be caused to open the valve for deflating the tires. When it is desired to permit the air to escape, the tongue is allowed to fall from its normal position, so that the smaller end of the tongue will pass through the valve carrier by screwing the plug or cap inward to unseat the valve. The essential features of the in-
vention are the improved flap valve, the upper flange on the casing, which prevents the inner end of the cas ing from coming into contact with the opposite side of the tire, and the novel deflating devices.

## Test of Antiseptic Substances.

In the Zeitschrift für Angewandte Chemie, Th. Bokorny, says Science, gives the results of a study of the antiseptic action of various substances. A culture medium of half per cent egg albumen or peptone, with one-tenth per cent potassium phosphate, two-tenth per cent magnesium sulphate and a trace of calcium chloride was infected with the bacteria of decay, and after addition of the substance to be tested placed for several days in an incubator. Among inorganic compounds, silver nitrate and mercuric chloride have about the same value, 0.002 per cent killing all organisms in two days. The antiseptic limit with silver nitrate is 0.0002 per cent; with mercuric chlo ride, 0.001 to 0.0002 per cent. Copper sulphat is nearly as active, 0.005 per cent killing all organisms in twenty-four hours and 0.001 per cent preventing decomposition. Zinc sulphate 0.01 per cent kills infusoria in eighteen hours but $0 \cdot 1$ per cent is not completely antiseptic while cadminun sulphate toward algæ and infusoria is weaker than the zine salt, but towar bacteria stronger, 0.02 per cent being antiseptic. Lead acetate and nitrate in $0 \cdot 1$ per cent solu tion only delay decay, while it is prevented by he same strength of iron sulphate solution. The fluorides are not strong antiseptics, the The fluorides are not strong antiseptics, the
limits being for hydrofluoric acid 0.02 per cent, barium fluoride 0.3 per cent, aluminum fluoride $0 \cdot 1$ per cent, calcium fluoride 0.03 per cent, fer ric fluoride 0.06 per cent, magnesium fluoride 0.05 per cent. Ammonium fluoride 0.1 per cent is without action, but sodium fluoride 0.1 per cent is antiseptic potassium fluoride is rather more active.

## AN IMPROVED FLOORING.

The engraving which we present herewith illus trates a flooring which can be readily secured in place and which will not warp. The flooring in general conists of boards provided on their sides with rabbets for orming bottom flanges which are transversely slotted Clamping irons are made to pass partially into the lots and are provided with arms adapted to be bent own over the board flanges. Of our illustrations, Fig. 1 is a perspective of the flooring with a portion broken away to show the clamping iron bent in posi ion, and Fig. 2 represents details of construction.
The flooring comprises a series of rails formed a their lower ends with flanges located alternately on opposite sides of each rail. The rails are embedded in a layer of cement and firmly on the alternat langes. On the upper end of each rail extend continuous horizontal flange. Over the hardened cement a thin coating of tar is poured and on this coating boards are placed, which at adjacent sides are formed with rabbets to produce bottom flanges, trans versely slotted in a line with the upper continuous flange of the rails. These oard slots receive the bodies of the clamping irons. The ower bent ends of the irons pass under the upper continuous rail flanges, a suitable opening having been made for that purpose in the hardened cement. The upper end of each clamping iron is formed with two arms, which are bent in opposite direc tions over the adjacent board flanges. A covering strip cut out at its under side may be made to receive the arms of the clamping irons bent down upon the flanges. The top of the strip is flush with the boards and can be nailed in position. By the arrange-
ment described, the boards are securely fastened in place, so that they are prevented from warping. Longitudinal shifting is prevented by the transverse clamp ing irons extending into the adjacent side flanges of the adjoining boards. The flooring has been patented by Thomas Cantwell, No. 1809 Amsterdam Avenue New York city.

## A Friendly Criticism.

The following amusing but brief review of th Naval Supplement recently appeared in The Elec trical Engineer, of London:
We have received the Scientific American Naval Supplement and find in it most interesting and fully illustrated descriptions of the different types of vessel in the United States navy. The only fault we find with the paper is a note to the effect that it was entered a econd-class matter at the New York post office. It is a first-rate issue in spite of the above.

## A NEW VEHICLE WHEEL

The subject of the accompanying engraving is a vehicle wheel characterized chiefly by the novel form of the hub and felly expanding devices, and patented by Robert G. McDowell, of Anaconda, Mont.
The hub of the wheel is provided with a front ring having wedge-shaped inward projections which receive between them the tenons of the spokes. Another ring has forward projections which extend between the spokes outside of the first named projections, as seen in


MODOWELL'S VEHICLE WHEEL
both our illustrations. The rear portion of the hub is formed by a ring having a threaded interior screwing upon a threaded tapering sleeve movable on the hubbox. This tapered sleeve fits beneath and wedges against the spoke tenons, and by its means the spokes may be forced outwardly or may be allowed to fall in wardly. The sleeve is held in place by a ring screwing upon the hub-box and acting after the manner of a jam-nut. Bolts may be employed to hold the various parts together. A lubricator is provided consisting of piston with a screw-rod which forces oil from the cup into proper channels in the hub-box. In a hub of this construction the spokes and other parts may be readily adjusted when shrinkage has loosened them
A device whereby the felly may be tightened upon the tire is also provided. The device consists of a wedge-shaped block whose inclined sides coact with the similarly beveled ends of the felly. From the block hrough a plate on the interior circumference of the felly a screw passes which enables the block to be drawn toward the hub so as to expand the felly

## Dangerous odors.

The Boston Transcript tells its readers what smells are dangerous. A single sniff of highly concentrated prussicacid will kill a man as quickly as a shot through the heart. The odor of a bad egg is due to the presence of sulphureted hydrogen, and the objectiona-


2 Sutury

## CANTWELLS FLOORING

ble perfumes of sewers and bone factories are attributable chiefly to the same gas. Chemical laboratories are famous for bad smells. Berzelius, who discovered the element called "selenium," once tried the experiment of permitting a bubble of pure hydrogen selenide gas to enter his nostrils. For days afterward he was not able to smell strong ammonia, the olfactory nerves being tewporarily paralyzed. Selenium gas has the odor of putrid horseradish. Tellurium is even worse There is a story of a physician whose patient, a lady refused to take an absolutely necessary rest becaus she was so fond of being always on the go in society He gave her a pill containing a small quantity of tellurium, and her breath was affected by it to such an extent that she was not able to appear in public for a month. She never guessed what the trouble was. The volatilized essential oil of roses is supposed to cause "rose cold." This peculiar complaint is so far nerv ous in its character that paper roses sometimes excite it

## a new rotary engine.

Of the accompanying illustrations, Fig. 1 represents a perspective view of a new rotary engine with a por tion broken away to show the interior, Fig. 2 a sectional side elevation with the piston-heads and abutments in position, and Fig. 3 a modification in section, showing a compound engine.
The engine is provided with a casing formed with a hub against which abuts a wheel-like piston having a solid web and a rim concentric with the hub. The piston thus forms an annular working chamber with the casing. Piston-heads are pivoted near their outer ends to the web of the piston and are mounted to swing in the working chamber. The inner ends of the piston-heads are provided with friction rollers which travel on the surface of the hub. Abutments are pivoted near their inner ends to the hub at opposite points. At their outer ends the abutments carry fric tion rollers traveling on the inner surface of the piston rim. The abutments and piston-heads are so arranged that when the piston rotates, the piston-heads swing outwardly, so as to pass the inwardly swinging abutments. Oppositely arranged inlet ports open into the working chamber at a point forward of the abut ments. Oppositely arranged outlet ports open into the working chamber at the rear of the abutments. When the steam enters the inlet ports, it presses against the piston heads, which have their rollers against the hub and their outer ends against the pistonrim. Similarly, the steam acts on the abutments so as to hold their friction rollers on the piston rim. The action of the steam on the piston-heads causes the piston to revolve. The piston simultaneously receives a like im pulse from the steam passing into the space between the corresponding abutments and piston-heads. When each piston head passes an exhaust port, then the steam in the rear of the piston-head can exhaust. As each piston-head passes over an exhaust port, another piston head passes the preceding inlet port, thus giving im pulses imparting a continuous rotary motion to the piston.
The engine has been patented by William Willerton and Thomas Shortliff, of Blackfoot, Kipp P. O., Montana.

## AUTOMOBILE CARRIAGE FOR WINTER USE.

Our engraving shows an interesting modification of the automobile carriage for winter use on snow and ice. It is the Bollee gasoline carriage adapted for running on hard winter roads by being mounted on steel runners, and the driving wheel being provided with a wooden rim, studded with conical points, this rim being substituted for the pneumatic tire on the driving wheel. The carriage was rebuilt for winter use by Dr. E. Casgrain, of Quebec, Canada. It is an interesting development of the automobile vehicle and opens another field for those who are working on the important problem of automobile propulsion.
The Bollee carriage has an enviable reputation in France, where it is made, as a thoroughly practical vehicle. The ordinary Bollee carriage is illustrated in the Scientific american for October 17, 1896. It is a machine of the tricycle order, with two steering wheels in front and the driving wheel behind, but in Dr. Cas grain's modification steel runners are substituted for the front wheels. It is characterized by a very low form, which assures great stability, which is an added advantage or use in winter, when the inequal ities of the road re more apparen than in summer There are two seats; and the
motor and the gasoline reservoir are in the rear the former being upon each side of the driving wheel. The frame of the carriage is formed entirely of hollow tubes. The gasoline reservoir has a capacity of seven quarts-sufficient for a run of fifty miles. The gasoline descends to the carbureter by gravitation, passing through a Panhard and Levassor flow regulator containing a hollow brass float that fo

willerton \& shortliff's rotary engine.
lows the movement of the liquid. A conical plu closes the inlet orifices when the influx of the liquid is too great. After the gasoline reaches the carburete it spreads over a bronze cap and is reduced to an ex tremely fine state of division, and in this form is carried along by a current of air regulated by a clack valve By means of a rod it is possible to uncover the holes o this valve more or less, thus modifying the composi tion of the gaseous mixture in such a way as to render it explosible, thus adapting the explosive mixture so as to run the motor at the desired speed. Ignition is effected by means of a platinum igniter heated by an external burner. The motor is of the four-cycle type and it develops two horse power. The cooling is effected through heat regulators having lugs cast upon them as shown in the engraving. The connecting rod and crank move in a bath of oil. The velocity of the notor is regulated by an apparatus which acts upon the exhaust valve, which, when the motor is running wild, prevents the lifting of this valve and, consequent-

dr. CabGrain's bollee carriage for winter ose.
y, an expulsion of the burned gases and the introduc ion of a new charge at the succeeding revolution.
While the motor runs normally, the valve is directly controlled through the medium of the levers and rods by a box fixed upon an axle parallel with the driving one. This box actuates a link and transmits motion to the valve. The valve is pulled back by means of springs. The gases, after their egress from the cylin der, pass into an exhaust cylinder designed to deaden the noise and are finally expelled. The motor is stopped and started by an ingenious device. The axle o the driving wheel is movable backward and forwar through the intermedium of a lever placed at the lef of the driver. This lever moves opposite a toothed sector at whose notches it may be arrested. The wotion of the driving axle is communicated to the wheel by means of a drum keyed to a hollow shaft that receives its motion from the driving axle. This drum, through a rubber belt, carries along another and larger one that is dependent upon the wheel. When the lever is shoved backward, the driving wheel moves forward and loosens the belt, which can then no longer otate the wheel. At the same time the latter applies itself against the fixed brake block and is arrested on the spot. But if, on the contrary, the lever is shoved forward, the wheel moves backward and stretches the belt, and an opposite effect is produced. This arrange ment has the advantage of obviating the inconvenence of the stretching of the belt, since, in order to tighten it, it suffices, upon starting, to push the lever ne notch forward. The carriage is provided with a train of three different gearings, that permit of obtaining speeds for five, nine and fifteen miles an hour. As may be seen, the person who sits in front does not aid in the steering of the vehicle. The steersman sits behind, his feet resting on each side upon a platforn provided with a straw mat. He merely has to mov his foot backward in order to press the lever of powerful brake whose block is tangent to the circumference of the driving wheel. With his right hand he steers the vehicle through a hand wheel, which, by a very simple gearing, turns the fore wheels to the right or left.

## The Perplexing Gas Meter.

Most gas consumers on this side of the Atlantic have ike experience to a facetious correspondent in The London Graphic, who asks as follows : Can anyone tell me if gas meters suffer from aberration of intellect, and if so whether there is such an institution as an Asylum or Demented Gas Meters? If so, I should be very glad to hear of it, and at once institute a commission de lunatico inquirendo, and have the case of my especial meter thoroughly investigated. I have spoken before of the difflsulty of tackling even a sane meter. I know a great many very clever people, but there is not one among the lot understands the language of a meter. even when it is in its right mind. Give the most well-informed person of your acquaintance a ladder and a candle and tell him to climb to your meter and inform you how much you how much gas you have burned, and you will find him absolutely puzzled. What then can you do with a mad meter, one that persists in registering an increase of gasevery quarter, though you feel certain that you consume nearly the same quantity in every corresponding period of each year? If the management of meters and the reading of the same were taught in schools, it would be better it would be better than much of the useless learning
which is crammed into children's heads.

## Sclence Notes.

A prize for an essay on "The Duty of Kindness to Animals." offered by the S. P. C. A. and competed for by London public school children, brought the society $\mathbf{1 3 6 , 4 6 5}$ essays this year.
The lighthouse on Armish Rock, in the Hebrides, is about 500 feet from the shore. To avoid having an attendant on the rock, the light is produced on the shore and projected across the water upon a mirror in the lighthouse, the mirror reflecting the light in the desired direction.-Der Westfale.
American scholars go over to Germany to acquire scholarship, but German professors come to America for new ideas in the way of illustrative apparatus. Prof. Magnus, who holds the chair of botany in the University of Berlin, was the guest of Prof. Atkinson at Cornell University for a week or two last fall. He was much interested in the photographic collection of the department, and made arrangements to have sent to him a list of photographs of mushrooms and a series showing the effects of fungi in producing decay o forest trees-duplicates of those used at Cornell. Word has just been received from him acknowledging the receipt of the photographs, and returning his thanks for them, saying: They are of very great use for my lectures, and the students have seen them with great interest.

Much attention has been paid to the boarders, wel come and unwelcome, in ants' nests, says The.Independ ent. It is well known that ants keep cows, i. e., the aphides, whose "honey" they feed upon. Variou beetles, mites, pill bugs, etc., only occur in ants' nests. One beetle (Claviger testaceus) found in the anthill of Paris is so dependent that it perishes on being re moved from the care of the ants. Janet now tells u that the "silver pit" or "slick," as they are called locally in New England (Lepisma), enter ants' nest and live what Janet calls a myrmecocteptic life. When the ants (in confinement) were fed with small drops of honey and pairs of them became locked together by their jaws, the Lepismæ would rush in between them and intercept the drop or a portion of it in its pas sage and then precipitately retreat, but only to bea another pair in a similar way, and so on until its hun gerw

The transfer of bacteria by subsurface water has lately been tested by a number of experiments in clearing of the forests bordering the Rhine near Stras burg. In an elaborate article by Prof. E. Pfuhl in the Zeitschrift fuer Hygiene, it is stated that two pits were used in the tests. One was 3.3 feet deep, and in it the ground water rose to within about $1 \cdot 6$ feet of the surface. The other was 24 feet distant in line perpendicular to the direction of the flow of the sub surface water. This second pit was 4.9 feet deep, 3.3 feet wide and 39 feet long. Two species of bacteria Micrococcus prodigiosus and the fluorescent vibrio which do not occur in the Rhine, were selected for the experiments. The cultures of these species were in troduced into the first pit, and at intervals of about half an hour samples were taken from the second pit and cultivated in the usual way on gelatine or agar plates. It was found that in an hour the micrococci and in two hours the vibrios had passed through the 24 feet of gravel separating the pits. In other experi ments, the micrococci were found to pass into the supply of a tube well drawing its supply through gravel from a distance of 12 feet from the place where
cultures of the bacteria were inserted in the water near cultures of

As is well known, Americans born of foreign pa rentage are larger than their ancestors, whether Eng lish, Irish, German or French; and Dr. Bowditch ha shown that the children of Americans of both sexes, born in the United States, are larger than those of for eign races, says The Independent. This is generally attributable to difference in the climate of the Old and New Worlds, our American climate being drier, more changeable and stimulating than that of Europe. It appears that the introduced English sparrow has undergone a gradual modification since its introduc tion, about thirty years ago, into this country. Dr of this bird, one-half from England and the other half from Providence, R. I. It was, says Science, found that the eggs of the American race, or breed, vary much more than the European, that they are smaller and of a strikinglydifferent shape, being more rounded and with a much greater amount of color variation This is attributed by the author to a suspension of natural selection. However this may be, it belongs with the class of facts which show that the modifica tion is primarily due to the change from one climate to another. Cockerell has found that common European snails introduced into this country soon begin to present variations not known to exist in England while in the introduced butterfly, Pieris napi, twelve American varieties, and of P. rapæ four varieties, have
appeared on American soil, within the few years which appeared on American soil, within the few years which
have elapsed since their appearance and spread on this continent.

## Miscellaneous Notes and Recelpts

Production of Etching Varnish.-Melt together 4 parts wax and 2 parts of black pitch and add gradually parts of powdered asphaltum. The whole is carefully oiled, which is kept up until a sample put on tin alls on bending between the fingers, whereupon

Colored Aluminum Alloys.-A purple composition scintillating in the reflexes of the ruby is produced by an alloyage of 78 parts gold and 22 parts aluminum With platinum, a gold-colored alloy is obtained; with palladium, a copper-colored onel. and with cobalt an ickel, a yellow one. Easily fusible metals of the col or of aluminum give white alloys. Metals difficult of fusion, such as iridium, osmium, titanium, etc., appea n abnormal tones of color through such alloyages.

## Werkstatt

According to a French patent of Anquetil, ink of th following composition gives copies on unmoistened copying paper without application of pressure :

| Aniline color | 30 grammes. |  |
| :---: | :---: | :---: |
| Water. | 2000 | " |
| Glycerine | 1000 | " |
| Alum | 15 | " |

It suffices, in order to obtain good copies, to lay a sheet of paper written on with such ink in the copy book, and to close the latter. It is only necessary t see to it that the writing comes into contact with th copying paper throughout.-Papier Zeitung.
Improved Method of Mercerizing Cotton.-C. Ahnert of Paris, has received a French patent for a method of mparting a silky gloss to cotton not in a state of ten sion. He says the tension of cotton in the treatment with soda lye for producing such luster is unnecessary if it has, before entering into the lye bath, been satu rated with soap solution. His improved method is as follows : The well-boiled cotton is impregnated with a oncentrated soap solution at $122^{\circ} \mathrm{F}$., and entered into the alkali bath of a concentration of $25^{\circ}$ to $35^{\circ} \mathrm{B}$ and a temperature of $86^{\circ}$ to $104^{\circ} \mathrm{F}$.; the cotton is taken out in two and a half to three hours and rinsed with water, to which an acid may be added. It is nex bleached.
Plated Sheet Aluminum.-Wachwitz has invented process for plating sheet aluminum which is said to emove the difficulties heretofore connected with th working up of aluminum. Copper-plated sheet alumi num can be worked up like copper plate and can be soldered, folded, tinned, nickel-plated, etc. The cop per adheres in a thin layer on the aluminum, so tha hardly any increase in weight is caused, and the cohe rence of the two metals is such that no separation en ues on rolling or stretching. The plating also render the aluminum more resisting to bending, to blows and knocks. Copper-plated aluminum wires, which can be readily silvered and gilded, are likely, under the abov suppositions, to gain importance in the wire industry and electrotechnics. As regards the latter, it is very mportant that aluminum is non-magnetic and pos esses great conducting power for heat and electricity -Dampf.
Bronzes from Metallic Oxides.-As a rule, bronzes for decorative purposes are produced in the shape of finely powdered metals or metallic alloys. By the followin methods handsomely colored bronzes can be obtained rom metallic oxides and solutions
White Bronze.-Chemically pure zinc sulphate, fre rom iron, is subjected for some time to calcination in an earthen retort.
Silver Bronze.-Mix 1 kilo of a concentrated solution of zinc sulphate with 30 grammes of cobalt nitrate, 30 grammes of nickel nitrate and 10 to 15 grammes o opper nitrate, all in solutions of $15^{\circ}$ to $16^{\circ} \mathrm{B}$. density and calcine after evaporation. The longer calcination is carried on, the darker the color becomes
Light Pink.-Mix 1 kilo of zinc sulphate solution with 30 grammes of iron nitrate solution of $20^{\circ}$ to $25^{\circ} \mathrm{B}$. an calcine after evaporation.
Leather Color (Yellow).-Treat 1 kilo of zinc sulphat solution and 12 to 30 grammes of an iron sulphat solution of $28^{\circ}$ to $30^{\circ} \mathrm{B}$. as above described.
Yellow Gold.-Treat as above 1 kilo of zinc sulphate solution and 28 grammes of manganese nitrate solu tion of $12^{\circ}$ to $14^{\circ} \mathrm{B}$. The duration of the calcination egulates the shade.
Yellow Green is obtained from 1 kilo of zinc sulphat solution and 25 gramues of nickel nitrate solution o $15^{\circ}$ to $16^{\circ}$ density, with slight admixture of silver nitrate solution.
Greenish Vermilion.-Dissolve 90 grammes of iron phate, filter, and add to the filtered solution 120 rammes of ferrocyanide, whereupon a bluish green precipitate results. Now a concentrated solution of 00 grammes of alum is stirred in and subsequently 100 grammes of finely powdered lime are added, and afte the effervescing is over, 900 grammes of lead acetate The precipitate obtained is washed, dried at moderat heat and finely pulverized. These pulverulent colors give good bronzes with bronze oil ; ground in varnish Zeitung.

The Kolnische Zeitung of January 16 has an in teresting summary of the results of shipbuilding in Germany in 1897, of which the following precis has been forwarded to the Foreign Office by H. M. Ambassador at Berlin :
Shipbuildiing, like all other industries in the past year, has every reason to be satisfied with its development It has been said that German shipbuilding can now consider itself to be on an equal standing with that of other countries; but this opinion applies rather to special ships constructed than to shipbuilding as a whole.
It is very instructive to consider for the past year the figures for ships and tonnage built. It will then be seen that, though Germans have much reason to be satisfied with the results, they must yet acknowledge that they are far behind Great Britain, and have no eason to rest on their present laurels.
In 1897, seventy-nine ships were launched from 28 yards, in which figures are included only seagoing vessels of at least 100 registered tons. This represent a total of 185,000 tons. The bulk of this tonnage is in passenger steamers, about 40,000 in eight men-of-war and 2,600 in sailing ships. This shows that the con struction of sailing craft, being only about 1 per cent of the whole, is practically at an end. And this small onnage built at home has only been increased by some 500 tons of foreign built sailing ships. This consideration is unsatisfactory from the point of view of training up crews for sea service
Turning now to the construction of steamers, it is seen that for merchant shipping German yards have ried many varied types, and not only for special de signs. Large steamships have been built with thei powerful machinery and complete fittings fulfiling al the many requirements of the passenger steamers of the day, in which branch the two large companies of Hamburg and Bremen (the Hamburg-American and North Gerinan Lloyd Companies) take the lead. Ger man yards are also turning out suecial kinds of ships, uch as ice breakers (of which many are for Russian account), petroleum steamers and steamers for high ea fisheries. Whereas Holland and England have earned enormous sums by fishing on the high seas, Germany stands in this respect even behind France and Belgium, on account of the protection accorded to this industry by the government and by the activity of patriotic companies. Fisheries of the high seas are now gaining some importance, and there are over one hun dred steamers employed in flshing, all of which have been built in Germany
With the exception of a few orders from Russia, the werchant vessels were built for the account of Ger mans. Such a result, viz., that Germans can, to a grea xtent, now supply their own requirements, must be regarded as most satisfactory, when one remember the well merited standing and renown of British yards, and their advantages as regards low prices for coal and ron.
Thus the Germans have reached the first stage which should encourage them to strive for the second step which is the attainment of orders from abroad for Ger man built vessels. With regard to men-of-war, the have already succeeded in this respect. Of the 50,000 ons of men-of-war built in late years, 23,000 were con structed in private yards and 27,000 by the government Besides the seventy-nine ships of 185,000 tons built a home, there were ordered abroad thirteen other ships of 32,000 tons. A torpedo destroyer of 500 tons w's also ordered in England. The present position is there fore a most satisfactory one for Germany when her former dependence upon foreign countries is remem bered.

## Quick Tourneys Made Now.

A French statistician has just drawn up an interest ing document showing at various periods in what time certain frontier towns could be reached from Paris The years chosen are 1650, 1782, 1834, 1854 and 189 In 1650 it took five days to go from Paris to Calais One hundred and thirty-two years later, in 1782, the duration of the journey had been reduced to sixty hours. In 1834 it had fallen to twenty-eight hours, and n 1854 to six hours forty minutes. To-day one of th oat expresses takes three hours forty-two minutes.
The journey to Strasburg took two hundred and eighteen hours in 1650. one hundred and eight hours in 1782, ten hours forty minutes in 1854, and to-day a matter of eight hours twenty minutes.
The difference for Marseilles is still more phenomenal. From fifteen days in 1650, the duration of the journe was reduced to eighty hours in 1834, and to-day it takes twelve and one-half hours. The distance from Paris to Bayonne two centuries ago took three hundred and eighty-eight hours; to-day it occupies eleven hours eleven minutes. Brest can be reached in thirteen hours thirty-seven minutes, while in 1650 it took two hundred and seventy hours. Finally, for Havre ninety-seven hours was considered quick traveling in 1650. It took fifteen hours in 1782 and seventeen hour in 1834. To-day it is a matter of three hours fifteen minutes.

## THE SPANISH TORPEDO-BOAT DESTROYER

 "TERROR."Persistent reports of conflicting nature are being circulated regarding the Spanish torpedo-boat destrover "Terror," to the effect she has been destroyed by the United States fleet off Santiago de Cuba. Though these reports lack verification, a description of the craft in question may be of interest.
The "Terror" and her sister ship "Furor" were contracted for by the Spanish government, and built near Glasgow, Scotland, by the Clydebank Engineering and Shipbuilding Company (Limited), during 1896 and 1897 ; and both were supposed to represent the most advanced type of naval construction and armament in their class. Though laid down on the general lines adopted by the Admiralty Board of the British navy, these craft differed slightly therefrom, chiefly in matters relating to the accommodation of officers and crew, and specially as regards service in tropical seas. Impermeability to artillery is little considered in torpedo-boat destroyers, inasmuch as they are supposed to rely upon a low freeboald, their speed and ability to maneuver quickly to avoid the fire of an enemy, and upon an armannent of rapidfire guns to resist attempts at boarding.
The "Terror" is (or was) 220 feet long and 22 feet beam, over a moulded depth of 13 feet, with a total (loaded) displacement of 380 tons, and driven by triple-bladed twin screws, each with four-cylinder triple expansion vertical engines. Her contract called for a speed of 21.5 and 28 knots, respectively, under natural and forced draught, and on her trial trip she is reported to have exceeded the former by a full knot and the latter by one-half knot, on both occasions with a load of 75 tons; one of her sister craft sustained continuously, for two
boiler is controlled by a special automatic feed regulating arrangement which keeps the water at a steady level in the boiler. For the auxiliary system a similar feed pump is placed in each boiler room, and each pump is connected by separate pipes with the reserve fresh water tank, the hot well tank and the sea, and discharges direct to the boilers. The pump in the after boiler room also discharges to the deck and there serves the purposes of a fire pump.
The main steam pipes are of galvanized steel. An independent pipe extends between each boiler roou and one set of engines, and each pipe is fitted with a stop valve and steam separator on the engine room bulkhead, thereby insuring dry steam in the engine There is also a connecting pipe between the main steam pipe and an equilibrium valve at each high pressure cylinder. An independent auxiliary stean pipe supplies all the auxiliary engines, fans, capstans, steam steering gear, etc, except the main feed pumps, and the exhaust steam is led by a system of pipes to either of the main condensers
The four cylinders of each set of engines are separat castings, but bolted together and transversely stayed and likewise stayed to the gusset plates in the wing connecting the frames and deck beams; also a pair of struts extend from each of the high pressure cylinders to gusset plates between the decks and forward bulkhead of the engine room, and like ties secure the low pressure cylinders. The cylinder bottoms, each a sep arate casting, are bolted to the cylinders, and they, together with the cylinder covers, and top and bottom covers of the valve casings, are of cast steel. Pistons of forged steel, turned throughout and fitted with Perkins metal rings; piston and connecting rods hollow and of wrought steel ; crosshead pins of casehardene

## Theater Sickness.

Under the name of mal de thêâtre, we find in the Progrès médical, says The New York Medical Journal an account of an affection often witnessed by phy sicians in theaters, according to the writer. It is manifested by loss of consciousness, faintness and even syncope. It generally occurs in persons who have dined hastily in a restaurant and reached the theate overheated. Pregnant young women are particularly disposed to it. The only treatment required is to loosen the clothing, lay the patient down, expose the face to fresh air, bathe the temples with a little cold water or cologne, and apply smelling salts. The pati ent should not be allowed to stand or sit up until the attack is thoroughly over, that is, for ten or fifteen minutes, and then he had better not remain for the rest of the performance, but go home.

## Prehistoric Dentistry

George Byron Gordon, the explorer, contributes an article on "The Mysterious City of Honduras" to the January Century. The article gives an account of recent discoveries at Copan. Mr. Gordon says :
" No regular burying place has yet been found at Copan, but a number of isolated tombs have been ex plored. The location of these was strange and unex pected - beneath the pavement of courtyards and under the foundations of houses. They consist $o^{\circ}$ small chambers of very excellent masonry, roofed sometimes by means of the horizontal arch and sometimes by means of slabs of stone resting on the top of the vertical walls. In these tombs one, and sometimes two interments had been made. Tlie bodies had been laid at full length upon the floor. The cerements had laid at full length upon the floor. The cerements had
long since moulded away, and the skeletons themselves


THE SPANISH TORPEDO-BOAT DESTROYER "TERKOR."
hours, under forced draught, a speed of 30.02 knotsapproximately $34 \cdot 2$ miles.
The armament consists of two 14 -pounder quickfiring guns, fore and aft, the former mounted on the conning tower; two 6-pounder broadside guns of like type: and two 37 -millimeter automatic, quick-firing guns mounted, respectively, on starboard and port bow all supplied by the Maxim-Nordenfeldt Gun and Ammunition Company (Limited), and representing the latest advance in naval artillery; in fact, the rapidity of fire, especially with the automatic guns, which are loaded and fired through the agency of the recoil, is described as a "hail of iron missiles;" also two torpedo tubes on the Schwartzkopff system, 14 inches in diameter, mounted on the upper deck so as to fire on either side. Four torpedoes are carried, along with complete sets of air compression machinery.
The steam power of these vessels is derived from four improved Normand boilers, with galvanized stee tubes, situated fore and aft in two separate water tight compartments. The two distal furnaces dis charge each into its own funnel, but the midship pair have one large funnel in common. Forced draught is on the closed stokehole system, the air being supplied by two single-breasted fans in each fire hold, placed one on either side of the bunker bulkheads, the air being admitted to them by large cowls directly overhead; the fan engines are of the open vertical type. The boiler feed consists of a main and auxiliary system of pumps and pipes, separate and en tirely independent of each other. The main systen consists of two of Weir's special feed pumps at the forward end of the engine room, each drawing from the hot well tank through a Harris patent feed water filter, and discharging either to the boilers in one compartment direct, or through a couple of Weir's feed wate heaters, situate on the forward engine room bulkhead between the pumps. The feed water discharge to each
steel fixed in forks of the connecting rod ; piston head piston rod and piston rod guide, one complete forging, the latter with machined recesses filled with white
metal on the "ahead" side; the "ahead" guide face of cast iron, with water circulation at back; "astern" facings of bronze.
The bed plates also are of cast steel, each consist ing of two angle bar shaped castings extending the whole length of the engine and resting on longitudinal frames extending between the engine room bulkheads. The main bearing frames extend between, at right angles, being checked into and secured to these castings, as well as to the floor of the vessel, by fitted bolts The crankshaft and pins, and thrust and propeller shafts are hollow and of steel. The high pressure and intermediate pressure cranks are arranged opposite to one another, and each pair forged in one piece; bal ance weights appear on the crank webs in order to re duce the vibrations to a minimum.
A large evaporator is situated amidships on the after engine room bulkhead, with a capacity of 3.150 gal lons per day of fresh water, beside which is a distilling condenser, capable of suppiying 560 gallons daily of pure aerated fresh water, chiefly used for ship purposes, the remainder of the vapor going to the main condensers to serve as make-up feed. A separate engine, with pumps, is also fitted for maintaining the water leve in the evaporators, circulating the condensing sea water and pumping the drinking water into the ship's tanks. An auxiliary air pump is fitted to each of the circulating pumps, and is connected to the bottom of he main condensers, discharging to the hot well tank. On the after engine room bulkhead there is also a du plex bilge pump, for clearing out the bilges of the engine and boiler rooms, and ejectors are fitted to each com partment, so that, in case of excessive flooding. the water may be rapidly got rid of. For the engraving he engines we are indebted to London Engineering.
were in a crumbling condition and give little know ledge of the physical characteristics of the people; but ne fact of surpassing interest came to light concernin their private lives, namely, the custom of adorning the front teeth with gems inlaid in the enamel, and by filling. Although not all of the sets found have been treated in this way, there are enough to show that the practice was general, at least among the upper classes or all the tombs opened, from their associations with prominent houses, seemed to have belonged to people of rank and fortune. The stone used in the inlaying was a bright green jadeite. A circular cavity about ne-sixteenth of an inch in diameter was drilled in the namel of each of the two front teeth of the upper row, and inlaid with a little disk of jadeite cut to a per fect fit, and secured by means of a bright red cement."

## The current supplement

The current Supplement, No. 1172, contains a num ber of articles of great interest. The subject of the front page engravings are the guns made by Messrs Vickers' Sons \& Maxim. They are regarded as a very important type of modern English guns: 3 -inch 6 -inch and 12 -inch guns are illustrated. "Three-Colored Photographic Printing" is an article by Captain W De W. Abney. Several novel types of acetylene gas gen rators are also shown. "Patents" is the subject of paper by James- W. See, which will be presented at he Niagara Falls meeting of the American Society of Mechanical Engineers. "The Battle of Manila" is the subject of an illustrated article showing one of the Spanish cruisers destroved bv Admiral Dewey and also a portrait of Admiral Montojo. "Pests and Poisons Peculiar to Cuba and the Philippines" is an interesting article by Dr. Archie Stockwell. "The Developinent of Central Stations" is an interesting address by Mr Samuel Insull, the first installment of which is pub lished in the current SUPPLEMENT.

## SANTIAGO DE CUBA-ITS ENVIRONMENT AND

 DEFENSES.Next to that of Rio de Janeiro, the bay of Santiago de Cuba is, admittedly, the most picturesque in the western hemisphere. In reality the bay forms two harbors, an inner and an outer, both landlocked, and harbors, an inner and an outer, both landlocked, and approached by a very contracted and more or less tortuous channel, beset with rocks and shoals. In fact, the entrance to the outer
and would be almost imand would be almost im-
possible but for peculiaripossible but for peculiarities of topographical outline and the fortifications that loom up against the hillsides. Santiago City, enerally known as "Cuba" to the natives ies at the further ex remity of the inner bay on its right, bank, conse quently is not at all visible from the sea. Dirty and squalid for the most part with ill-kept streets and dilapidated dwellings, it nevertheless, is most at tractive when viewed from the water front and at distance; the yellow and distance; the liter and blue houses literally ris from the water's edge, ex tending almost to the sum mit of a hill that, but for the dwarfing effect pro duced by the hazy blue peaks that encompass both valley and bay, would be termed a mountain. In deed, the shores of the harbor are almost uni formly high and rugged being merely the foothill and spurs of the Sierras.
As a military and nava station, S antiago date from 1514, when Diego Ve lasquez here founded a settlement and erected rude defenses for its protection. Thus, after Baracoa, Santiago is the oldest city in Cuba, and for more than two centuries enjoyed the distinction of being the capital of the island. In 1553 it was raided by the French and the fortifications in part destroyed. Ten years later a new series of defenses were undertaken that in 1663-65 were replaced by the obsolete brick, stone and mortar structures now known as Morro Castle, and Estrella, Punta Gorda and Santa Catalina batteries. Of later date are batteries Aquadores and Blanca-the one an outlying defense to Morro, the latter occupying the place of the ancient artillery barracks just below the city-and the fortress of La Zocapa (or Socapa). Of still later date are water batteries on Isla de Smith, where the lower bay debouches into the narrow gut that connects it with the Caribbean Sea.
Morro, which is practically a duplicate, though on a slightly reduced scale, of the castle of the same name that guards the entrance to Havana, is perched high upon the cliff that at the right hand entrance of the harbor forms Morillo Point. Its ancient crumbling look and weather-beaten and discolored walls cause it to have the appearance of being ready to topple into the waves below ; but for all, it is stronger and more defensible then its exterio would indicate and the least salient portions lie beneath the masonry, having been excavated from solid rock. It will be recalled this structure once held the cells, offices and torture chambers of the Inquisition at the tim when the "Holy Office" assumed to be arbiter assumed to be arbiter of all Spanis America. How far the Morro and its sister and outlying fortifications have been strengthened in order to meet the exigencies of modern warfare, and specially of the present conflict, is chiefly a matter of conjecture, and it is not safe to rely too much upon the indolent habits and procrastinating traits of the Hispano-Latin race.
Diagonally across the outer entrance of the harbor, to the west of Morro,


ENTRANCE TO SANTIAGO DE CUBA'S MORRO CASTLE

Punta Gorda has again to be considered, for if it has not been completely silenced, it is still capable of delivering an enfilading fire, and over the stern, instead of over the bow as before, of the foe. Again, certain charts indicate that in the vicinity of Rat Island the only navigable channel in certain spots shoals to 24 feet, which is prohibitive to the passage of battleships and the heavier class of cruisers, which require 26 feet. Thus Santiago is eminently fitted by nature to be a western Gibraltar. Properly fortified and defended, the harbor could defy any attack from the seaward; and to the landward the rugged characters of the hills and mountains are such as to offer almost unparalleled advantages for either offensive or defensive operations. But since the early history of the province of Santiago, no measures have ever been taken to defend its capital city and chief sea port from the rear, excep those of temporary and limsy character that have been necessitated by the raids of insurgents.
In the light of the fore coing, the feat of Lieut Hobson, in blockading the Hobson, in blockading the
lower bay of Santiago, by sinking the collier "Merri mac" in the narrowest part of the channel, between Santa Catalina and La Zocapa, acquires new inerest and further evi dences the act was of wore daring and difficult nature than has generally been imagined. It is evi dent the strongest battle
portion thereof, being such as to defy any improvement at the hands of man beyond fortifications and armament. The hostile vessel that essays Santiago Harbor is not only subjected to the fire of Morro and the water batteries below and behind to the east of this castle, but must likewise run the gauntlet of the Estrella, Santa Catalina and Zocapa; further, from the moment she is well inside Morillo Point she is subjected to an enfilading fire from Punta Gorda, an ordeal that is supplemented by a like fire from Isla de Smith as soon as the narrowest part of the channel is reached. At present this gut is additionally defended by the Spanish warships, Admiral Cervera having manifestly taken an advantageous position with this view. Presuming, however, all these obstructions and dangers are safely encountered and passed, to reach the city there still remains to be forced the second narrow channel, only about double the width of that guarded by Morro and Zocapa, et al., in order to enter the upper bay. Guarding the upper end of this channel is Rat Island (Isla de Ratones), now believed to be well de-
fended by modern earthworks; and the battery on


THE BAY AND CITY OF SANTIAGO DE CUBA
ships could hardly hope to
escape scathless under the fire of three fortresses-with all the advantages of elevation-and as many batteries, to say nothing of the Spanish fleet, not even if all the guns employed by the foe are of an obsolete type and comparatively deficient penetration. That the "Mer rimac" and her volunteer crew suffered so little from the batteries must be ascribed, first to surprise, and the batteris United States squadron. To surely and certainly perform the task set demanded a cool head, insouciance to surroundings, and dogged persistence, since the en terprise was of the nature of a naval forlorn hope. The results to the country in practically, and for the pre sent, at least, disposing of the Spanish fleet as regards future offensive operations in western waters, are incal culable.

## The Cavalry Horse.

The army regulations prescribe the kind of horses desired for cavalry as follows: "The cavalry horse must be sound and well bred, gentle under the saddle free from vicious habits, with free and prompt action at the walk, trot and gal lop, without blemish or de fect, of a kind disposition with easy mouth and gait and otherwise to conform to the following descrip tion : A gelding of uniform and hardy color ; in good condition; from 15 1-4 to 16 hands high ; weight not les than 950 nor more than 1.150 pounds ; from four to eight years old ; head and ears small; forehead broad eyes large and prominent vision perfect in every re spect ; shoulders long and sloping well back: ches full, broad and deep ; fore legs straight, and standing well under; barrel large and increasing from girth toward flank; withers ele vated, back short and straight; loins and haunches broad and mus cular ; hocks wellbent and under the horse ; pastern slanting and feet smal and sound."

THE average walking pace of a healthy man or woman is said to be seven ty-five steps a minute

## A GREAT POWER HOUSE <br> at miagara.

The canal of the Niagara Falls Hydraulic Power and Manufacturing Company is 4,400 feet long. For the past six years this com pany bas expended pany bas expended a arge amount of money in enlarging it. Their righ to take water from the up per Niagara has been re cognized by the State legislature to the extent that they may develop many thousand horse power The present width of the canal at its entrance is 250 feet. In 400 feet the width narrows down to 70 feet, and at this width it continues to the basin, which is located about 300 feet back from the edge of the high bank, with which it runs parallel. The basin is about 400 feet long and 70 feet wide. The com pany own a right of way 100 feet wide all along the length of their canal, so that they can still further increase its width 30 fee at their desire. For 40 feet of the present width of the canal the channel is 14 feet deep, and for the re maining 30 feet it is 8 feet deep. In constructing the 14 -foot channel it wa run along the north side of the waterway for a por tion of the length of the canal, and on the south side for the remaining dis tance, a course adopted no doubt, in order that buildings standing close to the canal might be avoid ed until it is found neces sary to still further widen the channel. The work of widening the canal is still in progress, in fact it seems to be the adopted policy


NEW PENSTOCK OF THE POWER HOUSE.
the first has been installed. It was made by $R$. D. Wood \& Company, of Philadelphia, and in design slightly resembles the water wheels in the original section, but its construction is different. It is known as the Jonval Geyelin improved wheel, and takes the water at the bottom through a 60 -inch valve in the penstock. The water flows upward and is admitted to the guide wheels by a gate and then to the runners. From the sides project dis charge pipes laterally and then downwardly, to which draught tubes 22 feet 8 inches long are at tached, thus utilizing, in part, the atmospheric pres sure. The heads of the casing are of cast iron, $13 / 4$ inches thick with $21 / 2$ by 6 -inch ribs at the bottom Four $23 / 4$-inch rods extend through the casing to stiffen it. The turbine wheels are made of bronze and they are located in the draught tube casing, one on each side of the casing proper. The pair weigh 5,095 pounds. They are mounted upon a horizon tal shaft, supported by a rigid bearing, with the flush bearings bolted to rigid bearings. The disk that $f$ par of that form part of the fush bed to the shaft and adjusted by four heavy set screws, one on each end of the shaft to take up the thrust. The gate used is a ring gate It revolves on a barrel which is fastened to the guide wheels by bolts. A walking beam working over the main casing wil operate the gate, which is connected to the beam by of the company to proceed with this work until their waterway has at-|rators furnish power for the operation of the Niagara/steel rods $21 / 2$ inches in diameter extending down tained its full width and depth. The company own $\mid$ Falls and Lewiston Railway, better known, perhaps, through glands into the casing. Over the walking their own outtit of drill boats, scows, dredges, tugs, as the "Great Gorge Route," shown in the SciENTIFIC beam is an air cylinder about 36 inches high and hav etc., and unlike many companies, do their work by American for March 28, 1896. So satisfactory was this ing an inside diameter of $201 / 2$ inches. The Reynolds day labor instead of by contract, all being under the supervision of their chief of engineers, Wallace C. Johnson, M. Ain. Soc. C. E. The excavated material is carried on scows to Port Dar, at the entrance to the canal, and there deposited in huge mounds on the com pany's property. It is utilized in many ways New pany's property. It is utilized in many ways, New
York State through Superintendent Welch of the State York State through
Reservation, having found it most serviceable for filling purposes about the reservation, no charge being made to the State for it.
The power house at the water's edge is built of stone, much of it being quarried of it being quarried on the site. The walls are of the most substantial construction, while the roof is of the steel truss pattern. The original section of the building was completed in 1896, and there is installed in it four turbines made by James Leffel \& Company, of Spring. field, O., illustrated in the ScIENTIFIC American for March 6, 1897, which operate eight generators, six of which supply power to the lower works of the Pitts burg Reduction Company, makers of aluminum, while the remaining two gene-


THE POWER HOUSE OF THE NIAGARA FALLS HYDRAULIO POWER AND MANUFAOTURING COMPANY. RECENT DEVELOPMENTS OF THE WATER POWER OF NIAGARA FALLS.
the General Ele tric Company for supplying current to the new chlorate of potash plant of the National Electroly tic Company located on the high bank above, adjoining the Cliff Paper Compa y's mill, and to the other side will be attached an alternating current dy namo designed to furnish current fo the Buffalo and Ni agara Falls Electric Light and Power Company. The first machine is in place and ready to run. It has been most care fully designed in or der to enable it to cope with the sever service of electrolytic work, the process re quiring practically continuous opera tion. The machine has 14 poles, and wil make 257 revolutions per minute, giving an output of 5,000 amperes at 175 volts
or a capacity of 875 kilowatts, which is nearly $1,200 \mid$ prevents water or moisture from attacking the carbide, horse power. It is direct connected to the water wheel. The current from this machine will be carried to the chlorate of potash works on aluminum cables, the lower part of which will be in bar form, and the upper in the form of cables well insulated. They will be the first of the kind put in practical service, but the company have great confidence in their efficiency, as the current from the original section of the station is carried to the aluminum works over aluminum cables having 500 strands, and which have been found to give good service.
The dynamo for the Buffalo and Niagara Falls Electric Light and Power Company will be of 700 kilowatts output capacity at 2,200 volts pressure. It is to be operated at 250 revolutions per minute and at 125 cycles per second. It is being made by the Walker Company, of Cleveland, $O$. In connection with it there will be installed a continuous current exciter of sufficient current capacity to supply current to the fields of the dynamo to permit of its producing 1,100 kilowatts at standard voltage for a short time.
The water supply for this power station passes from the canal basin through a connecting canal about 16 feet wide, 20 feet deep and 300 feet long, to a forebay located on the edge of the high bank and running parallei to it. The length of the forebay is about 200 feet, and it is 30 feet wide by 22 feet deep.
The walls of the original section were built of stone, but in the recent extension concrete has entered largely into its construction, some of the walls being faced with stone. A second connecting canal is being built between the forebay and the canal basin the walls being entirely of concrete. Where this canal passes beneath railroad tracks, it is to be made watertight.
The penstock of the original installation is 8 feet in diameter, the steel from which it is made varying from $\frac{5}{16}$ of an inch to $\frac{15}{8}$ in thickness. Leaving the penstock it extends horizontally 25 feet, then descends in a verti cal direction 135 feet, and then at arr angle of $45^{\circ}$ to the power house. It runs under the power house floor for about 70 feet, being suspended in the tail race on iron supports. In erecting the penstock for the new instal lation several changes have been made. The new penstock is about 11 feet in diameter. It leaves the forebay with an elliptical bell mouth about 20 by 11 feet. It runs out horizontally supported by two steel beams for a distance of 60 feet and then drops ver tically nearly 200 feet to the power house For about 50 feet of its length under the power house floor it is 13 feet in diameter. After passing one or two wheels its diameter is reduced until it is 7 feet in diameter, be yond which point it tapers off into a cone 18 inches in diameter to form a head, finally ending in an air chamber 15 feet high by 4 feet in diameter. Owing to the size of the elbow, considerable trouble was experienced in getting it to the desired point at the falls, as the passageways between some of th mills were too low to allow its passage on cars. The steel used in its construction varies from $\frac{5}{18}$ to $1 \frac{1}{8}$ inches in thickness. ${ }^{2}$ The new tail race under the power house floor is 22 feet wide and 30 feet deep, being slightly larger than the tail race under the origina section of the building. Its construction is most substantial, of ashlar masonry. In this penstock the new penstock is supported by a series of posts and beams, made by the Variety Iron Works, of Cleveland, O., all parts of which Chief Engineer Johnson has had made adjustable by keys. The water discharged from the wheels has but a few feet to go to reach the lower river. Standing, as does the penstock, out from the cliff in column form, it presents a most imposing ap pearance and attracts much attention.
The gate house is located over the forebay. It is an iron frame structure covered with corrugated iron. It is a thoroughly fireproof structure, and stands in the rear of the lower works of the Pittsburg Reduction Company. Here are located the appliances for opening and closing the gates which allow the flow of water into the penstocks. Before the water passes into the penstocks it goes through racks which screen out all floating substances likely to endanger the wheels. The apparatus in the new section of this building will be very similar to that of the original installation. an inprovement being made in waste gate appliances so as to avoid all trouble from floating ice.

Protecting Carbide against Moisture.
Carbide is packed for shipment in sealed tin cases, protected externally by wooden ones to prevent denting or piercing during handling or shipment, says The Progressive Age. As these cases cost above $\$ 15$ per ton of carbide, they add materially to the price of this mate rial. To overcome this expense and trouble, Joho M. Bulkley, of Detroit, has devised a method of coating the lumps of carbide with a waterproof material which


## gate house and connecting canal

surrounding country, spreading trichinosis, echinococ cus disease, gid, wireworm, and other troubles caused by animal parasites, and tuberculosis, hog cholera, swine plague and other bacterial diseases. The important factors concerned in spreading these diseases are offal feeding, drainage, rats and dogs." Two of are offal feeding, drainage, rats and dogs." Two of the remedies suggested are as follows : "First, by a
reduction in the number of premises on which slaughreduction in the number of premises on which slaugh-
tering is allowed, on which account it is urged as allimportant that there be a segregation of the slaughter houses, so that all the butchers of any given town will be compelled to do all their killing in a common, inclosed and restricted area. In abandoning slaughter houses care should be taken to destroy the rats, in order to prevent the spread of infection. Second, by regulating the factors concerned in spreading the diseases: (a) Offal feeding should be abolished ; (b) draineases: (a) Offal feeding should be abolished : (b) drainand (d) dogs should be excluded from the slaughter and (d) d
houses."

This question of slaughter houses is attracting much attention in Europe, though chiefly in connection with tuberculosis, and some of the countries there have adopted stringent regulations controlling thei management. The system in vogue in Denmark is said to be the most perfect. In Copenhagen every animal is after slaughter branded upon various parts of the carcass, and the hrand is exposed in the butchers shops to the public, which, in consequence, recognizes that the meat has been passed by the official inspectors as fit for human food. In England the question ors as fit for human food. In England the question
has only lately been seriously taken up. A royal commission has been appointed, members of which are at the present time visiting some of the principal towns in the king dom for the purpose of collecting evidence. In France carcasses are seized when there are any visible signs of tuberculosis.
From abattoir statistics it is shown that in Berlin 12 per cent of the cattle slaughtered are tuberculous; in Dresden, 14.4 per cent; in Upper Silesia, 9.5 per cent; in Durham, 18.7 per cent ; and in Mid-Lothian (a district in Scotland in which Edinburgh is located), 20 per cent. Of those slaughter ed in London, 25 per cent are diseased, and in New. York, about 20 per cent. There can be no room for doubt that the sooner the task of putting all slaughter houses into a proper sanitary state is effectively carried out, the better will it be for the public health.

## Fever in Plants.

A phenomenon in wounded plants that seems to correspond exactly to what we should call fever in animals has been dis covered in England by H. M. Richards. His experiments, which are described by him in The Annals of Botany, are thus epitomized in a note in Natural Science "He finds that accompanying the increased rate of respiration is an increase in the temperature of the parts affected. A kind of fever supervenes, and as in the case of respiration, the disturbance runs a definite course, and attains its maximum some twenty-four hours after injury. It is inter esting to note that the attempt to rally from an injury is accompanied by some
sanitary conditions under which slaughter houses are generally maintained, just so soon will they insist that remedial measures be taken. The most effective way to impress people with a sense of their danger is by pointing out to them that these unsanitary conditions are one of its sources, and to prove to thein that, unless radical remedies be put into force, infectious diseases may increase to an almost unlimited extent
Ch. Wardell Stiles, Ph.D., in a paper published in 1896, presents in a ciear manner the subject of country slaughter houses as a factor in spreading disease. In he course of his remarks he says: "The first matter o notice in connection with this subject is that every laughter house is, from the very nature of things, a center of disease, and naturally the poorer the condition of the premises, the more dangerous they are These facts will appear clear if one considers what takes place at one of these houses. Even if only a few animals are slaughtered each week, the total number may amount. to several hundreds during the year. Some of the animals are surely diseased. At least one of the hoge has aichinosis, and when the offal of this trichinous. hof if fed to hogs which are raised upon the grounds, the latter cannot escape infection with trichinæ. But that is not all. The slaughter houses are of ten overrun with rats; the rats feed on the offal and when feeding on the offal of a trichinous hog they likewise cannot escape infection with trichinæ. Rats
act as direct transmitters of trichinosis to hogs." Dr. Strileagives many more instructive details, but which " Evare not the space to quote. He summarizes thus " Every slaughter house is a center of disease for th
what the same symptoms, increased rate f respiration and evolution of heat in plants as in animals. Owing to the nature of the case, the reaction is less obvious in the former than in th atter and a delicate thermoelectric element was re quired to appreciate the rise in temperature; but, compared with the ordinary temperature of plants in relation to the surrounding medium, the rise after injury is 'as great, if not greater than in animals. The maximum in all the plants investigated was be ween two and three times the ordinary excess above the surrounding air. Potatoes proved the most satis factory objects for experiment, and it was found that in massive tissues (such as potatoes or radishes afford) the effect of injury was local, whereas in the case of leaves (e. g., onion bulbs) much greater extent of tissue was sympathetically affected.'

From experiments on rabbits, Dr. T. Oliver con cludes that risk of death from asphyxia after inhaling mixture of air and acetylene is not so great as from a similar mixture of air and coal gas. The time taken to produce toxic effects is longer in the case of acetylene and the symptoms are free from the nervous or re spiratory excitement seen with other narcotic vapors. Provided asphyxia has not gone too far, recovery is rapid after exposure to fresh air. The subject is re ceiving further in vestigation. - British Medical Journal

A drop hammer just erected in the Billings \& Spencer works, in Hartford Conn., is said to be the largest in the world. The drop weighs $3,000 \mathrm{lb}$. and the anvil $90,000 \mathrm{lb}$.

## YOLOANOES AND EARTHQUAKES IN THE PHILIPPINES.

The Philippine Islands lie along the great belt of volcanic activity which extends from Japan to the Moluccas. The chain of living volcanoes enters the Philippine archipelago from Formosa, through the Bashees group, and, running the entire length of the great sland of Luzon, bends to the west and enters the island of Negros at its northern end and, passing down this island, crosses to Mindanao, apparently through Siquijor or Fire Island. With several active volcanoes in the Bashees Islands and that of Cagua at the northeastern xtremity of Luzon, the volcanic forc extremity of Luzon, the volcanic forc seems to be exha cinity of Manila is reached. One o the chief landmarks of the capital is the great cloud-capped cone of Ma hayhay, standing off to the southeast It appears to be now extinct, the last eruption occurring in 1730. It is over 7,000 feet high, but the crater has fallen in and the whole mountain is overgrown with luxuriant vegetation Toward the top this consists, in great part, of tree ferns, with their trunks draped in mosses and overgrown with many species of smaller ferns.
In the province of Batangas and almost due south of Manila, at a dis tance of some 25 miles, is the active volcano of Taal. It stands in the mid dle of the lake of the same name. It is less than a thousand feet in height and looks like the summit of a great volcano which has sunk in the lake, and there are native traditions to this effect. At present its only sign of life is the column of white smoke which continually rises from its summit, but it was in active eruption in 1716 and again in 1754, when it threw out stones and hot ashes which destroyed the little villages on the shore of the lake. The clouds of ashes reached Manila, and the water of the lake is said to have boiled with the great heat.
At the southern end of Luzon are a nuinber of volcanoes. but the most celebrated of these, both for its size and beauty and for the destructiveness of its eruptions, is El Mayon. It rises from the fertile plains of Albay to a height of over 8,000 feet, an almost perfect cone. The lower third of the mountain is densely covered with regetation, which dwindles to bushes and coarse grasses above. The upper half of the cone is of bare sand and lava and other volcanic rocks. Mayon is constantly throwing out smoke and flames, and often streains of lava are seen flowing down the narrow ravines about the summit.
In 1766 there was a terrible eruption, destroying many villages upon the plains below, and in 1800 it was again in eruption, but with less destruction of life. In 1814 the most memorable of its eruptions occurred, perhaps appearing more destructive than the others, because there were eye witnesses to write its history. It was preced ed and announced the night before by frequent night before by frequen earthquakes, concluding the next morning with most terrible shock. Afte this the volcano was seen to immediately throw ou an immense pyramidal cloud of smoke, black a its base, but of many col ors in the middle. wher the rays of the morning sun fell upon it, and ashy gray in its upper part After another terrible earthquake shock and loud thunderings, the volcano began pouring ou immense streams of lava The atmosphere became suddenly dark and the flashes of lightning were incessant. Then, in the darkness, great red hot stones and hot ashes began falling These reached falling. These reached for many miles about the bas of the mountain and horses and cattle were killed in the fields. The villages were fired by the red hot stones falling and the peo ple were crushed or suffo-


MANILA-CHORCH OF SAN AUGUSTIN INJURED BY EARTHQUAKE OF 1872.
tablished an estate upon the east side of Malaspina, on the strait separating Negros from Zebu, told me that the mountain was continually shaking and groaning. Near the southern point of Negros is the ancient volcano of Dumoquete. There appear to be no accounts of its eruptions, but as we steamed along the coast we were struck with the appearance of immense ancient lava streams reaching from the summit of the mountain to the sea. Some of them looked like gigantic railway embankments. so even was their grade and so level their surface. They were too recent to have weathered into good soils and were covered for the most part with low trees and coarse grass. While stopping at the town of Dumoquete we heard of the existence of a lake called Danao, in the mountains, and we determined to visit it. We first followed one of the old lava streams up to the village of Santa Rosa, made up of a few families of Indians who were engaged in cultivating abaca, or Manila hemp. After leaving the village and climbing for six hours up the steep mountains and along knife-like ridges, we reached the lakes. There were two of these, each perhaps a quarter of a mile in diameter and lying in a valley surrounded by mountains so steep that we were in continual danger of slipping down into the water, which was over our heads a step from the shore. The lakes seemed to occupy an ancient crater, but the whole country was so thickly covered with timber that we could get but little idea of its configuration. The barometer showed a height of 3,500 feet
The volcanoes of Mindanao are outside of the territory occupied by the Spanisi and Christian Indians, and I lay without my hat, and passing through a thousand $\mid$ have been seldom visited. Mount Apo is said to reach dangers. I was accompanied under the tree by two wild a height of over 10,000 feet.
boars, which had fled from the forest, two swine from the village, a crow with its wings stretched out, and a poor rat trying to protect its young ones."
The eruptions of Mayon are said by the natives to be preceded by underground noises and mutterings like distant thunder. These are accompanied by trembling of the earth, while the birds and other animals flee from the mountain
One of the landmarks of the central Philippines is the great volcano of Malaspina, or Kanloon, in the northern part of Negros. The level and fertile plains of western Negros, containing the most valuable sugar estates of the Philippines, are probably the product of former eruptions of this great mountain. Its base is surrounded by dense forests and but little is known of any recent eruptions. A native who had recently $e_{S}$

Earthquakes, the usual accompaniment of volcanic activity, are too common in the Philippines to be re warkable, unless they tumble one's house about his ears. The light, basketlike dwellings of the natives, perched upon posts, sway about like cradles during these strange movements of the earth, and are often thrown out of perpendicular, but are rarely destroyed.
The stone buildings of the Spanish, though usu ally built of light volcanic rock, or of coral, and with thick walls and low stories and projecting but tresses, to protect them from earthquakes, are fre quently thrown down. Spanish Manila, the old walled town. the only city in the archipelago built of stone, has suffered most, and some of the streets are still blocked by the ruins of the great earthquake of 1880. In 1863 the city was nearly destroyed, aud at frequent intervals since its foundation it has suf fered loss of life and prop erty.
In the provinces, build ings of stone are rarely found, those existing be ing generally the churche and conventos, or priests houses. These have been built by the untrained na built by with no tives and with no othe architects than the priest themselves, but are strong
ly built and rarely fall Several times, while being entertained by these hos pitable priests, we have been startled by the cry of "'Temblor!" when all would rush out of doors, to be out of the way of falling walls, and after a few min utes' waiting, would re turn to take up our din ner or conversation where we had left it.

A railroad to extend entirely across northern Sweden and Norway, fron the north end of the Gulf of Finland northwest to Ofoten, on the Atlantic. about 120 miles north of the Arctic. circle, is pro posed. The line will be about 300 miles long, and will, it is said, be furthe north than any part of the new railroad to Arch angel.
recently patented inventions. Bicycle Appliances.
Saddle.-Frederick C. Avery, Toledo, O. The object of this invention 18 to produce a saddle
which will properly sustain the weight of the rider. The sadde consists of a seat portion, a cantle. a pommel-clip and an intermediate bearing plate connected to the sead portion. Means are provided for connecting the plate $t$ the cantle to eapport the rider. The plate may also be
yieldingly connected with the pommel clip. With this constraction it is possible to adjust the tension on the saddle cover on the seat portion and horn portion inde
pendently. Any annecesery weight on the horn portion pendently. Any unneceesary weight on the horn portion
causes that portion to move down, so that it can do no caasmes
halace.
ple
Tool-Case.-Louis H. Knopping, New York city. This tool-case is formed in two halves, each hali comprising a metalic frame consisting of a band or
bar and forming the outline thereof to which a sheet of fabric is fastened. Hinges connect the two halves at their bottom edges. The case is fastened to the bicycl frame by a clamp consisting of a band of spring metal
wound around the tube and having its ends bent inward at right angles to the body. One end is pierced to receive a clamping bolt. The other end is provided with a slot extending inward from the end, adapting it to slip over the clamping bolt. This fastening derice is applicabnot only to bicycles, but to all kinds of tabes.
Bicycle-Railway.-William F. Mangels, Brooklyn, N. N. The purpose of the inventor in constructing his railway was to provilie a means whereby unskilled persons can enjoy bicycle riding with the ut.
most tafety. The railway is provided with a continuous track in which a duct is formed. An endless band o rigid material is mounted to travel in the duct. Upon the by the posts and connected with the bicccles travelin on the track. A brace arranged above the band connect the posts witt one another. When the bicccles are actuated by the pedals, then they move forward carrying
the band along, and since the bicycles are rigidly sup. the band along, and since the bicycles are rigidly sup.
ported, no danger of falling off is incurred by unskilled porrea, n.
persons.

## Mechanical Devices.

Corn-Plantrr.- Samuel M. Wixcel, Marcus, Ia. The object of this invention is to provide
a device to be used as
subustitute for the check a device to be used as a substitute for the check wire-
namely, a belt contained in ite entirety upon the machine and provided with driving devices operated by contact with the ground. A simple mechanism is also provided
whereby the dropping apparatus of the seed-boxes is whereby the dropping apparatus of the seed-boxes is
operated hy the check-belt, and the markers are operated operated hy the check-belt, and the markers are operated
from the seed dropping mechanism. A marking device from the eeed dropping mechanism. A marking device
is also provided which will make a mark by which to is also provided which will make
Hat-Printing Machine.-Thomas J. McCarthy, Orange Valles. N. J. In this maccine for hat, a frame is provided having guidewars, another fram being mounted to slide on the giides. A lock holds the sliding frame in itt lower position and a plunger in the
sliding frame carries a printing die. Means are provided sliding frame carries a printing die. Means are provided for normally retracting the plunger. A lever is mounted
on the sliding frame and is connected to the plunger to project it upon an inmpression bed and the hat resting plunger for heating the die, and an ink ing ingoller mounted upon a transversely movable slide engages the die in its nuper poestion.
Ticket-Holder and Register.Tanuel Fortữo (deceased), Perry B. Turpin, Wasbing. ticket-bolder and ticket-register is to prevent manipula tion of the tickets by the conductor and to obviate
the necesity of employing other means than the apparatus itself for registering the number of ticket sold. The apparatus comprises a reel for carrying the a registering device operatively connected with the feed device. The strip of tickets is forced out of the apparatus by means of a mechanism consisting of a plate on whic the strip is supported, a eliding plate being provided with clamping arms to clamp the strip and carry it along. The sliding plate is impelled onward by means of a deric consisting of a spring. controlled trigger outside of the apparatus, a shat on wilec the trigger is mounted and and operatively connected to the trigger and sliding plate The pulling of the trigger sliding plate mechanism. The registering is done by series of lettered rotary dial plates connected with the

Brushing or Combing Machine. Edgar Cassanova, New Orleans, La. This machine, for
combing the fringe of towels and for brushing the nap of blankete, comprises a casiug in which a rotary brush carrier is mounted. A series of brushes are fixed to the carrier and a transeresely curved bed-plate is located in the bed plate holds the fringe in place, so that the brushes will move through the fringe, which hangs free over the
bed.plate. An endless belt movable below the brush carrier receives whatever lint may be brushed from the rringe and depositit it upon an upper stretch of endless belt which drops the lint in a suitable place. The brusi carrier may be rotated by any desired means. In brush
ing the nap of a blanket, the motion of the brosbes
 the upper and lower belta, and is carried forward around
roller and along with the upper stretch of belt As it passes anderneath the brushes the nap is brushed and
caised.
apparatus for Copying, Regtster Inc, Checrina and Adding.-Jules Frydmane, Paris,
France. According to this invention a board adapted to se inserted in the machine is employed in conjunction with the apparatus. 'The board carries a pad on which apures ma be inscribed and a series of pivoted projec-
tions or plates bearing numerals and other indications. These plates, when in a predetermined position, are
adapted to engage various parts of the machine upod
$\left\lvert\, \begin{aligned} & \text { the insertion of the board, and that the machine } \\ & \text { operated according to the oosition of the plates. }\end{aligned}\right.$
Mechanical Movement. - Edward Riddle, Browning, Mo. This invention provides for nechanical movement designed to convert reciprocat vention comprises two racks, each consisting of two ide bars having their inward or opposed surfaces toothe age the teeth of one side withrut touching the teeth pon the other side. Various constructions are provide by which the racks are caused to reciprocate by the revo-
ation of the pinion or by which the pinion is caus ation of the pinion or by which the pinion is
to rotate by opposite reciprocations of the racks.

## Miscellaneous Inventions.

Fountain-Pen.-John Weeks, Brook yn, N. Y. In this fountain-pen the barrel is provided onnected to a valve. The plunger, when moved in one irection, draws the ink from the nib, and when moved
年e valve controlling the supply ink to the nib. The may be cot off to such an extent that the pen may be carrie
age.
Fire-Extinguisher.-Abraim H. Van Riper, Nutley, N. J. The object of this inventor is to provide a simple means whereby a chemical-usually a
gas similar in chemical properties to carbon dioxidemay be mixed with a stream of running water, thus in
creasing the capacity of the apparatus. The fire-extin reasing the capacity of the apparatus. The fire-extin ater inlet and outlet. A perforated conical disk is situated forward of the inlet. A cylinder for containing ng cylinder into the A pipe leads from the gas-contai rated disk-outlet discharging in the direction of the inlet the first-named cylinder. Means are provided for The invention is an improvement over named cylinder ers in so far as the supply of extinguishing liquid is prac tically unlimited.
Display Rack.- Edward S. Robbins, Parker. S. Dak. This display rack is constructed in eparable sections, one section being provided with a leeve and the other section with skeleton tongues a
agles to one another. A skeleton base constructed iverging members connects the two tongues, either the tongues being adapted to enter the sleeve. With this rack goods may be displayed in many positions to the
best advantage.
Gas-Stove.-Robert Pringle, London, England. This gas-stove has a casing comprising An air admission and heating chamber surrounds the remaining sides of the roasting space and is located a the lower part of the roasting space. The upper part of the heating chamber is offset or inwardly projecting, and eath to the roasting space above. Burners are situated in the space beneath the air heating chamber, but no directly beneath the flues. Air.inlets rise within the A depending baffle or curtain incloses a downcast passage opening to the combustion chamber at or below the level he line of the burners An inner curtan depenas within being deflected inward and the products of combustio rom passing up through the roasting chamber, while permitting the direct radia
Stove. - Charles T. Litchfield and oseph T. Baugher, Spokane, Wash. A combustion casing having a closed top and draught-openings in it lower portion. A fire.box having its lower portion pro jecting into the combustion chamber is provided at it apper end with an extension. The fire-box and its exension form with the casing a heating space. A feeder or magazine projects through the top of the casing an xtends into the upper end of the fire-box, the maga nular chamber through which the gir from the heating space passes to the fire-box. Stoves of this pattern have a strong down draught through the fuel, the coking surface being, moreover, formed in
grate and beneath the fuel supply.
Carpet Stretcher and Tacker. cyril M. Jansky, Au Sable, Mich. This carpet stretch is so constructed that, after having driven one tack, the tacking nechanism will be automatically moved to the position for driving the next tack, thus providing meaus or successively driving several tacks without moving hem a stretching bar for engagement with the carpet and means for moving the stretching bar toward the frame.
A tacking device is mounted on the frame and means are provided for imparting a step-by-step motion to the
Wire-Fence Tool.-Hugh W. Deni W, Gebhart's, Pa. With the assistance of this toolit is nd also to splice them when they are broken. The conl has a shank carrying a head and two angular lugs proximity to each other, the lugs having portions cut away at their corners to produce plane surfaces by rimped by the action of th in the wire as the wire of the head a splicing lug projects having an undercut A radial slot in the head leads to the splicing lug and r also engaged by the splicing lug. The tool is the splicing effected.
Scale-Weight.-John F. Brazleton waight which phen propely placed sto provit weight-bar, will not leave its position. A crotch or
this scale-weight. The weight is made heaver at that surface of the weight being inclined in the direction $f$ the inner end of the slot or crotch
Heel-Spring for Boots or Shoes -George E. Swan, Beaver Dam, Wis. When walkin with a shoe to which this spring has been attached it claimed to which thes are relieved from the sever cumstances. The device is provided with a plate having an opening and adapted for attachment to a he tread-block has its ends resting against the inside the plate, the tread-block being of reduced thickness utward through the slot in the plate. A spring bee gainst and exerts a downward pressure on the block and at its forward end presses against the front end of the tread-block, the rear end of the block being free $t$ wardly.
Musicai, Instrument.-Benjamin C. Auten, Princeville, Ill. This musical instrument com uated by devices controlled by keys. The keys and ctuating devices are contained in a slidably mounta carriage. A top plate for the carriage has apertures
through which the heads of the keys project, the aperthrough which the heads of the keys project, the aper-
tures being arranged in rows indicating chords and tures being arrauged in rows indicating chords and
scales. A shaft is journaled in bearings in the box and cales. A shaft is journaled in bearings in the box an
is provided with a gear wheel in mesh with a rack on th carriage. A ratchet wheel is mounted on the shaft. pring-pressed pawl is attached to the box and engag the ratchet wheel. This instrument, it is claimed, can
be played by persons of little or no musical knowledge. Reading Attachment for Meters. tachment of this inventor comprises a plate having apertures for viewing the dials on the meters on which the attachment is to be used. Ring-shaped dials ar monted to turn on the plate concentric with the aper-
tures, each movable dial being formed with numera zero upward.
Twine Holder.-Frank Bossong, Ellensburg, Wash. This twine holaer is designed for ase in mercan a take-up rod yieldingly suspended in proximity to a twine support or receptacle, so that the is always lifted out of the way when not in u nd is at the same time held in position to be readily
rasped when necessary. In use the rod is pulled down nd when the cord is relessed it springs up. The hold s monnted on a vertically adjustable carriage-plate, th o embrace a track-plate secured rigidy to a wall locking device retains the carriage-plate in any desir position
Capontzer.-Andrew M. Duncan, Al oow or spoonshaped end having a sot for the rand and of the cord of the organs, a wire loop adapted to be contracted in close proximity to the bowl or spoon
shaped end to effect the operation and means for conhaped end to effe

Designs.
Lamp-Body. - William A. Rayment aunton, Mass. In this design a globalar bowl is lined orted by a series of golf-sticks, whose heads rest upo base and whoes argores a flag and balls are produced in relief on the base and epression is formed to simulate a golf-hole.
Tip for Tool Handles. - John - H Hamlin, Salt Lake City, Utah. The body of the tool in Upon the convex surface a tapering projection appeara One side-edge of the body is provided with a projecting ead surface, a side of which is formed by a portion of curved surface. In the opposite side-edge of the bod n undercat recess is formed adjacent to the edge of th bes a claw.
Grass and Weed Cuttrr.-Jesse K Painter, Julesburg, Col. The essential feature of this design consists of a flat blade whose edges are beveled
at the upper surface. In outline the blade is provided with a reer edge formed upon the lines of a compound curve, the convex portion being at the center and the concave portions adiacent $t_{0}$ the side edges of the blade. The sides are each formed with a short, straight surface. These straight surfaces meet converging surfaces, the center of the blade.
Kitchen Cabinet.-Samuel Sanders, eavenworth, Kan. The principal features of this de sign consist in a base and a casing rising from the rear
portion of the base. The front edges of the sides of the casing are curved, the base having its front appear ing with side posts and with ornamental legs connected op of the base, the top aprizontal top leads to a step-like portion of the casing.

Puzzle-Block. - Cortez Gatewood Washington, D. C. This design comprises a rectangular game board upon which is a star having a broad tinted outine with depressions at the extreme points of the star and depressions at the junction of the points, the Notr.-Copies of any of the above patente will be end the name of the patentee, titleof invention, and date of this paper.

## NEW BOORS, ETC.

american Agriculturist Year Book AND Almanac For 1898. By Herbert
Myrick. Springfield, Mass. 1897. Orange Judd Company.
This year book is a treasore of statistics for the farm
sabject pertaining to agriculture, industry, commerce
and markets, economics and politics, household educaion, etc. It appears to be a very valuable book for the armer, or whom it is primarily intended. It is remark-
The Differential. 1899. Published by the Junior Class of Case School
of Applied Science. Cleveland, O.
Pp. 147, xxxiii.

Practical Stair Building and HandRaILING. By the square section and
falling line system. By W. W. Wood.
London: E. \& F. N. Spon. New York:
Pp. 83.
Price
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This work has been written to assist those who wish o acquire a knowledge of the most practical and sysbuilding and handrailing. The system of handrailing outlined is somewhat new, but the author has contin usly put it to a practical test for more than five years, and he isconvinced that it is only required to be known o be appreciated. In compiling this work the autho ing inost fully the elementary part. The book is illusTHE
The Designing of Cone Pulleys. A for the problem of proportioning or the problem of proportioning
cone pulleys. With concise, practi-
cal rules. By Walter $K$. Palmer. $\begin{array}{lll}\text { Lawrence, Kansas. 1898. } & \text { Palmer. } \\ \text { Pp. }\end{array}$ Price 50 cents.
Probably no other minor operation of machine designing involves such a complex mathematical analysis cone pulleys. The present pamphlet is intended to co ey infor useful in designing such pulley
aters Within the earth and Laws of RAINFLOW. By W. S. Auchin-
closs, ${ }^{\text {Cl }}$ C.E.
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turers of oil and fat products, soap and candle makers, agriculturists, and candle makers, agriculturists, by Charles Salter. London: Scott, Greenword \& Company. New Ynrk:
D. Van Nostrand Company. 1898.
Pp. 240. Price $\$ 4$.
The presert work takes up the subject of animal fats nd it contains illustrations and descriptions stand test proses on and ber of oils for a great variety of purposes: as, in the case of vegetable fate and oils, considerable improvements inoduced into the products belonging to the same category. Great improvements have also been made in the preparation of
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Pp. 101. Price 75 cents.
This little volume has been prepared by the autbors ppearing in the pages of Prof Silvanus Thompsons "Dynamo-Flectric Machinery and Polyphase Electric

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