
engines of the firbt-class battleship "Wisconsin."-[See page 389.]

## grientifir eqmerican.

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## NEW YORK, SA'TURDAY, DECEMBER 16, 1899.

## RELATION OF RAINFALL TO BOILER SCALE.

it probable that if the average steam user we asked to name the various contributory causes of the formation of boiler scale, he would stop short of the rainfall. Yet we have it on the authority of that ex cellent little monthly. The Locomotive, published by the Hartford Steam Boiler Inspection and Insurance Company, that there is a direct relation of cause and effect between the two. The unusually light rainfall of the past season in many parts of the country has been a matter of note, and it seems that the reports turned in by the boiler inspectors in regions so affected show that there has been an unusual amount of trouble from scale
The reason for this, according to our contemporary is not hard to find, the unusual deposits of scale being due to the increased hardness of the water after a lengthy spell of dry weather. In times of drought the water is drawn necessarily from the lower levels, in reaching which it has become impregnated with lime uagnesia and other soluble substances contained in the overlying strata. In a season of copious rainfall, he overlying strata. In a season of copious rainfal absorb the surface water, which rapidly drains off absorb the surface water, which rapidly drains off into rivers or reservoirs. as the case may be, before it
has had time todissolve out the scale-forming substances in any quantity. In a season of light rainfall, like the present, the ground can absorb. practically all the water that falls, and the proportion of surface water is relatively small. Hence, in dry seasons the water used in the boilers will be largely spring or hard water, and in wet seasons it will consist chiefly of surface or soft water, the deposits of boiler scale being larger or s:naller in proportion.
The moral of all this is twofold. In the first place luring a dry season boilers should be more frequently opened, examined and cleaned. Just how much oftener this should be done must depend upon local conditions and the severity of the drought ; but it is suggested that, judging from observations made in the State of Connecticut, they should be inspected in such a season as the last about twice as frequently. Another fact to be remembered is that when a heavy rainfall comes, bringing a sudden supply of surface and therefore soft water, the scale that is in the boiler will be suddenly loosened up, and unless precautions are taken it will lodge over the fire-sheet and cause trouble. This is particularly liable to happen during the melting of he snow in the spring, when the water will be particularly free from mineral salts.

## OPENING OF THE NEW ST. LAWRENCE CANAL

 LOCKS.An event which will be of great importance in the development and expansion of the commerce of the Great Lakes is the opening of the new St. Lawrence canal locks. Our readers will remember that when the United States government wished to bring the revenue cutters "Algonquin," :" Gresham," and "Onondaga" from the lakes to the Atlantic, to assist in the Cuban operations, it was found necessary to cut the vessels in two and float them through the St. Lawrence locks in sections. Now, although these little craft are only 205 feet in length, they were about 20 feet too long to be admitted, the old lock being unable to accommodate a vessel over 186 feet in length. The operation was not without its risks, as was proved by an illustration published in the Scientific AmeriCAN of July 2, 1898, showing one of the sections of the "Gresham" capsized in the attempt to make the passage. The new locks are capable of admitting vessels up to 270 feet in length, and the arrival recently of the "Porto Rico," a vessel measuring 250 feet over all, at New York, after making a successful passage from the Great Lakes, indicates that tie direct result of the venture will be the shipment of freight direct from the lakes to various points on the Atlantic seaboard.
It has been suggested that these improved facilities, which are entirely under British control, will operate to the naval disadvantage of this country, for the reason that the greater size of the locks will permit a considerable number of the larger gunboats and smaller
cruisers of the British navy to enter the Great Lakes, whereas by the treaty of 1814 the shipbuilding yards on the lakes are prevented from the construction of warships. Although the excellent relations existing and likely to continue between the two governments render it unlikely that this strategic advantage will ever be put to the test, it is probable that, as suggested in the President's message, the restriction to warship construction on the lakes will be removed by mutual agreement. The advantage to shipbuilding interests on the lakes from such a change would be considerble, for there are many smaller vessels, such as the twelve 1,000 -ton gunboats, proposed by the Naval Board, which under the new conditions could be built on the lakes and then brought to the seaboard through the new locks.
"the WISH IS FATHER TO THE THOUGHT.
A correspondent in Japan writes us that the follow ing paragraph, taken from The Daily Mail, has been published with apparent delight by a number of Eng. lish journals in China and Japan, special prominence being given to it in The Japan Mail: "The chairman of the Midland Railway Company was able yesterday to make the highly satisfactory announcement that the American engines which were purchased by that company do not compare at all well with the British made locomotives. As we have often had to draw at tention to the inroads which the United States ar making upon our trade, it affords us pleasure to give prominence to this evidence. This is probably the first occasion on which American engines have been fairly tested against British ones upon a high-class road, and the world, we hope, will note the result! Our correspondent writes that Americans in the East would like to hear the other side of the story, and be assured whether the chairman of the Midland Railway made the unqualified statement that the American en gines do not compare at all well with British-made lo comotives.
After making careful inquiries both here and in England, we can assure our correspondent that the item referred to is one of those half-truths that are worse than falsehood. Whether the misrepresentation is willful or not, there is no doubt that "the wish is father to the thought." What the chairman of the Midland Company did say was as follows: "With regard to these first ten Baldwin engines, they are at present working on the line, and Mr. Johnson, our lo comotive superintendent, says that although they are not by any means up to the finish of locomotives that are made in this country, they are doing their work satisfactorily." We have ourselves italicized the las clause, which was omitted by The Daily Mail for the evident purpose of making the chairman seem to con demn, where he actually indorses, the work of the American locomotives.
We are not in the habit of correcting misstatement that occur in the daily press; but the present instance is so purposely misleading, and as our corresponden informs us, the false impression is being so industri ously spread abroad in the very countries in which American engines are gaining a secure foothold, as to call for emphatic contradiction. The statement of Mr. Johnson that the new locomotives were doing satisfactory work was made in August. In the inter vening three months the whole of the order has been filled by the Baldwin Company and sufficient time has elapsed for a fairly thorough test to be made. The re sults continue to be strongly in favor of the American ocomotive. The engineers who are running the engine report that not only are they hauling the same trains as the English engines upon the same average coal con sumption, but they have proved to be capable of draw ing much greater trains, and would now be doing so were it not for the fact that the sidings at the English stations are too short to admit longer trains. Hence the American engines cannot be given trains of the maximum weight at which they can show to the best economic advantage, and the fact that they compare favorably with the English engines under conditions that are more favorable to the latter speaks volumes for the American type.
It is urged that the English engine is more durable -a claim that can only be established after a test extending over a lengthy period; but we note that Mr. Ivat, locomotive superintendent of the Great Northern Railway, for which twenty Baldwin locomotives were recently constructed, says: "I have been examining them, and I cannot find any important part that ought not, with fair usage, to last as long, or nearly so, as those of our own engines." In addition to the ten Baldwins, there were ten engines furnished by the Schenectady Works. Regarding these, we are informed that the company has received "very favorable reports." the operation showing the same satisfactory results as have been achieved by the Baldwin locomotives.
The Midland Company is keeping a careful log of the relative performance of the two types, realizing that they have a valuable opportunity to determine the efficiency of the more roughly finished, less expensive, but harder worked American locomotive as compared
with the more highly finished, supposedly more durable and certainly more expensive and generally easier worked English engine. There is no doubt that the test will be fairly conducted and the results made known without reserve. If, after taking all the questions which determine economy into consideration, such as first cost, hauling capacity, fuel and oil consumption, repairs, and length of usefullife, the American machine proves to be more economical, the English locomotive builders will find that the battle for supremacy is on in earnest, and that in their own exclusive territory.

TUNNELS VERSUS BRIDGES FOR RAPID TRANSIT.
The craze for building bridges, and $\$ 15,000,000$ bridges at that, which has taken possession of the gentlemen who just now control the expenditures of the city of New York, was forcefully rebuked by the controller at a recent meeting of the Board of Estimate. About a year ago the Board committed itself to the construction of two bridges, between Manhattan Island and Brooklyn, one of which is to cost $\$ 15,000,000$ and the other $\$ 13,000,000$. A sum of $\$ 50,000$ was voted at the time for the preliminary expenses, and at the next meeting of the board a resolution was introduced authorizing a bond issue of $\$ 2,000,000$ on which to commence active operations. It was suggested by the controller in a very able address that action shọuld be delayed in issuing bonds for construction, until the question of constructing tunnels in lieu of bridges could be thoroughly investigated. He presented reports upon the relative cost of tunnels and bridges, which had been prepared at his request by the Chief Engineer of the Department of Bridges, and the engineers of the Brooklyn Bridge and the new East River Bridge, which made out a strong case for the tunnels on the question of first cost and cost of maintenance. It was stated that the tunnel beneath the East River constructed to carry the mains of the East River Gas Company is 10 feet 6 inches in diameter, or several inches larger than the City and South London tunnel, which is daily carrying a heavy passenger traffic. This tunnel according to the report could be duplicated to-day for less than $\$ 500,000$, or two such tunnels, one for east and one for west-bound traffic, could be built for about $\$ 900,000$

A report put in by the firm who built the tunnel under the East River used by the New Amsterdam Gas Company stated that a double-track tunnel to carry the same number of passengers as could be carried on the proposed Manhattan Queens Bridge could be built for $\$ 1,900,000$, whereas the bridge is to cost $\$ 13.000,000$; and another tunnel, to take the place of the Manhat-tan-Brooklyn Bridge. would cost only $\$ 2,500,0 \cup 0$, as against a cost of $\$ 15,000,000$ for the bridge
Another feature named by the controller was the great rapidity with which tunnels can be constructed, the East River gas tunnel having progressed at the rate of 100 feet per week. From this it is concluded, that a tunnel between Brooklyn and New York could be completed in two years from the letting of the contract. It was further pointed out that the great height. of the bridges above the river called for costly condemnation of private property to provide for the approaches, whereas tunnels can be kept within the line of the city's streets ; and, furthermore, that tunnels are not tied down by consideration of topography to particular locations, but may be located with a sole view to meeting the requirements of traffic

While there is no disputing the broad truth of these arguments, they somewhat overstate the case in favor of the tunnels, and omit to mention compensating features in the bridges. On the question of cost there cannot be two opinions-the tunnel is cheaper. But it is not so much cheaper as Mr. Coler supposes; for, like the bridge, it must have lengthy approaches, which, in the very nature of things, will require condemnation of property to make roomfor terminals; unless, indeed, it is proposed to dispense with terminals altogether and connect direct with the underground system. Then, again, it is some what misleading to draw a parallel between a two track tunnel accommo dating railway cars only and a vast thoroughfare such as will be the new East River Bridge, with two steam railway tracks, two trolley tracks, two wagon roads, two broad sidewalks for foot passengers, and in all probability two separate tracks for bicycles. It would take at loast four two-track tunnels to provide the same traffic capacity as this huge bridge with its clear width of 118 feet, and four such tunnels would cost not less than $\$ 10,000.000$, without any allowance being made for the approaches to accommodate trolley, wagon, and foot-passenger traffic. The object of the new East River Bridge, as stated at the time of its commencement. was to provide a broad thoroughfare across the river over which the surface, elevated, wagon. and foot-passenger travel might pass without interference of terminals or grades.
It seems to us that the situation can best be met by the provision of both hridges and tunnels, the forme to connect the elevated and surface roads and the later to unite the new underground system with the various transportation systems of Brooklyn. One of the
wo proposed bridges would suffice for the present and the $\$ 15,000,000$ it is proposed to spend for the other could be used to better advantage in the construction of three or more tunnels of the kind suggested.

## UR EXPORTS OF IRON AND STEEL.

The most, gratifying feature in the growth of the iron and steel trade of this country is the fact that a rapidly increasing proportion of the product of our furnaces and mills is being shipped abroad. In spite of the greatly increased demand at home, due to the present era of prosperity, and despite the steady rise in prices, our exports continue to grow at an increasing rate. The first ten months of the present year show an increase over the corresponding months of 1898 of about $\$ 20,000,000$, bar iron exports, for instance, having increased in quantity by 100 per cent, steel rods by 30 per cent, and steel sheets and plates by over 100 per cent; the greatest increase being in wire nails, of which we sold nearly 200 per cent more than in the preceding year. Thus our exports of wire for ten months rose from 135 million pounds in 1898 to 219 million pounds in 1899 ; steel sheets from 48 to 109 million pounds in 1899 ; steel sheets from 48 to 109 million
pounds, and wire nails from 24 to 56 million pounds. pounds, and wire nails from 24 to 56 million pounds.
The largest increase in value was in the exports of The largest increase in value was in the exports of
machinery, which rose in value from 12 million to 15 million dollars; builders' hardware coming next, with an increase from over 5 million to over 7 million dollars. The total value of iron and steel exports was for 1898 , $\$ 67,290,560$; and for $1899, \$ 86,162,258$. The present indications are that we shall sell to the outside world over $\$ 100,000,000$ worth of iron and steel and manufactures therefrom for the whole calendar year.

## TROPICAL PRODUCTS OF OUR NEW POSSESSIONS

The commercial possibilities which await the tropical island territories which have come into closer relationship with the United States during the past year in supplying a permanent and growing market in this country are suggested by the figures which the Treasury Bureau of Statistics has obtained of the importation of tropical and sub-tropical products into the United States during the ten months of the present year, compared with that of the corresponding months of the preceding year. They amount to no less than $\$ 280,000,000$, or an average of over $\$ 1,000,000$ for each business day of the year. The figures include raw silk, tea, rice, and the small portion of sugar which is manufactured from beets; but even if these be omitted, the total which would be clearly entitled to be classed as tropical products would exceed $\$ 250,000.000$ annually, including sugar, coffee, India rubber, fibers, tropical fruits and nuts, cacao, tobacco of finer grades, spices, dye woods, cabinet woods, etc. Curiously enough, all these articles can be and are now produced to a greater or less extent in the islands in question, sugar cane being grown in large quantities in Cuba, Porto Rico, Hawaii, and the Philippines. Coffee is successfully grown in all of the islands in question and at one time was a very important crop in Cuba as at present it is in Porto Rico, Hawaii, and the Philippines. Fibers of which the importations in the present year will amount to $\$ 20,000,000$ in value can be readily grown in all of the islands. The Philippines are already supplying the most important feature of our fibers, Manila hemp, which alone in the present year will amount to about $\$ 6,000,000$ in value.

## THE AUTOMOBILE CUP.

The cup which has been recently presented to the Automobile Club, of France, by Mr. James Gordon Bennett is to inaugurate a series of yearly international rontests between the different clubs of Europe and America, the winning club to hold the cup until beaten, as in the yacht races. This will form a yearly event which promises some interesting sport, as there is no doubt that the cup will be warmly contested by the different clubs. It is now in possession of the Automobile Club, of France, who will hold it until the first contest decides the winner. A series of rules have been established for the conduct of the races; the following is a resume of them:
The cup may be competed for by all the clubs now on the official lists, which includes those of Belgium, Austria, Italy, Great Britain, Germany and the United States. Any club not on this list may be accepted by a majority of the clubs above named. To enter the competition, a letter should be addressed to the president of the club holding the cup, in which the president of the club holding the cup, in which
will be stated the number of vehicles to be entered, will be stated the number of vehicles to be entered,
and other necessary details. The time fixed for the races is from the 15th of May to the 15th of August. Each club may send from one to three automobiles, these to belong to the class known as " voitures," as specified in the rules of the Automobile Club, of France, for 1899. According to this they shouid weigh, empty, more than 400 kilogrammes, and carry at least two more than 400 kilogrammes, and carry at least
persons, these placed side by side. A weight of 70 kilogrammes is allowed per person, this being regulated by the addition of ballast. as usual, to make up the 140 kilogrammes total. The 400 kilourammes, representing the weight of the vehicle empty, is exclusive
of combustibles, accumulators, water, baggage, etc. One of the rules is that all the automobiles entering the contest should be constructed in the countries represented by the different clubs. They are to be conducted by members of these clubs, the two places being occupied during the whole time of the race.
A committee of supervision is to be formed, and for this each club will be represented by a delegate; the donor of the cup is an honorary member of this com mittee. The necessary officers will be appointed, and also the starters, judges, timekeepers, etc.; these latter are not necessarily chosen from among the members. The races will be run over a route of 550 to 650 kilometers, with stages of not less than 150 ; they are to take place in the country whose club holds the cup for the year in question; if desired by this club, the races may be held in France, starting presumably from Paris. This will no doubt be carried out in a number of cases, on account of the fine roads in that country and from the fact that Paris, besides being a local center, has all the facilities for the care of automobiles.

Among other rules the most important is naturally that which concerns the winning of the cup; this is decided by the automobile which first crosses the line and the club it represents will be declared victor. All communications in regard to these contests may be addressed to the secretary of the Automobile Club, of France, Place de la Concorde, Paris.

## ANCIENT EGYPTIAN PORCELAIN.

It has often been a subject of question as to whether a veritable porcelain has ever been made by the Egyptians, the term including products which shall be compact and translucent. The French savant Brogniart, in his treatise on ceramics, concludes that all the samples of porcelain found in Egyptare of Chinese fabrication. M. Le Chatelier has lately made some interesting researches in this direction and has pre sented his results to the Academie des Sciences. Among the samples given him by an archæologist he has found a fragment of a funerary statuette coming from Saggarah, which he pronounces to be undoubtedly of porcelain; its hieroglyphics leave no doubt as to its fabrication in Egypt. The paste is translucent and of a pale blue color ; in composition it presents marked differences from that of china. It is a veritable soft porcelain, its blue color being due to the addition of a small amount of copper. The experimenter has been able to reproduce a substance which resembles this very closely by making a paste of ground sand, 55 parts; white clay, 5 parts; and a special blue glass, 40 parts. This latter was made up according to the parts.
$3.3 \mathrm{SiO}_{2}, 0.23 \mathrm{CaO}, 0.13 \mathrm{CuO}, 0.64 \mathrm{Na}_{2} \mathrm{O}$
This paste when baked at a temperature of $1,050^{\circ} \mathrm{C}$. yields a pale blue mass which turns to green when the temperature is raised above $1,200^{\circ}$. It is to be re marked that by reason of the feeble proportion of clay in the composition, the wet paste is plastic only in a feeble degree and for this reason could not be used for molding objects except those which took a compact form, such as the statuettes referred to.

## RAILWAY SAFETY APPLIANCES.

The Interstate Commerce Commission, on December 6, gave a hearing to the representatives of the several railway companies, asking for a further extension of the time allowed them to equip their lines with safety appliances, under the act of March 2, 1893. Two years ago the Commission granted an extension until January 1,1900 , and the present extension desired is one year. Representatives of a hundred railways were in attendance, as were also representatives of labor organizations. The President of the Baltimore \& Ohio Road, acting as chairman, representing eighty-eight other roads, having 80,000 miles of line, made the opening argument. He said that on June 1, 1899, 211. 268 freight cars out of a total of $2,268,000$ engaged in interstate commerce were not equipped with safety appliances, but since that time the number has been reduced to between 150,000 and 175,000 . He stated that the railroads had done as well as could be expected, and some of the cars not equipped were so old that they would go out of service within the coming year, and the present withdrawal of 175,000 unequipped cars would practically paralyze interstate commerce. Other railroad officials also spoke, advocating an extension of time.

## "ADVANCE SHEETS" OF THE GERMAN CONSULAR REPORTS.

To satisly the numerous demands from German manufacturers, exporters and Chambers of Commerce, for an improvement in the information service of the German Consular Bureau, the Imperial Government has recently begun to publish pamphlets containing extracts from Consular Reports and other interesting matter. It is entitled "Advices for Commerce and Industry," and is something between the daily "Advance Sheets" issued by our Department of State and the monthly "Consular Reports." It is very gratify ing to know that our Consular Reports and methods are considered abroad to be worthy of emulation.

NEW YORE'S TRADE IN WILD ANIMALS.
With the approach of cold weather all wild animals move into their winter quarters, and following the custom of their class the animals held in captivity in museums and circuses take up their abode in warm, steam-heated cages prepared for them. During the summer months many of them have been traveling about the country on exhibition, and others have been browsing in the rumerous parks and private summer menageries just outside of large cities. 'The demand for wild animals for small parks in summer is quite general, and dealers in wild creatures make quite a fair profit in renting them out during the dull season. But as winter approaches, most of the animals return to the cities for exhibition in their regular quarters, where an eager public is always willing to pay a small fee to gaze at them.
The trade in wild animals has been unusually brisk for several years now, and the importations have steadily increased. In spite of this, however, prices instead of advancing for most of the animals have fallen; the reason for this is attributed to the fact that expeditions for capturing wild animals in their natural homes are more numerous than ever before, and they are better equipped for their work than in the past. Consequently more wild animals of nearly every description come to the civilized countries in captivity than in the days of Nero, when imperial Rome boasted of thousands of wild animals caged in its confines. While it is generally reported that many of our wild beasts are rapidly being exterminated, it is nevertheless true that they will never become extinct so long as their kind can be bred in captivity. This is now an accomplished fact with nearly all of the birds and animals.

This success of breeding in captivity is noticeable among lions in particular, a nd from present indications there is little danger of these felines becoming extinct. The importation of lions has almost ceased because it is cheaper and easier to breed them in captivity. Formerly an importer of fine lions could calculate upon getting $\$ 5,000$ for a good specimen, but to-day young lions bred in captivity are almost a drug in the market. The only demand for imported lions is to keep up the stock of the breeding ones, or for very large, powerful creatures, for it is noticeable that the tendency in cage-breeding is for the animals to degenerate in size and ferocity. Tigers do not take as kindly to cage life as the lions, and they do not breed so satisfactorily in captivity, and considerable numbers are imported every year. Elephants do not breed well in captivity, not more than two or three ever having been bred in this country, but the importations of these animals is so large that the prices obtained for them have dropped from $\$ 10,000$ to $\$ 1,500$ to $\$ 2,500$ each.
Numerous as monkeys are in this country, they are not bred here, as they do not breed well in captivity. They are so easily obtained in the country south of us, however, that prices obtained for them are merely nominal, and there is little danger of their immediate extinction. In their native countries they multiply so rapidly that the supply always keeps well up to the demand. Among the highest priced animals of to-day are the rhinoceros. There are quite scarce, and they do not breed in captivity. There are probably not more than half a dozen in number in this country; all were bought years ago at good round sums. Thus the full grown one in Central Park cost the department $\$ 7,000$, and a similar sum was paid for the fine African specimen in the Philadelphia Zoo. The most recent purchase of a rhinoceros was the full grown one for Barnum's circus, which cost the proprietors $\$ 7,250$.
The hippopotamus is another extremely rare and expensive creature, and sales of these African products are so few that it is difficult to quote a price for them. It is seldom that dealers have a good specimen to sell, and few private circuses could afford to give the prices that would be demanded. The hippopotamus born in Central Park is the only instance of these animals breeding in this country. Had this baby hippopotamus belonged to a private show, it would have made a fortune for its o wners.
Snakes and birds form a large part of the animal importer's business. These creatures come in great numbers from India, Africa, and South America. The public is peculiarly fascinated by snakes, and they are among the most popular creatures exhibited. The best specimens of reptiles come from India, and a snake twenty feet or more in length is worth considerable money. In a cage it is the size of the snake more than its venomous qualities that attract, and a large boa constrictor or python is worth more than a rattlesnake of smaller size.
Exporting wild animals was formerly quite an extensive feature of the trade in these creatures, but owing to the scarcity of our large animals this feature of the business has fallen off. A young American bison can now be exported and sold for $\$ 1,000$, and American elk, moose, and caribou have good market demands in Europe. Our Florida diamond-back rattlesnake and the alligator have a fair market demand abroad, and goors specimens are occasionally shipped
to foreign dealers to fill orders.
G. E. W.

A TOOL FOR RELOADING EMPTY CARTRIDGE SHELLS.
One of the simplest devices of its kind to which our attention has been drawn is an ingenious tool for reattention has been drawn is an ingenious tool for re-
loading empty cartridge shells, which has been patented by Walter H. Gripman, of Sioux Falls, South Dakota. By means of the tool the old primer is rapidly expelled, a new primer accurately inserted, the shell and bullet resized, the mouth of the cartridge expanded, and the bullet securely fastened in the charged shell.
Fig. 1 is a perspective view of the device. Fig. 2 is a section showing the method of expelling the old primer and seating the new. Fig. 3 is a section showing the method of compressing the powder, crimping the shell around the bullet and resizing the cartridge. Fig. 4 is a side elevation of a pusher employed.
The tool is provided with guideways for a reciprocating die, operated by levers connected with links having a toggle action. The reciprocating die co-acts


A TOOL FOR RELOADING EMPTY CARTRIDGE SHELLS.
with a stationary die having an inner and outer retainer or guideway for the head of the shell. The two dies are provided with bores for receiving a pusher carried removably by the reciprocating die and provided with a detachable pin.
To remove the old primer, the head of the shell is placed in the inner retainer or guideway of the stationary die, as shown by the full lines in Fig. 2, so that the open end of the shell registers with the bore of the reciprocating die. When the levers are brought together, the pusher passes into the shell, and its pin forces the primer out into the bore of the stationary die; at the sametime the beveled end of the pusher enlarges the shell mouth. The levers :are now swung apart ; the pin is removed from the pusher ; a new primer is placed in position, and the head of a shell is placed in the outer retainer of the stationary die, as shown by the dotted lines in Fig. 2. The closing of the levers causes the pusher to pass through the stationary die and to seat the primer. The levers are again opened. The pusher is taken from its bore; the shell is removed and filled with powder, and a bullet is placed in position. The shell-head is then fitted in the inner retainer, as in the first instance, and the levers are closed, so as to cause the bore of the reciprocating die to crimp the shell upon the cating die to crimp the shell upon the
bullet, to compress the powder by forcbullet, to compress the powder by forc-
ing the bullet in wardly, and to resize the cartridge by contact with the wall of the reciprocating-die bore. In resizing the bullet the pusher is again used, without its pin, the cartridge being placed at the inner end of the bore of the stationary die and extended toward the reciprocating die. Hence, when the levers are closed the pusher forces the bullet through the the pusher forces the bullet through the
bore, trimming off surplus material and bore, trimming off surplus material and
grease, and giving the bullet the desired grease, and
diameter.

African Transcontinental Telegraph.
The construction of the African Transcontinental Telegraph Line, by which it was expected to unite the Cape with Alexandria across the whole of the continent, has been carried on with great actnent, has been carried on with great activity, at least up to the time of the commencement of the hostilities in the south
of Africa. The line has been finished up of Africa. The line has been finished up
to a point midway between Lake Nyassa to a point midway between Lake Nyassa
and Lake Tanganyika. From Karonga, a village situated at the northern end of Lake Nyassa, the line passes toward the northwest to gain the southern extremity of Lake Tanganyika. It will then follow the western shore of this lake and penetrate German territory, finally reaching trate German territory, finally reaching
Lake Victoria Nyanza, then Uganda, Lake Victoria Nyanza, then Uganda,
which is Englist territory. The conwhich is English territory. The con-
struction of the line has been under the struction of the line has been under the
charge of 10 engineers, having 850 nacharge of 10 engineers, having 850 na-
tives under their orders. A column of scouts chooses the best direction to follow,


A Naval 4•7-inch Lyddite Gun on Timber Platform.


Naval 12-pounder on Improvised Carriage.
THE NAVAL GUNS AT LADYSMITH.
is too much to say that they "saved Ladysmith," there is no question that they served very materially to keep down the fire of the Boer siege guns, among which there seem to be several long-caliber Canet pieces of great range. We are indebted for our illustrations to The London Graphic.

## HAULING LOGS BY MOTOR TRUCKS.

That the automobile will some day find an extensive use in our agricultural and logging districts is not beyond the bounds of possibility. An auto-truck has been already invented by George F. Reed, of Waldo, Fla., which seems to possess the necessary strength and durability for the requirements of such heavy, mechanical traction. Mr. Reed's vehicle is driven by a gasoline engine, firmly secured on a platform or body

hadling logs by motor trucis.
supported by two rear traction wheels and a front pilot wheel. The engine shaft extends longitudinally, pilot wheel. The engine shaft extends longitudinally,
and carries at its rear end a bevel gear meshing with and carries at its rear end a bevel gear meshing with
another bevel gear on a transverse shaft. Pinions on the end of the transverse shaft engage spur-gears forming part of the rear traction-wheels. Clutch-members on the transverse shaft and pinions can be thrown into frictional engagement with each other by means of two levers operated by the feet of the driver.
On the stationary axle of the rear wheels two drums are loosely carried, which, by means of friction-clutches, can be independently thrown into gear with a wormcan be independently thrown into gear with a worm wheel driven by a worm on the engine-shaft. The
clutches are connected with levers extending below the clutches are connected with levers extending below the
platform, and are thrown by an assistant standing at the side of the truck, since they are not manipulated while the truck is in motion. About the drums, chains are wound, by means of which the logs are drawn up beneath the platform and supported during transportation.
The vehicle is steered by means of the front pilot wheel, the controlling-shaft of which passes diagonally through the gasoline supply tank and carries a hand-wheel within reach of the driver's hand.

German Steamship Lines at Hamburg.
The following figures show the great development of the commerce and the navy of the German empire, and particularly the expansion and present inportance of the port of Hamburg: At the beginning of this year, nine great navigation companies were counted at this port, among which may be mentioned the following: The most important is the Hamburg-American line, which has 67 steamers, giving a total tonnage of 256,300 . The financial condition of this line is good, it having paid a dividend of 8 per cent upon its capital. The 30 steamers of the Hamburg. South American line represent 101,350 tons, and the dividend paid during 1898 reached 13 per cent. The Kosmos line has 25 steamers, with a tonnage of 90,000 . Among the other companies may be mentioned the Sloman line, with 25 boats and a tonuage of 53,300 ; and the Woerman line, having 21 boats and a tonnage of 39,000 ; the 11 boats of the German-Australian line, amounting to 44.300 tons, gave a dividend of 10 per cent; the German-American Petroleum Company has 10 boats, tonnage 35,000 . Following these are the German-Levant. with 14 boats, representing 29.000 tons, and the East African line, with 12 boats and a tonnage of 31,000 .

THE ENGINES OF THE FIRST-CLASS BATTLE SHIP "WISCONSIN."
The battleship "Wisconsiu" is being constructed under an Act passed in 1896, authorizing the building of three seagoing battleships, which are known as the "Alabama" class. The "Alabama," which was illustrated in the Scientific American of September 30, is being constructed by the Cramps, of Philadelphia the "Illinois" by the Newport News Shipbuilding the "Illinois" by the Newport News Shipbuilding company, of Newport News, is being built at the yards of the Union Iron sin" is being built at the yards of the Union Iron
Works, San Francisco, Cal. It was the last named firm that constructed the "Oregon," whose remarkable trip of 14,000 miles around Cape Horn will be fresh in the memory of our readers. By the courtesy of Mr. G. W. Dickie, superintendent of the Union Iron Works, we are enabled to present the accompanying illustrations of the engines of the "Wisconsin" as they appeared when set up in the erecting shops of the Union Iron Works prior to their being installed in the engine room of the "Wisconsin. There are two sets of these engines, rights and lefts, placed in separate water-tight compartments, separated by a longitudinal bulkhead. They are of the vertical, inverted-cylinder, direct-act ing, triple-expansion type. The high pressure cylinder is $331 / 2$ inches, the intermediate 51 inches, the low pres sure cylinder 78 inches in diameter, the common stroke of all pistons being 48 inches. The collective indicated horse power of the two sets, working under a pressure of 1 inch in the firerooms, is expected to be about 11,000 , when the engines are making 124 revolutions per min ute.

The framing of the engines consists of special forged and bolted-up columns for the back, and forged steel, turned columns for the front side. The forged column is similar to that first used by the Union Iron Works for the engines of the "Olympia," and also for those of the "Oregon." It consists of two forged, scrap iron, plate sides, with flanges for securing the column to the bed-plate forged solid with the sides, as are also the flanges for securing the columns to the cylinder bottoms. Between these two sides is secured the casting which forms the main guides, which extends clear through from the front to the back of the columns and forms a rigid connection between the two sides. Below the guides the sides separate and form an inverted Y frame. Below the guides a plate is worked in between the two legs forming a strong intercostal. The con struction, which is plainly shown in the accompanying half-tone engraving of the engines, provides a frame of great rigidity, which does not weigh any more than the cast steel frames, and provides a greater certainty of absolutely reliable material. It has given complete satisfaction in the engines of the "Olympia" and the "Oregon" already referred to, and has been readily ac cepted by the Bureau of Steam Engineering in place of the type called for in the original specifications of these engines.

All of the cylinders, which are constructed of the best qual ity of cast rron are provided with working linings, and linings, and eted. The eted. Than main steam values are of the piston trpe, and they are worked by donble-ba links; practic
ally all of the valve gears are made interchangeable The crank shaft is made in three sections, which are reversible and interchangeable. The crank pins are $143 / 4$ inches in diameter and 17 inches long, and the crauk webs are each $161 / 4$ inches wide by 10 inches thick. A $71 / 2$-inch hole is bored axially through each shaft and crank pin. The thrust shafts are 14 inches in diameter with 9 -inch axial holes. Each shaft has 11 thrust collars, 2 inches wide, placed $31 / 2$ inches apart the outside diameter of the collars being $211 / 2$ inches. The propeller shafts are $143 / 4$ inches in diameter, with a $93 / 4$-inch axial hole bored throughout their length, the hole being tapered in the after section, where it passes through the propeller hub. All of the crank line and propeller shafting is of hollow, forged steel, of very hiph quality.
The reversing gear is of the straight-push type, controlled by a hydraulic controlling cylinder and differ ential valve gear, and a hand pump is attached to the hydraulic end of the reversing engines for operating by hand. The air pumps, which are of the single-acting vertical type, witi inverted steam cylinders, are independent of the main engines, There are two air pumps for the set, which balance each other.

A special feature of the condensers for these engines is the fact that the shells are to be made of steel plate, the water ends being of bronze. This is a feature that may be considered as somewhat experimental, and the result of using steel for the shell will be watched by
marine engineers with considerable interest. The main circulating pumps which supply the condensers with cooling water are of the centrifugal type. There are two of them, one being placed in each engine room. When they are used as emergency pumps on the bilge of the ship, they will have a capacity of 12,000 gallons per minute each. Each engine room is also to be fitted with an auxiliary condenser with its air and circulating pumps, fire and bilge pumps, main and auxiliary feed pumps, and hydraulic steering pumps in duplicate.

The screw propellers are of manganese bronze and are three-bladed, the pitch being variable from 16 feet 6 inches to 18 feet 6 inches, the designed pitch being 17 feet 6 inches. The diameter of the propellers is 15 feet 6 inches. The starboard propeller will be right, and the port propeller left-handed. Each blide is firmly bolted to the boss by tap bolts of rolled manganese or Tobin bronze, secured by lock plates. An interesting feature is that the hubs and plates for these propellers have been tinned, this being done for the purpose of maintaining a better surface on the propellers, and also with a view to mitigating, to a certain extent, any gal vanic action which may arise between the propellers and the adjacent steel structural inaterial.

The ship carries eight single-ended steel boilers


ONE OF THE TWIN ENGINES OF THE BATTLESHIP "WISCONSIN."

A Proposed School for Consuls.
After several long-continued sessions, in which many important papers were read and discussions were had, the special committee appointed by the National Educational Association to inquire into the practicability and advisability of the long talked of National University, at Washington, has adjourned until next February, leaving an unfavorable report in the hands of its secretary. While final action has been deferred, the report, which is in the form of a set of five resolutions, is of such a nature as to clearly show that the committee regard such an undertaking as not within the pale of the government's proper sphere. Coming from such men, among others, as President Eliot, of Harvard, President Schurman, of Cornell, President Harper, of Chicago, President Draper, of Illinois, Prof. Butler, of Columbia, and Superintendent Maxwell, of New York city, this report must carry much weight and is likely to put an effectual damper on the plan for some years to come, at least.
One recommendation of the committee, however, is of special and timely value and must commend itself to every thinking citizen who has had any acquaintance with foreign trade or travel. It is contained in their fifth resolution and reads as follows
'Fifth-The government, through the State Department, might wisely maintain in Washington a school for consuls, analogous to West Point and Annapolis, and like those schools, leading to a life career in the overnment service."
If nothing other than this is ever accom-
plished by this committee, and it can, through its influential membership, get practical politics to recog. nize that aptitude, special training, and permanency are the three essential keynotes to the upbuilding of a really invincible consular force, placing orce, placing us in foreign rade where the training at Annapolis has placed us in oaval affairs, their labors will have been amply productive and beneficial. It may
placed in four compartments, two boilers in each compartment. Each boiler has a mean outside diameter of 15 feet $61 / 2$ inches, and an outside length of 10 feet. They have a total grate surface of 685 square feet and a total heating surface of 21,200 square feet; the boiler pressure is 180 pounds to the square inch. Each boiler is provided with four Morrison suspension furnaces of 3 feet 3 inches internal diameter. The thickness of the shells is $1 \frac{7}{16}$ inches.
We close our description of the engines with a brief statement of the leading particulars of the "Wisconsin." When this fine ship is equipped with all her guns and is carrying two-thirds of her ammunition and two-thirds of her stores, she will displace 11,525 tons. Her estimated trial speed is 16 knots, although she will probably make about 17 knots. She carries a normal coal supply of 800 tons, but with close stowage her bunkers will accommodate 1,200 tons. She is protected by a water-line belt of $161 / 2$ inches thick at the top and tapering to $91 / 2$ inches at the bottom. It will also taper toward the ends, being 4 inches thick at the bow. The turrets and barbettes will carry 14 and 15 -inch armor. The armament will consist of four 13 -inch breech-loading rifles, fourteen 6 -inch rapid-fire guns, sixteen 6 -pounders, and ten smaller guns. There will be four torpedo tubes. An excellent feature of the "Wisconsin" will be her lofty spar deck, which will raise the freeboard to about 20 feet as against 13 feet in the "Oregon."
such a school for training for life as a representative cor training for as a representative of this country in foreign lands is likely to be even
more valuable in furnishing an efficient staff for colonial administration; a civil staff which must soon assume very considerable proportions in our administrative life.

The New Cars of the Third Avenue Line
The new cars on the Third Avenue line are said to be the largest in use on any street railway in the United States. They are 41 feet long and the body of the car is 32 feet long. The platforms are unusually commodious, and the doors are of extra width. The seats are the same design as the steam railroad coach seat and there are twelve of them on each side. Each seat accommodates two persons, but they are a trifle narrow. The windows are arranged so that they can be dropped down, converting the car into a kind of open car. Each car is provided with air brakes, which can stop a car under full headway in half its length. Four sets of cylinders and brake mechanism, one for each pair of wheels, are furnished, so that the breaking down of one would not impair the efficiency of the system. Ordinary air-brakes are also provided. The weight of the new cars is 40.000 pounds and they are driven by four 30 horse power motors.

Gelose is a gelatine obtained from agar-agar and is used for preparing culture fluids for bacteria.
©orrespondence

## The Explosion at the Domi

To the Editor of the Scientific American
The Scientific American recently published a short editorial on the accident at the Dominion Car bide Works. The coroner's inquest held at the reques of the City Council brought out the following facts :
The fire originated in a building adjoining the car bide works, cause unknown.
A hole was cat in the roof of the works directly over a crucible containing about 1,000 pounds of molten carbide.
Water from the firemen's hose was poured in through the hole on the upper floor, whence it streamed down into the furnace room on pigs of carbide lying on the floor, and on a small quantity of broken carbide ready for packing. Gas generated from the water dripping on the cold carbide. It was ignited by burning wood falling through the ventilating shaft, and burned quietly as rapidly as it was given off. Suddenly an accumulation of water poured into the crucible on top of the molten carbide. An explosion followed that wrecked the plant and injured eighteen men. The verdict of the jury was that the explosion came from that crucible, but left it an open question as to whether it was caused by the rapid conversion of the water into steam or by water gas formed by the vaporization of the water on the unfused mixture of coke and lime. The expert testimony was all against the possibility of the explosion being acetylene. Such men as Thoma Macfarlane, analyst for the Department of Inland Revenue: Prof. Shutt, analytical chemist, Dominion Experimental Farm ; Prof. McGill, of the Geological Survev, and the men engaged in manufacturing car bide, deposed that it was impossible to generate acety lene from red hot carbide. Medical evidence as to the injuries from the explosion showed that they were the result of dry heat, not steam. The victims themselve said that the burns came from the hot unfused mix ture of lime and coke. Only one injury was serious, resulting in the loss of an eye.
The coroner's verdict has dissipated a great deal of prejudice against carbide. The jury came to the conclusion that its manufacture was not of a hazardous character when conducted in a fireproof building. The City Council, acting on the finding of the jury, have instructed the by-laws committee to frame a by-law to regulate the manufacture and storage of carbide. They consider this necessary because Ottawa is des tined to be the center of an immense carbide industry Within the city and in a radius of 45 miles, there is over a million horse power in waterfalls, abundance of lime, and easy access to coke and charcoal. In this northern country, where the nights are so long in the fall and winter, acetylene is bound to take a front rank as the poor man's light
a. Holland.

Ottawa, Canada.

## Fossil Hunting in the Rockies.

The State of Wyoming is a geological wonderland. It is new land, the newest land on the continent, geolorrically speaking. In the prehistoric ages, but nearer to the time of the advent of man than that at which any other American land appeared, if not after this advent, this part of the United States arose out of the primeval waters. Up to this time there had been an inland sea, or several seas, over all Western North America from the Gulf of Mexico clear upward to the Arctic Ocean. The outlines of this primeval sea can be traced almost all over the great plains through the Dakotas, Montana, Wyoming, Colorado, Arizona and New Mexico, by the fossil remains which are scattered throughout this vast area in great profusion. The long ages subsequent to this uprising of the land, the Mesozoic time of the geologist, have also left rich deposits to mark them, from the little invertebrate
ammonites to the giant vertebrate dinosaurs of the ammonites to the giant vertebrate dinosaurs of the
Jurassic age, the largest land animals that ever lived. The natural surface formations all through this vast region are magnificent from a scenic point of view and marvelous from any standpoint. The Bad Lands, or lava fields of Dakota, the geysers, boiling springs and vividly colored rock formations of the Yellowstone National Park, the tremendous cañons through which the great rivers have cut their way to the ocean, the alkali lakes and deserts and the rich mineral wealth so comparatively near the surface-all these attest the youth of the earth's crust at this point and indicate some of the marvelous transformations which are being ceaselessly carried on in Nature's vast laboratory.
Small wonder, then, that this region is the paradise of the geologist. A number of scientific expeditions have explored these plains-notably the early ones of Dr. F. V. Hayden, from 1854 to 1859, and those of Prof. Marsh in the early seventies. The latter made more than 20 trips across the mountains and discovered 200 new species of animals. But the fossil field of Wyom ing seems to be practically inexhaustible. For the past two or three years Prof. Reed, of the University
of Wyoming, has been prospecting throughout the State, and last year he made several highly important discoveries. About ninety miles northwest of Laramie he came upon the bones of the most colossal animal ever taken from the earth's strata. This was a huge dinosaur, a monstrous lizard, measuring over 120 feet in length, the petrified skeleton alone, it is estimated, weighing more than 40,000 pounds. The labor of removing this giant is so enormous that the skeleton is still in its natural resting-place, but it is calculated by the university authorities that, by next spring, they will be entirely excavated.
What is, without doubt, the most thoroughly or ganized scientific expedition which has ever entered our great western domain has just finished its field labors. Led by Prof. W. C. Knight, of the University of Wyoming, 80 scientists, mostly professors of geology from the great universities and colleges all over the country, and their assistants, have spent " 40 days in the wilderness "-exploring, examining fossil exposures and gathering specimens.
The expedition was thoroughly organized and equipped. Seventeen teams, with tents, parapher nalia and provisions, with seven cooks and a dozen cameras, left Laramie, the seat of the State University, on July 20. Three secretaries, Prof. Collier Cobb, of the University of North Carolina ; Prof. E. H. Barbour, of the University of Nebraska, and the writer, kept systematized account of what was being done, and gave information to the press of the more important finds. Everything possible was done to secure excel lent and permanent record of the results of the trip. For the photographers a dark room, or, more properly a dark tent, was provided, and every new move and scene was recorded on a dozen plates. The route la through Southern and Western Wyoming, with the Grand Cañon of the Platte River as the chief objec tive from a scenic point of view

The progress of the party had been systematically planned beforehand, to take place so that the fossils might be found in order, from the lower to the higher, from lowest invertebrate to highest vertebrate. Ammonites, baculites, belemnites-but there is no use going over the list of scientific names. Many beautifu and almost perfect specimens of these mollusks wer found and shipped back to the various universities whose representatives were with the party. A num ber of slabs of carboniferous sandstone were obtained with ripple marks and very beautiful impressions of leaves on them, some of the latter as exquisitely lim ned as though carved with an engraver's tool or cut by the photographer's lens. Of course, however, the great objective of the trip was the vertebrate remains, found first at Lake Como, Aurora, in the massive ledges of sandstone which rise in successive tiers at this point. The landscape seemed familiar to us as we camped at the foot of the ridge one hot, dusty even ing about five o'clock. Then we remembered. Prof Marsh took out his great dinosaur (now in restoration at Yale) from this exposure and afterward painted the surroundings. The dinosaur was a mighty lizard, whose remains are found plentifully scattered through out the Cretaceous and Jurassic inland seas of Wyom ing. It was probably a land animal, though possibly it lived amphibiously on land and in fresh water swamps, and perhaps even along the shores of the salt oceans. Prof. Reed, in speaking of the monster discovered by him last year, said
"An accurate idea of a living dinosaur is practically out of the question. According to my opinion, I should say that the animal now being brought to light weighed in life about sixty tons, that he had a neck thirty feet in length, and a tail perhaps sixty-five feet in length. His ribs were about nine feet in length, and the cavity of his body with the lungs and entrails out would have made a hall thirty-four feet in length, sixteen feet in width, and arched over probably twelve feet in hight. Such a space, if properly arranged, would seat at least forty people. A round steak taken from the ham of the animal would have been at least twelve feet in diameter, or more than thirty -five feet in circumference, and would have had a solid bone in the middle twelve by fourteen inches, with no hollow for marrow. A set of fours in cavalry could easily have ridden abreast between his front and hind legs, provided he had not objected. Every time he put his foot down, it covered more than a square yard of ground and must have fairly shaken the earth. The smallness of the head of this animal is a peculiar thing. I should say that the head of this mighty dinosaur was probably not larger than a ten-gallon keg. He must have been a very sluggish creature, as his brain cavity would certainly not warrant the belief that that organ weighed to exceed four or five pounds."
Remains of a number of other animals, mostly reptilian in their nature-with a few primitive mamthese Mesozoic beds of the West. It is believed by scientists that these animals inhabited the ancient lakes and swamps by myriads, and, in dying, sank in the mud. Their bones were covered over with other deposits and became petrified. All through the long geological ages they lay sinking deeper and deeper,
until covered with perhaps 20,000 to 30,000 feet of solid rock. Then, in the titanic process of the birth of the Rocky Mountains, the great surface beds were tilted and twisted and bent upward, and, by erosion, the bones are brought to light. Owing to its massivenes and hardness, the bone most frequently found in the case of almost all fossil animals is the femur, although ribs, skulls and vertebræ are also plentiful. The second day of the camp at Aurora the expedition came upon its first dinosaur bones. Mr. Edquist and his assistants, of Gustavus Adolphus College, Minnesota discovered a great femur, six and a half feet long which they were able, by arduous and protracted labor, to excavate without much damage. A number of others-bones of all descriptions-were obtained on the expedition, the full value of which cannot be ac curately estimated until the scientists return to the laboratories and begin the work of restoration. Quit an interesting and valuable collection of mineral spec mens was also secured. There was a taxidermist with the party, and he can show a fine set of specimens of the bird life encountered on the trip. Mr. J. E. Cameron, of Coe College, Iowa, acted as botanist to the expedition, and went home laden with a collection of the rare and beautiful flowers which strew the prairies and deck the mountain sides.
As a camping trip what a splendid, delightful success it was! The fine, tonic air, the magnificent scenery, all the charms of outdoor life, in the finest game and fish country in the world, made the day pass hilariously and full of enjoyment.
In closing, 1 cannot resist the temptation to relate a little incident. As this is "on" the narrator as well as others I presume he will be pardoned for the telling. Let me preface the story by saying that up to the time of the occurrence I refer to, our acquaintance with coyotes, those small wolves of the Western plains, had been confined to hearing them howl most dismally and blood-curdlingly at about four o'clock in the morn-ing-not so very far from the tent. The day I speakof, three of the party-a man.from California, a man from Minnesota and the writer, who hails from the "effete East"-were exploring an old unused coal mine, indeed only a hole in the ground where the railroad had been prospecting for coal. The California man had a Springfield rifle and a belt fairly bristling with car tridges, the man from Minnesota was equipped with a double-barreled shot-gun and the other fellow had a six-shooter in his hip cocket. As we crept along the low gallery-so low in places that we were almost forced to go on all fours-suddenly there was a terrible howl which echoed throughout the narrow spaces till it sounded like a whole legion of demons--and some thing white and furry, with gleaming eyes and red jaws, dashed by us out toward the entrance to the mine. The mighty hunters, guns, revolvers, and all, tumbled over one another in headlong rout. The revolver went off promptly, with the result of causing the armor plating-pardon, the stiff corduroy trousersof the deponent to be bent out ward like the armor on the ill-fated "Maine." Upon our hurried exit we spied a very small coyote, probably much more frightened than we, scudding off over the plain. Then we re deemed our sportsmanship. Three firearms rang out simultaneously-though what was accomplished by the shotgun and the revolver it is hard to determine -and Mr. Coyote went to join the great company of former citizens of earth whose bleached skeleton whiten the trail from Wyoming to Utah.-The Independent.

## Free Seed Distribution.

As most of our readers are aware, $\$ 130,000$ is appro priated annually for free seed distribution, and this has occasioned much adverse criticism. Secretary Wilson is now preparing the part of his report which treats of free seed distribution. As far as possible, he wishes to avoid the hostility of the seedsmen by dis tributing entirely new varieties, which was origin ally contemplated in the appropriation, and distribute the varieties of seed which the commercial seedsmen are not handling and experimental seeds which have not gained a foothold. The Department's agents are engaged in a search for such varieties all over the world, and after carefully testing the seeds they will be distributed in the appropriate sections of the country. After the species has gained a foothold, the seedsmen may be trusted to take care of the current demand. Secretary Wilson is of the opinion that there is ample work for the Department without distributing time-tried seeds, and that there is enough room in improved grasses alone to absorb to advantage the entire appropriation that the government allows for the seeds. The introduction of one new variety of rice in the South which is now growing successfully is said to have a commercial value of $\$ 1,000,000$ a year to the American growers; it cost the government only about $\$ 5.000$. In connection with the rice cultivation it is interesting to note that investigations are being carried on relative to cultivating rice in an artificial swamp, whieh may be drained off when harvesting time arrives, so as to permit the use of labor-saving machinery. This will enable vast prairies to be utilized.

A correspondent informs us that in 1890 twenty ostrich eggs were hatched by incubator and eighteen of the birds were raised.
Congress will be asked for the establishment of a national park in the southern Alleghanies, probably in the Blue Ridge or Smoky Mountains, west of North Carolina.

A telegram has been received at the Harvard Col lege Observatory from Prof. Kreutz, of Kiel University stating that a planet of the tenth magnitude was discovered on December 4, by Charlios.

The stain of banana juice is almost indelible. It does not proceed from the stalk or plant, but exists in the green fruit as well, from which when cut or bruised it exudes in the shape of viscid milk or cream-like drops.
The International Commercial Congress at Phila delphia was an entire success, and the city of Phila delphia spent $\$ 100.000$ in entertaining the gruests. It is said that large orders were placed by foreign delegate for American groods.
In 1890 there were only four insurance companies in Japan, with a capital of $1,600,000 \mathrm{yen}$. In 1898 there were seventy-three registered companies with a capital of $34,720,000$ yen. At the same period the thirty-six Japanese companies alone showed an issue of 510,000 policies, the value of $120,000,000$ yen.

The President of the New York Board of Health has taken action toward the strict enforcement of the law regarding the sale of poisons. There have been many cases of suicide lately by carbolic acid poisoning, and if this chemical was more difficult to obtain, it would doubtless decrease the number of cases.
The climate of Egypt is magnificent, and there are few winter resorts that are preferable, meteorologically speaking. The air is fine and dry and the sunshine is perfect, while with equable temperature, wholesom food and water, and gentle breezes, there is little to be desired. Unfortunately, the sanitary arrangements in Egypt are very bad, and most of the hotels, even in Cairo, are built on contaminated sites
Fruit is now being shipped from New South Wales packed in the bark of the ti tree and the outer bark of the Melaleuca leucadendron, which is shredded into a sort of coarse chaff. These barks seem to have some peculiar power of preserving oranges cluring carriage This may be owing to the elasticity of the packing and the fact that it permits of ventilation. Unless the bark is cut too fine there is no sweating possible. The bark costs only $\$ 20$ per ton.
The work of the Egyptian Exploration Fund for the year has lain in the same district as before, a short distance down the Nile from Dendereh. Altogether about 1,250 graves of prehistoric age and about as many historic graves-mainly about the twelfth dy-nasty-were opened and recorded. The society has already received from the Egyptian government the promse of a permission to work at Abydos, one of the most important sites in Egypt. Prof. Maspero will return to Egypt to resume the direction of the Department of Antiquities.
In 1897 in Germany $1,383,700,000$ gallons of beer were consumed, 1, 192,000.000 were drunk in Great Britain ; $180,000,000$ in France, and $90,000,000$ in Russia. It is estimated that 36 gallons per head are drunk in Belgium, 32 in Great Britain, 25 in Germany, 21 in Denmark, 12 in Switzerland, 10 in United States, 9 in Ho land. 5 in France, $31 / 2$ in Norway, 2 $1 / \frac{1}{2}$ in Sweden, and 1 m Russia. A writer in The North American Review declares that a large quantity of beer is consumed in order to satisfy the craving for the elements which are eliminated from wheat in making white bread.

Accordıng to Technische Notizen, the celebrated Parisian oculist Dr. Emil Berger has constructed a binocular microscope whinch admits of seeing objects plastically (i. e., in relief). As is well known, the stereoscopic effect is lost by the use of only one eye, and consequently of our monocular microscope, not to speak of the harmful suppression of the vision on one eve at the expense of the other. This new microscope places the object in a normal distance (about 33 centimeters) from the eye. If the news is credible, Dr. Berger's invention will prove a great boon to the hundreds of thousands whose profession forces them to use microscope.
The current number of the Supplement contains a most interesting account of the manner in which photographs are obtained in Paris in the theaters by M. Boyer. In brief, the system consists of an arrangement for burning several magnesium cartridges in succession. A number of batteries of burners are used, and pure magnesium is consumed. The powerful blowing apparatus permits a prolonging of the flash for the time required. The cartridge apparatus is actuated by electricity. In order that it may be possible for the operator to make a series of negatives without being annoyed by the smoke of the preceding flashes, there is installed a ventilating fan actuated by an electric motor. By means of a cloth sleeve the smoke and dust are carried outside of the building.

The Cooke Locomotive and Machine Company, at Paterson, N. J., has just built five locomotives for the Barry Railway Company, of Wales.
The Buers do not seem to have learned how to ren der the rails of railways unserviceable. They heat them and then bend them around trees or other ob jects. They can, however, be easily straightened.
Ninety new locomotives have been ordered by the New York Central Railroad, and five of them will be built after the design invented by Cornelius Vanderbilt and tested by him on the Mohawk division of the road for nearly three months.
Between January 13, 1898, and August 13, 1899, new lines of railway, with a total length of 3,171 miles, were thrown open for traffic in European and Asiatic Rus sia. The total length of railways in the whole Russian empire, on August 13, was 30,321 miles.
Twenty railways threw open their shops to sixty Cornell students during their last vacation. Their employers now say they were cheap at the $\$ 1.30$ a day they were given, and the boys say what they learned was cheap at the price of a three months' vacation.

Rear-Admiral Rugers, President of the Naval In spection Board, has returned to Washington from a visit with the Board to Peconic Bay where a test was made of the submarine torpedo boat "Holland." The Rear-Admirai made a verbal report, speaking in the most favorable terms of the boat.

The first railway in Corea was opened to traffic on September 18. It runs between Seoul and Chemulpo and the track is now laid to within 5 miles of Seoul. It was built by tine American Trading Company, is of standard gage. and is $261 / 2$ miles long. The Japanese government appropriated $\$ 900,000$ for its completion. American materials and cars are used throughout, and there are two trains in each direction a day.

What is believed to be the largest shearlegs in Great Britain have recently been completed by a shipbuilding company. They are guaranteed to lift 150 tous. The legs have an overhang of 60 feet and an inhang of 13 feet from the center of the trunnions. The front legs are 45 feet apart at the bottom, measured from center to center, and are long enough to describe a radius of $13 \overline{5}$ feet. The back leg is $18 \bar{j}$ feet long.
Each car of the armored trains which are now being employed in British operations against the Boers is painted khaki color. Both the engineer and the fire men are completely protected, and the orders are con veyed by bell signals. One of the engines is fitted with a steam pump. Hose is provided of sufficient length to enable water to be taken in from rivers or other sources of supply on the journey. The engine is placed in the middle of the train to allow for the use of Maxim and other guns.

It is stated that the application of heat accumulators on the locomotives of the Moscow-Koursk line of the Russian state railroads has given excellent results, allowing au increase of weight of trains of from 15 per cent to 25 per cent. The apparatus, according to The Engineer, consists of a cylindrical reservoir of cast iron with a capacity of about 300 gallons placed horizontally on the top of the boiler and communicating with it by pipes and valves. During stops or in rumning down grades, when little or no steam is consumed, it is used to heat the water in this reservoir, which is then used for the feed.

Engine No. 601 of the Lake Shore and Michigan Southern Railway made a remarkable run between Buffalo and Cleveland, November 22. It hauled a fast passenger train with eight cars. It left Buffalo 59 minutes late and ran into Cleveland 2 minutes ahead of time, thus making up one minute more than an hour in a distance of about 185 miles, the schedule time being 4 hours and 25 minutes. Between Perry and Painesville, a distance of 5 miles, the running time was made in 3 minutes. The engineer in charge of the train was of the opinion that even this speed could have been increased.
A German manufacturer, who recently visited Pittsburg, was greatly surprised in the difference in the welcome he received eight years ago and at the present time. At the former period the manufacturers enter tained the foreign visitors lavishly and showed them all the wonders of natural gas and the resources o their plants. All this is now changed. He requested permission to inspect certain mills and see the inproved machinery and methods in vogue. He was surprised to find that it was impossible to obtain the required permit. Other foreigners have succeeded in entering some of the mills, but the manufacturers are becoming more and more chary in granting facilities for the inspection of their plants. There was a time, and it was not so long ago, when foreigners did not care to enter the mills; but at the present time they are very anxious to do so. It should be remembered that abroad in very few cases are foreigners ever allowed to inspect plants, and there is no reason why we should grant favors which we cannot receive in return.

The Electric Review objects to the term "wireless telegraphy." and the other names which have been proposed seem equally objectionable, such as "wave telegraphy," "etheric telegraphy" and "space telegraphy."
A prominent detective agency has recently investigated the use of electricity for breaking the vaults if banks and safes. The report states that there haw never been a single successful burglary of a bank vault or safe by electricity, and that there is no necessity for alarm on this score.
According to Eugineering, a young Danish inventor has constructed a phonograph which will take telephone messages. It is said that a steel band is used instead of a wax cylinder. If true, this would be a most interesting and important invention, but we cannot vouch for its authenticity
Wireless telegraphy will, it is said, be introduced into the British navy as a branch study. The "Hector," an old hulk lying off Porismouth, has been fitted out as a school of instruction, and will be used as a receiving station, and the "Canopus" will be provided with a regular equipment of Marconi apparatus.
A curious novelty is a clock let into the sidewalk. The dial !consists of a glass plate through which are seen large numbers denoting the hour and minutes. The upper line changes every hour, and the lower every minute. The figures are operated by electricity and are controlled by a master-clock inside the store. The numbers are carried on celluloid ribbons, which are fed by proper mechanisu.
There was a test of the Pollak-Virag system of rapid telegraphy from Chicago to Milwaukee on November 22. and a test was also made on the same day on a line from Chicago to Buffalo and return. Messages were sent at the rate of 122,000 words an hour between the first named places, and 90,000 words an hour from Clicago to Buffalo and return. The results were not as satisfactory as was hoped, owing to the fact that all the apparatus could not be gotten into position.

- A new dredge for use on the Volga River, in Russia, has just been built by the Cockerill Company, of Belgium, and is constructed in two parte so as to pass through the canal system leading from the Baltic. Each half is 216 feet long, $311 / 2$ feet wide and 9 feet deep, aud each half can be operated separately making a bottom cut 62 feet wide. The dredge has steel hulls and is propelled and controlled by electrical machinery of American manufacture. Steam is generated by American boilers fired with naphtha.
A New York doctor has sent a letter to the Park Board proposing a system of signals in the park, which will do away with much of the uncertainty regarding runaways. He suggested that at the reservoirs there be stationed alarm bells, which will ring under certain conditions and that they be electrically equipped and connected with various stations along the different roads. At each station will be detailed a saddle horse and rider probably from the Police De partment, and as soon as the bell rings the horse will be released, somewhat similar to the system in vogue in the Fire Department. Those in carriages and horseback riders will then be warned by the ringing of bells at the different stations, so that they can get out of the way of danger.
The Electrical World notes that in modern electrical development there is a general disappearance of the original form of the Kel vin mirror galvanometer. The instrument was simple, sensitive and useful, and be fore the dynamo came into existence this type of instrument was used in nearly all electrical measure ments. When dynamos spread and multiplied, the convenience of this galvanometer for measuring purposes waned and direct-reading instruments were introduced. The worst trouble with mirror galvanometers was due to stray magnetism. The same is true of the tangent galvanometer. In the days of the early dynamo they were largely used. The D'Arsonval type of mirror galvanometer came to the rescue at this juncture, and now largely occupies the place of its predecessor. This instrument usually ignores magnetic changes in its neighborhood.
Stockholders of the Electrolytic Marine Salts Company, to which we have already referred on a number of occasions, are coming out of their speculation rather better than might have been expected. The final 6 per cent was paid in liquidation on December 4, making in all 36 per cent of the amount paid in on the stock. This result has been secured, according to Engineering and Mining Journal, by the sale of the dock and shore property in Maine, and by the surrender by the founder of the company, who was the inventor and promoter of the swindle, of a small part of his profits, and in return for this he retains a liberal balance and is left to pursue the studies of life in Paris which he undertook when he left the company and the country, free from annoying legal inquisitions. The company's plant at Lubec, Maine, is earning money for the parties who bought it. It is not, however, turning out gold bricks, but canned sardines.
the trojan horse at the paris opera house.
'The Opera House, of Paris, has just put upon the stage a work of Berlioz, one part of which, under the name of "'The Trojans," was played a short time ago at the Opera-Comique, although there was nothing comical about it, but rather the contrary. The other part, which the Opera House is now giving, is called "The Taking of Troy." Now, every one knows that in this affair a wooden horse plays an important rôle. It is probable that Homer and Virgil and the other authors who have written upon this subject refer to a
feet in length by 8.2 in width, surrounded by a fence The whole weighs 9,240 pounds. The legs form the base of a huge framework constituting the animal's body, and it is to this framework that are applied the belly, flanks, hindquarters, shoulders and head, which latter is 11.5 feet in height and weighs 1,320 pounds. The nostrils, forehead, and eyes are sculptured, while the rest is constructed of juxtaposed pieces of board and forms a sort of inlaid work which is very well exe cuted.

As the Opera House does not give the same play


Fig. 1.-WORKMEN DRAWING THE TROJAN HORSE IN SHOP OF THE OPERA HOUSE.
more or less well founded tradition of a deed of war that made some stir in its time; but it seems scarcely credible that the Greeks would have been imprudent enough to inclose their bravest warriors in a frame having somewhat the appearance of a horse, or, on another hand, that the Trojans could have been simple enough to haul this affair into their city without perenough to haul this affair into their city without per-
ceiving that it was inhabited. Moreover, in view of ceiving that it was inhabited. Moreover, in view of
the means that they had at their disposal, it would the means that they had at their disposal, it would
have taken them a long time to transport such a mass, even had they desired to do so. But, no matter ; poets and musicians do not bother themselves with such details, and so we, in order to follow them, are obliged to reconstruct (for them alone, fortunately) the famous horse of Troy. It was M. Vallenot, the skillful head machinist of the Opera, to whom the business was intrusted.

Documents do not abound, since there are nothing but vague bas-reliefs that can be connected with this monument, and all that we can do is to refer to the Iliad and Æneid. Here we find, among other things, that the legs of the Trojan horse were formed of four trunks of young oaks, and that the body and head were of red fir. In order that the Opera horse may conform to this description, tints have been applied to it that imitate those of the woods employed in the original. The whole is very satisfactory, and it may well be conceded that it resembles the machine of war that the Grreeks constructed in order to occupy their moments of leisure during the long years of the siege.
The Opera horse is about 28 feet in height (Fig. 2). It is made entirely of fir and rests upon a base $26 \cdot 25$
every day, and as an accessory of such a size is some what cumbersome, it was necessary that it should be capable of being easily dismounted. To this effect, the head, neck, and back are provided with rings, through which, with the aid of ropes passing through pulleys above, the pieces are quickly let down to the floor. After this, the frame, which is assembled by bolts, is dismounted in less than an hour (Fig. 3).

However, when the piays produced during the week do not require a great display of stage setting, the horse is not dismounted, but merely stowed a way. By means of two cables winding around a winch in the loft, the mass of 9,240 pounds is raised about two inches, and then, while some of the machinists quickly remove the inclined plane upon which it rests, others cause it to turn about 90 degrees. Then, at a signal, it is gently lowered upon another track provided with is gently lowered upon another track provided with
rails and at right angles with the first, and is pushed rails and at right angles with the first, and is pushed
to the back of the stage, where it is no longer in the to the
way.
The horse is not inhabitable, since the piece does not require the entrance and exit of Greek warrior before the audience; but it has to pass over the entire width of the stage-starting from the wings to left of the spectators and going to the right in order to enter the breach made in the walls of the city. This gives rise to a large procession, formed in part of Trojans, who drag the animal (Fig. 1). Now it would never have been possible, no matter how wide the stage, to make parade of this entire "team," and so it became necessary to employ an artifice. The ropes upon which the men who cross the stage pull are really attached to the horse, which is supposed to be still very far away, while in reality it was very near by and concealed by the side scenes. But the ropes are all of the same length because they are wound around drums that are installed in the framework (Fig. 3) and provided with brakes so that the ropes shall be very taut in order to make it appear that the Trojans are in fact drawing a heavy load. In reality, it is by a windlass placed under the stage that the machinists move the colossal animal at the proper moment. The base upon which the latter rests is, moreover, provided with rollers which run over rails fixed to the inclined plane representing the declivity to be ascended in order to reach the walls of the city. The effect of this huge mass crossing the stage is very imposing.
For the above particulars and the illustrations, we are indebted to La Nature.

## The Evolution of the Bedroom and Bedstead.

Perhaps the last article which the late Lawson Tait contributed to medical litera ture was "Hygiene of the Bedroom and Bedstead," which appeared in several British and American journals. It treats of the evolution of the bedroom and of that now necessary article of furniture, the bedstead, in Great Britain. It tells us, says The Medi cal Record, that in the days of the cave dwellers and through the various stages of savagery and nomadic life, dwelling space was used for all purposes in common. It was not until the wandering hunter had, so to speak, settled down that he saw the advantage of putting aside a portion of his
dwelling for sleeping purposes. The Briton in the time of the Norman era had a very fair notion of what constitutes a comfortable bedroom and bedstead, although his castle might be outwardly grim and forbidding. The walls of the castle were thick and solid, thus securing a fair uniformity of temperature, while the downdrafts of cold air were modified by hangings of tapestry. For their bedsteads there was no need of hangings. The Saxon farmer, however, had to live under very different conditions. His house was of wood, and carpentry at that time was at very low ebb, so that the doors and windows were ill-fitting, and drafts were the rule. This resulted in the evolution of that abomination of abominations, the four-poster bed ; and as Dr. Tait preferred to put it, "A small bed; and as Dr. Tait preferred to put it, "A small apartment was constructed inside the bedroom in the
shape of a four-poster hung round with curtains, into shape of a four-poster hung round with curtains, into
which a whole family must have crowded. possibly which a whole family must have crowded, possibly
with the addition of occasional visitors." The conservative Britisher clung to his time-honored four-poster until the fifties, when occurred the dawn of domestic sanitation. The first step in the right direction was the introduction of the metallic bedstead.

## American Inventions Abroad.

The fact that the United States is the most profitable field for the exploitation of useful inventions has taken a firm hold upon the inventive minds of other countries, says Consul Albion W. Tourgée, of Bordeaux, France. The first thing a man does who has a new idea of any sort is to seek to have it patented in the United States. This is specially true of inventions United States. This is specially true of inventions pertaining to railroad appliances. French inventions
are usually defective in the mechanical character of are usually defective in the mechanical character of
the means by which the end sought to be accomthe means by which the end sought to be accomplished is attained. This is, no doubt, due to the fact that so small a portion of the population have any practical mechanical knowledge. Almost every man


Fig. 2.-THE HORSE COMPLETE.
in the United States knows the use of tools, and very many who have no manual occupation are fairly skilled workers, and those who have inventive genius are not ashamed to devote their leisure time to the acquirement of the technical skill necessary to prepare their working models and perfect their inventions. In France, on the contrary, such knowledge is considered France, on the contrary, such knowledge is considered
derogatory to anyone in the higher walk of life. A clerk will not close a shutter nor dust off the top of the desk on which he works, since that is the business of an "ouvrier"; nor will a man who moves in good society permit himself to be seen carrying a package of any sort along the street. One result of this exclusive use of tools by laborers is that French inventions usually have to an American a certain sense of awkwardness in their mechanical application. The idea may be a good one, but there is very seldom any of the handiness which one finds in an American invention. Mr. 'Tourgee cites a French invention which was brought to him. It does not seem to us to be particularly new, and he says concerning it that whether the system is of practical importance or not, it serves to show how the United States is regarded by the inventors of Europe, who make haste to secure protection under our law, so as to take advantage of the wonderful market it opens to really meritorious devices.

There is a total enrollment of about 3,000 students in Cornell University, consequently the class rooms, lecture rooms, and laboratories are overcrowded. This shows that Cornell is enjoying well-deserved prosperity. Extensive additions are contemplated. There are now 225,000 volumes and 36,000 pamphlets in the library of the university.

## December 16, 1899.

## A NEW SAFETY VALVE.

We give herewith sectional and plan views of a new safety valve, for which we are indebted to La Nature. The plate submitted to the action of the lever that carries the counterpoise, $D$, rests upon the top of a small cylinder, $B$, movable in a vertical direction in the valve box. This cylinder carries at its lower part a transverse piece, $C$, provided with two apertures, and into which is screwed a vertical rod This latter is connected through a nut with another rod, $D$, which is fixed to a thin metallic disk, $M$, of which the circumference is clamped between the flanges of the valve box. Beneath the disk, $M$, ther is a double spiral spring, $H$, which rests upon a disk that can be maneuvered by means of a screw protected by a cover hinged to the bottom of the box. The base of the latter is provided with an aperture for the purpose of revealing the existence of any leakages of steam that might take place through the disk, $M$.
The regulation of this valve is a very easy matter. The surface of the disk, $M$, is such that the pressure exerted upon it by the steam is equal to that exerted upon the cylinder, $B$, and the rod, $C$. Such pressure is obtained by regulating the tension of the spira spring by means of the screw at the bottom. By act ing upon the nut that connects the rods, $D$, the cylinder, $B$, may afterward be brought into contact with the plate submitted directly to the action of the lever carrying the counterpoise.

Such regulations will remain in force for pressure up to an amount determined by the conditions of equilibrium adopted: but it will no longer exist if the weight, $G$, be changed or the lever rendered station ary. In fact, if the weight be increased, the cylinder $G$, will immediately descend, and the steam will es cape. In like manner, if the lever be fixed, the pres sure will cause the disk, $M$. to $y$ ield and carry along the cylinder, $B$, through the intermedium of the rod, $D$.

## A CALIFORNIA VERDE ANTIQUE QUARRY.

## y prof. challes. f. holder

The question whether we are advancing in the mechanical arts and great schemes of engineering is often suggested when we are confronted with the work of the ancients. The pyramids are the most stupendous works of man ever contemplated, and there appears to be nothing new under the sun. Interest in irrigation in the Southwest dawned within the past twenty years, yet in Arizona and New Mexico there are traces of a civilization so old that the mind falters in following it back. We see beds of streams cut through miles of country, even wountain ranges, and a maze of irrigation streams crossing and re crossing the land, made unknown ages in the past years, so perfect from an engineering standpoint that the experts of to-day are emptying them of the sand and débris of centuries and using them as the arteries that shall bring new life to this fertile part of what was the old Ame rican Desert. Everywhere we follow in the steps of the ancients, and on the island of Santa Catalina there is an interesting illustration of this.

When the whites first visited Southern California, they found in use among all the mainland Indians richly shaped ollas or mortars of steatite or serpentine, while scores of articles were formed of finer grades of the same, which experts have pronounced verde antique. In almost every grave ollas were found, and hundreds had been handed down and were in the possession of the Mexican descendants of the Indians. There were flat stones, perforated to hang on pegs, quaint ornaments, sculpturings of varions animals and tally stones with lines cut in them. One found by the writer at Santa Cruz Island on the breast of a


THE ROUND SCARS INDICATE THE PLACES FROM WHICH THE OLLAS WERE BROKEN BY THE INDIANS

serpentine quarry and mill, santa catalina island, cal.
sace is shown by the ollas they made, and they were the merchants who supplied the races of Southern California with their pots and mortars or ollas.
Prof. Schumacher's attention was attracted at Pott's Valley by the remarkable rock shown in the accompanying illustration, where the scars of ollas that have been broken off by the islanders are plainly seen. The rock is a lofty mass of steatite that rises in the center of Pott's Valley, now called Empire Landing. It is a land-mark from a long distance at sea, and is overgrown and surrounded with cactus and various kinds of vegetation; indeed, the cactus hides a large portion of it-an almost impregnable chevaux de frise. The scars are circular and are the marks where the round ollas were broken off. The method of work was very primitive, the natives having only slate and quartz knives to work with. With these rude implements they carved out an object the shape of a cannon ball and as large as a football. Gradually this was picked away until, finally, it hung by a narrow stem, which was broken off. The inside was then slowly dug out with the same rude tools, and in time the olla acquired the smooth and often artistic form so familiar in all the museum collections. The common shape is round, but fine mortar shapes three feet in height were not unusual.
The writer some weeks ago went over this old manufactory very carefully and found it most interesting. Here was an aboriginal manufactory - an out-door workshop-in the immediate vicinity of which were found verde antique implements in various stages from the olla just outlined to the one that had been broken off leaving the scarsin the rock. In a word, the complete evolution of the olla could be traced here, especially t the head of Cottonwood Cañon, back of Pott's Valley, where verde antique crops out in ledges in every direction. On many of these can be seen the work of the native carvers, while beneath are the piles and heaps of chips as they were left centuries ago.
The early Spanish navigators, Cabrillo and Viscaino, who discovered the island three hundred years ago, described the fine canoes of the natives. These, laden with ollas, crossed the Santa Catalina channel, and the natives exchanged them for game and skins not found here. The present owners of the island, recognizing the value of the stone for coumercial purposes, have followed out the mute sug. gestion of the ancients by establishing at Empire Landing a sawing plant, opening up a valuable quarry and one that is unique, it is believed, having no prototype at least in this country. The verde antique resembles soapstone in the crude rock and would easily escape observation. It is of different degrees of hardness, and while so soft that it can be readily worked, it has great tensile strength, its chief value being in the remarkable manner in which it can be worked. Almost every possible object can be made from it from a boat to a screw. A great value lies in its imitation when polished of the darker grades of marble; and owing to its cheapness and durability it is in demand among architects for mantles, lining, electrical slabs, and where a perfectly polished surface is required with the strength of marble. The new city hall of Los Angeles and many of the fine buildings in that city and San Francisco are finished in it, the stone taking a rich polish, abounding in greens and yellows, grays and black.
A visit to this quarry is most interesting. Here, eight or nine hundred feet above the sea, is an elaborate plant and a series of saws that are capable of cutting out hundreds of feet of verde antique a week. The rock is first bored into with a steam rock drill, a modern improvement on the flint chins of the ancient owners of the soil. A series of borings make it an easy
matter to break off the slab, which is then by means of a huge crane lowered upon a car and run under the saws and blocked for cutting. The terin saw would be misleading to the layman, as it is really a gang saw with blunt surface, and worked by the steam en gine moves back and forth on the edge of the stone not touching it, but cutting by the grinding into it of a mass of steel shot which are really the teeth of the saw. The rapidity with which this is accomplished is marvelous, and large slabs are cut out with ease-huge slabs for the side of a wall, fronts for fireplaces, aquarium sides or plates, tiles for flooring, etc. Al the tanks of the Geological Station here were mad from this stone, which apparently solves the question of producing a cheap but attractive aquarium and one so far as the tanks are concerned that can be built rapidly. The stone is cut into the proper shape and shipped to Los Angeles, where it is polished and ap plied to many purposes, and its development has be come one of the valuable industries of Southern California.

## A NOVELTY in RAILROAD COLLISIONS

The popular interest which a railroad collision pos sesses is, no doubt, due in part to the extraordinar manifestations of power revealed by the curious and often grotesque positions into which the various elements of the coliiding trains are thrown. Although we do not see the solution of the popular conundrun as to what would happen if the "irresistible" were to strike the "immovable," we do have an opportunity to see how the huge moving mass of the locomotiv and its load seeks out the line of least resistance and arranges itself accordingly. The confused entangle ment which is known by the name of "railroad wreck" assumes its curious positions in accordance with strict physical laws.
The accompanying view of a wreck, which occurred recently on the Chicago and Alton Railway, was repro duced from a photograph, for which we are indebted to our esteemed contemporary The Railway Age. Our readers will understand how exceptional were the re sults of this collision when we explain that the coal car, upon which the locomotive is seen resting, is not one of the cars of the first train. but was the first ca immediately behind the locomotive of the second train. The circumstances of the collision were as follows: Two heavy freight trains had been sent out over the lines, with about fifteen minutes' interval beween them. The first train had been stopped at tank to take water, when it was run into by the second train, which was being hauled by two engines and wa running at the rate of about twenty miles an hour The leading engine was flung to one side of the track and, turning completely around, came to a rest headed in the opposite direction from which it had been traveling. The second engine, the one shown in our illustration, must, at the moment of the collision, hav been forced into the air clear of the rails to a sufficient height to allow a forty-ton coal car, which was the eading car of the train, to shoot forward beneath and catch it as it fell. In no other way could the relative positions, after the collision, of the engine tender and coal car be explained. As a matter of fact, is a common occurrence, where the locomotives weet front to front in collision, for the engines to rear squarely into the air and then fall sidewis or be thrown back upon their own trains. The nere momentum of the two engines alone would not accomplish this or fling a locomotive, as in the case of our illustration, clear into the air but we must remember that behind the engines there is the stored-up energy of, say, a thousandton train moving at the rate of twenty miles an hour, which would be amply sufficient to force he locomotive clear of the rails.
The engine having elected to travel on othe wheels than its own, the wrecking crew promp y accepted the suggestion, and, after backing the end of an empty coal car under the front end of the engine, as shown in the illustration, the two cars with their novel fremght were hauled to the Bloomington shops for repairs. The weight of the engine is fifty tons, therefore, the total load f the car, including the coal, was about ninet tons. The bolsters were of steel, and it speak volumes for the strength and general excellence of construction that it should have received and carried such an unprecedented burden without ma rial injury.

## Variations in weight.

The following table, which is given by W. W. Wag staff in the last number of Knowledge, is interesting:

|  | verage. | lb. oz. | lb. oz. |
| :---: | :---: | :---: | :---: |
| 9 | A. M.-Before breakfast | 155 | (losing 3 6) during night. |
| 10 | A. M.-After " | 157 | (gaining 112 ) |
| 12 | noon.- Before lunch | 156 | (losing 0 14) |
| 1 | P. M.-After | 1576 | (gaining 10 ) |
| 5 | P. M.-Before dinner | 15612 | (losing 010 ) |
|  | P. M.-After | 15814 | (gaining 2 2) |

By these figures it will be seen that an average person weighing 155 pounds loses 3 pounds 6 ounces dur-
ing the night and that he gains 1 pound 12 ounces by breakfast and then that he loses about 14 ounces be fore lunch, that lunch adds an average of 1 pound and then he again loses during the afternoon an average of 10 ounces : an ordinary dinner to healthy persons adds 2 pounds 2 ounces to their weight. Of course exces in eating and drinking will change these figures, but they are interesting as averages

## A NEW FORM OF FIRE-ESCAPE AND LOWERING

 APPARATUS.To provide a simple apparatus for lowering objects of any kind gradually, which apparatus will be partic ularly adapted for use as a fire-escape, is the purpose o an invention patented by Edward M. Christ, of Pine


PERSPECTIVE AND SECTIONAL VIEWS OF THE FIRE ESCAPE AND LOWERING APPARATUS.
Grove, Pa. The apparatus comprises essentially a Grove, Pa. The apparatus comprises essentially a
sand cylinder with a valve outlet, in which cylinder a screw-driven perforated follower is contained, serving to regulate the rapidity of the descent.
Fig. 1 is a perspective view of the apparatus, the sand cylinder being broken away to show the follower Fig. 2 is a cross.section taken immediately above the cylinder. Fig. 3 is a cross-section taken through the bottom of the cylinder.
The cylinder and perforated follower are supported in a frame in which a windlass is mounted. About the windlass a rope is wound, passing behind an upper and lo wer roller and in front of a central roller, so that it is bent out of the straight course, as shown in Fig. 1. The shaft of the windlass carries at one end a bevel gea meshing with a bevel gear on the threaded shaft of the follower. The bottom of the sand cylinder as wel as the follower is perforated, providing a number of outlets for the sand. These outlets are normally closed by a valve plate, which is provided with openings adapted to register with the outlets in the cylinder bottom.

The valve plate has an extension or arm with which


CURIOUS COLLISION-COAL CAR BRINGS HOME ITS OWN LOCOMOTIVE.
a spiral spring is connected, serving to hold the valve plate in the position shown in Fig. 3. One end of the entral roller is connected with the arm, the other end of which is loosely held in a bearing on the frame.
When the parts are in their normal position, the coil spring will hold the valve plate of the sand cylinder closed: but when the rope is pulled, the central roller will be thrown aside, thus swinging the valve plate, causing its openings to register with the cylinder outlets, and permitting the sand to flow into a receiving pan. The ollower cannot descend until the sand begins to run and the rapidity of its descent will be regulated by the quantity of sand dropping into the pan in a given time
The degree of pressure on the rope automatically
controls the flow of sand. The rotation of the windlass is regulated oy the follower; hence the rope, with the object to be lowered, is caused to descend gradually. The rewinding of the rope will simultaneously raise the follower shaft and return the follower to its initial position.

Automobile News.
A representative of a German firm purchased one of each make of several automobiles at the National Export Exposition. He says he was attracted by the superiority of the ball-bearings and running gear of the American machines. He intimates that the superior points of the American machines will be taken advantage of, and will most probably be incorporated in their future output.
The electric automobile recently covered the distance between Atlantic City, New Jersey, to a point four miles west of Berlin, Camden County, a distance of fifty miles. The round trip was made at an average speed of 15 miles an hour, and a speed of 20 miles an hour was attained at times. The distance was carefully measured by three bicycles provided with cyclometers.
A steam plow invented by Colonel Templer, R.R., Director of the Military Baliooning and Steam Transport, has been given a trial near Aldershot, says The Mechanical Engineer, and fully carried out the objects for which it was designed. It threw up a 4 -foot intrenchment at the rate of 3 miles an hour across a very rocky and rough country, Two of these machines are to be shipped at once for use with the South African field force in storming positions. The machine is so arranged that it will throw up works on either the right or left, and so powerful are the picks in front of the plowshares that rocks and stones are split to pieces and hurled upward.
The Automobile Almanac for 1900 and the Automobile Trade Directory is soon to be published by The Automobile Magazine, of New York, and will contain a large amount of valuable information interesting to automobilists, such as special reference to signs of the weather, moonlight tables, wird pressures, State ordinances, highway laws and directories of all kinds. We see from some of the advance statistics which have been furnished us that there are 688 automobiles in use in the United States, or about ten per cent of those used in France, that number being 6,546. No other country, however, can boast of as many automobiles as our own, Belgium coming next with 478 : then comes Germany with 434 and Austria 403. Great Britain has 412. It seems that there are 190 manufacturers in the United States, but that of this number only twenty were in a position to deliver carriages on December 1, 1899. In France, on the contrary, there are 702 manufacturers and 1,150 dealers.

## Laurel Wreath

It is an interesting fact that the large laurel wreath which was presented to Admiral Dewey by the United States Senate was composed of leaves grown in Africa. The wreath was about three feet in diameter and was made of silver laurel leaves mounted on a base of natural pampas grass. The leaves are pure silver gray on both sides and are delicately veined. The leaves have a white metallic luster and an exquisite softness of tone. The New York Tribune recently had some interesting facts concerning the silver laurel. It is looked upon by the natives of Africa as a sacred plant, and was used as a decoration for festive occasions. Its beauty and similarity to silver have induced collectors to send it to European countries, and the inroads on the growing stock have been so great that its exportation has been prohibited, and the leaves which now come to Europe and the United States are said to be smuggled, the price in New York beinir about 25 cents a leaf. By the presentation of the laurel wreath, the custom established by the Greeks many hundreds of years ago was followed, and by the ceremony Admiral Dewey became one of the host of laurel-crowned characters who figure in the chapters of bistory. The laurel of the ancients was dark green and was the same hardy plant which is now found in abundance in the Mediterranean region and in the Canary Islands. There were at least four shrubs and smal trees known as laurel, or bay. The Laurens nobilis, or "Victor's laurel," known also as sweet bay, was one which was used by the ancients for the decoration of favorites. It was a large leathery, shining, reticulated leaf and with axillary cluster of yellowish-white flowers The fruit is oval, bluish-black in color and about a hal inch long. It is not as common in Europe as the species of cherry laurel or common laurel, which is also found in the United States.

There were nearly 22,000 deaths in 1898 from snake bites in India. According to The Medical News, the efficiency of the new serum is now fairly well estab lished, but the price of a bottle, which is $\$ 1$, puts it beyond the reach of most of the victims.

HOW SCULPTORS CHANGE THE SCALE OF THEIR statues,
Sculptors do not always make a full-sized model of their work, but occasionally they do. At any rate, almost none of them actually do their own cutting in marble. This is intrusted to highly skilled artisans who do the work under their direction, and the sculptors superintend all of the finishing touches and even occasionally do some of the work on face and hands. The actual cutting of the stone is a most $\begin{aligned} & \text { ifficult pro- }\end{aligned}$ cess, requiring great expert skill. In case a full-sized model is made, the sculptor sends it to one of these professional marble cutters, who roughly outlines the block. The general outline is often given to the block before it leaves the marble quarries in order to save freight. The rough carving is then done by the marble cutter, who so shapes the block as to give it the general outlines of the figure to be reproduced. To effect this he drills a series of holes in the block, the depth of each of which corresponds to an external point of the statue supposed to be inclosed in the stone. After a sufficient number of these holes have been made, he removes the entire perforated portion, and what remains gives the broad lines of the statue. This focusing can be effected simply by means of a series of vertical cords and the compasses or by a special instrument called the "sculptor's cross." In the first method a rectangu ar frame is secured over the head or top of the statue and from it depend a series of plumb lines around the model, and an exactly similar series depend from a frame suspended above the marble to be chiseled. These lines are marked with divisions starting from the frame. In order to mark a datum point of the statue in the marble, the workman measures upon one of the guards its vertical distance from the plane of the wooden frame, and then by means of com passes its horizontal distance from the cord. This done, he places the drill near the corresponding cord of the rough block and marks upon the drill the length of the hole which he then bores until this mark comes even with the cord. The end of the hole is then at the same distance from the cord as the real point in the model, which has been ascertained with the aid of a compass. The workman then operates in the same way for a series of datum points which have been marked in the model, so that finally the workman succeeds in determining the general scale and form of the statue by means of a multitude of facets, which, when the marble is removed in flakes, grives the general form of a statue.
This method of procedure is advantageously replaced in many cases by an instrument called the "sculptor's cross," which is based on the principle that a point is determined by position in space when we know its distance from three fixed points. The apparatus consists of two iron rods at right angles with each other and connected by a double socket similar to that of a marking gage. The vertical rod has a slider, which holds at right angles an arm provided at its extremity with a bent point, and the lower or horizontal rod is provided with two straight points. The extremities of these three points constitute fixed points, with respect to which the positions of the different parts of the model are determined. Upon the vertical rod slides a socket, which, through a ball joint, supports the bar upon which is the exploring style. The use of the instrument will be seen from our illustration, for which we are indebted to Lectures pour Tous. The workman selects three points upon the model and three corresponding ones upon the block. The points of the apparatus are fixed once for all, so as to apply themselves either upon points upon the model, or upon the block, so that the three points may be determined with the greatest accuracy upon the rough-hewn block. After fixing the intermediate style-bar in the proper position, one of the points of the model is put in contact with the style; the serews of all the joints are tightened, and then the instrument is transferred to the block. The latter is then chiseled away until the region is reached upon which the point of the style is resting. The three fixed points rest in their places. The same thing is done for a series of points quite near each other and arranged over whole surface of the model. The mobility of the sockets and of the ball and socket joint of the stylus-carrier permits of reaching all the regions of the statue without changing the position of the points, and this insures great accuracy in the work as a whole Finally all the contours of the figure are determined point by point. The workman becomes so expert in the use of this instrument that a sculptor can confide his model to him with a full assurance that all parts of it will be reproduced with absolute fidelity.

Gutenberg invented printing by using movable types, while Mergenthaler, who also marked an epoch in the art of printing by his invention of the linotype machine, virtually discarded them

A SWITCH-THROWING DEVICE FOR CARS. Our illustrations represent in perspective, section, and plan, a new form of switch-throwing mechanism, which is operated by the motorman or driver of a car. The device is the invention of Swan Parson, New Britain, Conn. In the platform of the car a foot-rod is vertically mounted in a bracket and provided at its lower


PARSON'S SWITCH-THROWING DEVICE FOR CARS.
end with a switch-operating plate. The fuot-rod is normally held in raised position by means of a coiled spring. The switch-operating plate, as shown in Fig. 4, representing an inverted plan view, comprises two guides having obliquely-disposed edges converging toward the rear of the car. Two spring-pressed guidefingers are pivoted in a depression at the rear ends of the guides. A pointed central guide is located in the rear of the oblique guides and is adapted for contact with pivoted fingers. When in contact with the pointed guide, the fingers and corresponding oblique guide form a straight line. The switch-tongue is provided with a projection (Figs. 1 and 3 ) normally spring-


METHOD OF USING THE "SCULPTOR'S CROSS" IN REPRODUCING STATUARY.
pressed outwardly and designed to engage the switchoperating plate on the car. In order to throw the switch the foot-rod is depressed, so that the projection on the switch-tongue engages one of the oblique guides. Let it be supposed that it engages the upper guide in Fig. 4. The oblique guide will throw the switch toward the central position until the projection comes in contact with the upper spring-pressed finger in Fig. 4. The finger will thereby be pushed hack until it as sumes the position shown by dotted lines and forms a continuous guide for the switch-tongue projection, with the upper oblique guide and lower edge of the rear guide. The tongue is hence gradually thrown. If the other finger were engaged by the projection, the switch-tongue would be thrown in the opposite di-
rection. The device it is evident will throw the switch in either direction, without any difference in the operation. Even if the projection were not encaged by one of the oblique guides, the switch would still be thrown by a finger and the rear guide. The device cannot, therefore, tail in action.

Hydraulic Elevators for the Eiffel Tower.
M. Ribourt gives, in the bulletin of Societe des In genieurs Civils, an account of the hydraulic elevators for mounting to the first and second platform of the Eiffel Tower at the time of the Paris Exposition. These elevators are now being constructed by the Fives-Lille Company, and will be installed in the east and west pillars of the tower, assuring a total of 20,000 persons per day. They are independent of each other, and the motors of the hydraulic cylinders are operated by pumps placed in the south pillar of the tower. The elevator truck supports two cabins which will hold 50 persons each. The whole, with 100 passengers, is to weigh only 15,500 kilogrammes. The twin hydraulic cylinders have pistons in laminated steel whose diameter is 400 milimeters, with a course of about 17 meters. These cylinders operate a series of pulleys, carrying the wire cables of the elevator. For the ascent, they will be fed by two high-pressure reservoirs, containing water at a pressure of 50 atmospheres. Upon the descent, the water will be forced into a low-pres sure reservoir at 20 atmospheres by the weight of the elevator. The time occupied in making the trip from the ground level to the second platform, or twice 130 meters, will be but two minutes. About 500 horse power will be required for the ascent of the elevator. For the descent, a hydraulic brake is to be used.

## The Automobile in Africa.

One of the first projects for the use of the automobile in Africa is that which has been recently taken up by a French company, the Compagnie de Transport ation du Soudan Française. A treaty has lately been passed with the government, permitting it to engage in the transportation of merchandise in Soudan, of which the French possessions hold an important place. Between the station of Kayes, the iimit of the present railroad, and the Niger, lies a siretch of country of about 300 miles, which at present has but little transportation facilities, and it is this gap) which the new company proposes to fill up with the aid of automobiles, which will thus join the railroad to the right bank of the Niger. The vehicles will be of a slow-speed pattern and will follow a kind of wide grass road running through this part of the country; this road, while impracticable in the rainy season, is at other times quite well adapted for the passage of automobiles. About fifty will be needed to supply the demands of traffic. These are now being constructed by one of the large Paris factories. One peculiarity of the service is that Chinese are to be employed as conductors, these having been chosen because they are able to support the climate of the region and are more intelligent and capable than the natives.

The current supplement
The current Supplement, No. 1250, is a par ticularly interesting number. "The New Bremerhafen Dry Dock " is fully illustrated. The annual address of the American Society of Mechanical Engineers, entitled " Engineering in the United States Navy-Its Personnel and Material," by Rear Admiral George W. Melville, U.S. N., is continued in this issue. "Suggestions as to Improved Appliances for Launching Ships' Boats" is by John Hyslop. "Recent Excavations in Ancient Babylonia" is an interesting and fully illustrated article. "The Development of Iron Manufacture in the United States in the Past Seventy five Years" is a most important paper by John Fritz. "A Uniquc Impuise-Wheel Generating Plant" is also fully described. "The 'Iransmission of Electrical Energy "is an illustrated article. "Geography," the address by Sir John Murray, president of the section of geography of the British Association, is concluded.


RECENTLY PATENTED INVENTIONS．
Engineering improvements．
differential pressure gage．－Charles B Heintz，Cleveland，Ohio．The purpose of this inven
tion is to provide a pressure－1ndicator for engines，cylin ders，pumps，by means of which it is possibleaccurately determine the pressure at both ends of the cylinder or i the two pump－chambers，so that in case of variation o essary aijustments in the valves，The indicator cem P1898 a tube adapted to be connect at its ends with different pressure supplies．Pistons are fitted to slide in the tube and are spring－pressed toward the ends of the tube．A pointer
against each piston．
furnace．－John L．Brown and Julius R．Tan ner，Allegheny，Penn．The furnace is of that clas in which the grate comprises an endless conveyer
mounted to travel in the fire－box so as to carry the fue uniformly to the point of combustion．The invention is primar．ly concerned with the provision of a chain con－ eyer．A pair of rods oblong，in cross－section，ar
losely mounted in the chain．The horizontal forks o the grate－bars are mounted on the rods，the bars being
arranged back to back to prevent their displacement arranged back to back to prevent their displacemen
when in positiou．A coupling－link connects the rods to hold them from independent movement．

## Mechanical Devices．

type－writing machine．－Manuel S．Carmo－ A．Mexico，Mexico．Two patents have been granted to this mventor for a novel type－writer．In both machines
the same result is attained with somewhat different means．With only five keys，he obtains all the charac－
meane ters usually employed in writing，so that the machine ca
be readily operated with one hand．Tine number of com binations obtainable with these five keys is thirty－one Two auxiliary keys are emploged，by means of which thirty－one additional characters can be obtained twice over，so that the total number of possible charaters
ninety－three．The spacing of the type is automatically measured，so as to correspond with each letter to b printed，enabling the form and size of the type to be
varied at will．With the same machine large and small varied at will．With the same machine large and smal and Russian characters can be used．The writing is al ways completely visible．

Railway－Contrivances．
SEal－Lock－－Webster F．Traves，Nelson，Cana－ carrier moving in a casing and having a longitudina slot，and held statiouary by a part carried by one of the members to be secured．A pin is held on the carrie adjacent to the slot；and a pin in the casing enters
the slot of the carrier when the carrier is held by the arts of one of the members to be secured．The tw pins hold a frangible seal which is broken when the

## Miscellaneous lnvention

DISPLAY－CABINET FOR WINDOW－SHADES． Henry MuGinnis，La Salle，ill．In selling window hades at retall，the salesman has much trouble in roperly exhibiting his wares．The shades，moreover，
reason of much handling，are considerably wor The device comprises a supported shelf having a serie of longitudinally extending slots in one end．Roller brackets sllde in the slots；and complementary roller supports are mounted at the other end of the shelf．In
displaying the shades，the shelf will be swung open and the shades pulled down in succession for exhibitio The body of the stock will be kept in pockets provided or it and will be taken out only to fill an order．The pocket，so that it is possible to tell at a glance how man hades of any style are on hand．The stock will als eo kept clean，even the sample staades being kept in display device．－Addison P．S．Deem and provides a device which will serve as a frame for picto rial or advertising matter and a receptacle for matches， cigars，cigarettes，and pipes，or soap and combs，or pen and ink．The display－device is so constructed that
the advertising matter may be changed．The device may be hung up or made to stand alone on a support． non－REfillable bottle．－Joseph Colba ANI，Brooklyn，New York city．The bottle has ragule bottom over which a plug is located．The keeper
rod of a sealing device is passed through the bottom topper to an engagement with the fragile bottom latch－rod carrying a stopper is arranged for locking e gagement with the keeper－rod，the end of the latch－ro projecting from the bottle neck．When it is desired to empty the bottle，the end of the latch－rod is sharply riven down，whereupon the pointed end of the keepe rod will be forced through the fragle bottom，the opell
ing thus made being stopped by the plug mentioned At the same time the neck stopper is carried down，thus unsealing the neck．
brick－Mold sander．－Elson T．Bennett，To anda，Pa．In the ordinary brick－mold sander it the proper time so that there will be no interruptio in the feeding．It is also necessary to rap the boxes by
hand in order to remove the surplus sand，and to feed hand in order to remove the surplus sand，and to feed
the molds by hand．The preseut invention renders this wrk automatic，so that the feeding of the molds to the machine，rapping，and sanding are mechanically per－ The automaticity of the operation of this machine dis tinguishes it from all other brick－mold sanders
PROJECTILE OR DART FOR BLOW－GUNS Joseph G．Whittier．Attica，Ind．The projectile is so constructed that it will not only pass through the gun－ barrel with great velocity，but travel true to its course
after leaving the barrel．Upon striking the target，the projectile will inclent it or cling to it，so that a mark will left at the point of impact．
Tap．－Charlees N．Duncan．Kewanee，ill．The tap consists of a right－angularly slotted plug，one slot being
closed at both ends and the other being open at oue end．
he closed slot，and iserted lateratly in the plage hroug wise through the open slot．Both plates fit together an The improvement enables the tap to be inexpensively onstructed．Various sizes and forms of threads ca be cat with the same tap．The dies can be supersede y others or taken out and sharpened when worn．
TOOL－HOLDER．－William H．C．Harrison，Wood ville，South Australia．The invention provides a mean for carrying a set of independent bits in a socket，so hat they cannot be mislaid．When required for use ny one of the bits can be quickly secured in the
socket．The bits are hinged or attached at their tang end on a rotatable sleeve，so that when required each b may be turned on its hinge and quickly affixed in the
cket．The bit may be returned to its initial positio without being detached from the sleeve．The number of its which can be carried is limited only by the capacity of the sleeve
FLOWER－POT STAND．－William C．Krick，Brook－ n，New York city．The stand comprises an uprigh with the lower end of which legs have swinging conne for engaging with the upright．Adjustable arms for re eiving the flower－pot tray are pivuted to the upper end of the upright．The stand besides being firm and sub－ tantial，can be compactly folded for transportation．
Fountain－PEN．－Byron F．Marsh，Eustis，Fla eed of ink is regulated by the air－pressure within the reservoir or barrel of the pen．The pen－seat is forme with a longitudinal cavity in which an air－tube fits pro－
jecting beyond each end of the pen－seat．The air－tub ills the inner portion of the cavity in the pen－seat and rmly engaged with the inner walls of the pen－seat pluc． The outer portion of the cavity is enlarged at its out d with a longitudinalls－extending external groove pro nding an ink－duct，the outer portion of the air－tube erving to hold the pen－point against the inner wall of wi
he pue fence．－Herman Martin，Vermilion，Ohio． which the running－wires will be effectually staye gainst one another，thus preventing them from sprea g．This end is attaned by means of a stay co crimp at each angle．The stay is applied to the running－ wires by bending the crimps around the respective wir and securing the ends to the top and bottom stays．
BORING－TOOL－－－Loron Mitceell，Augusta，G he tool is designed to bore apertures and form recessee carrying a bit，in which shank a twisted shaft is moun d to turn．An auxiliary cutter is carried by the shaf hank－bore and engages the shaft whereby the longitudi nal movement of the rod will rotate the shaft．The too is very simple and by its means the operator can simul taneously be
COMBINATION－TOOL－－Robert Newall，Quincy， Mass．The tool comprises a stock with an offset．Ad jacent to the beveled side of the stock is a protracto ant from the center of the protractor edge，equidis clamping－screw engage slots in the stock and blade to ach other and to clamp them together．The tool eadily transformed into an inside square，T－square， depth－gage，set－square，external miter－square，interna miter－square，height－square，inside and outside beve quare，and exterual and internal center－square，and pro Paper－box．－Grace Bartlett，Jamestown，n．y ion of flowers and is so constructed that the blossom will not need a packing of sisue paper moss，or othe material，the arrangement of the body being such tha the flowers will be prevented from moving．
tobaCço－PiPE．－Bernard J．Tebbens，Manhat an，New York city．The pipe is provided with a stem which may be readily blown out without disturbing the tobacco in the bowl，By reason of this arrangemen he stem is always free from nicotin．The stem formed with a seat for a val ve－plug，which is part of the
bowl and serves to mount the bowl revolubly on the stem The valve has three partu by the adjustment of which the stem is opened at its heel or placed in communica ion with the interior of the bowl．
binder．－Henry T．Wise，Philadelphia，Pa．The device is especially designed for binding papers in file wrappers，envelops，and like articles．The binder aasily manipulated to fasten the papers or documents penin the file wrapper，or to persit the closing an on a string inside of the wrapper and securely bound De by a plate．The wrapper is held closed by pasis the string around it and securing the end to a tongue． FATTENING－COOP FOR POULTRY．－Walter URNAS，Lisbon，Iowa．The coop has a front wa close the coop and binding against the bottom thereo wen closed．A trough extends in front of the wall
noves in and out of its path and holds the wall close when the trough is closed．
Chimney－top．－Cbarles E．Burress， 1302 n Market Street，Wichita，Kan．The chimney－top has prond a main portion below，adustable laterally，and independently of the top－rim portion and The base of the chimney－top may be adjusted to fit dif erent sizes of chimneys，and the top is adapted to ceive a smokestack or pipe extending
obtain a better draft for a low chimue
wheelbarrow．－Wiliiam J．Freed，Eureka， Utah．The barrow comprises a pipe bent at its middle to pass about the wheel and forming side bars and is．Cross－bars comect the side－bars．The wheel－
is received in blocks about which clamping bars The frame－bar has an opening at one side to re
the end of the axle．The principal feature of this
and
is larger，narrower，and deeper than the ordinary wheel
barrow．It is especially a mine－wheelbarrow．Since有 able than that usually found．
self－lubricating sheave．－Samuel Matt with a chamber containing oil and with a tube wherebs the pivot or spindle is constantly lubricated while the heave is in action．Since the feed is stopped when the ane，there can be no loss of lubrican．
ACETYLENE－GAS GENERATOR．－WILLIAM Roles，Goldfield，Colo．The novel features of this in ention are found in a water－tank arranged at one sid wighted displacement plunger is supported on one sid of the counterpoised gasometer－bell and is movable in he tank．The plunger rises and falls with the bell．A the water in the tank up into with the carbid；as the bell fills，the plunger rises，caus－ TROUSERS SUPFORT OR STRETCHER－ARCHI L．Ross，Port Chester， N apporting structure in which are spacer parallel ba ormed each of a single piece of wire having upwardly stending loops for receiving a pair of buttons on the trousers．The bars also have downwardly－extending loops alternating with and projecting below the up－ orted and stretched so that their shape is fully pre

UmbRELLA－RUNNER．－Samuel E．Smith，Olea ．Y．By means of this device the necessity of pressin comprises an inner sleeve slotted for the passage of the ocking－latch and surrounded by a concentric oute fieeve．To the outer sleeve a spring is secured，carrying the outer sleeve and adapted to force the spring asain

PROTECTOR FOR KEYBOARD－RAILS．－LEOPoL Bernard，Manhattan，New York city．To prevent the of the performers，the inventor employs a sheet ver the upper edge of with hooks or arms extending over the upper edge of the rail and having their ends in incandescent－mantle support．－Fran W．Poland，East Liverpool，Ohio．The purpose of thi W．vention th prow whe dis plageing of the support under the intense heat，Thi nd is attained by constructing the burner－supportin od with a transverse extension at its upper end．Thi
xtension projects into immediate proximity to or light ontact with a stable part of the burner，so that should the rod sag or bear positivers displacement．

## Designs

STANDARD FOR COPY－HOLDERS．－Louis Hud ike an inverted U and is provided with perpendicularly stending base－arms connected by a rod．
CAN－OPENER．－John A．Plint，Butte，Mont．The leading feature of the design consists of a handle having depending shank and a forwardly and downwardly bade extending from the shank．As he operd ears down on the handle，the V －shaped back of the As the blade is properly curved the cut extends close e edge of the can body．
MONUMENT．－Edwin O．Townsend，Zanesville polygonal shaft with a dome cap and wings on opposit sides of the shaft．
stovepipe－drum．－Louis S．Irgens，Valley City， V．D．The design consists of a shell having epirally rranged tubes which retard the upward movement WINDOW－SHADE BRACKET．－John B．Gill，R well，New Mex．The leading feature of the design is ound in two members at angles to each other，hav constitutes a stop which prevents the cutting of the lower sash．
game－board．－Matthew Lecloux，Bayonne fields with defined spaces in the fields，one concent in the outer field being of a different color than the other spaces．The game is played with a suitable object the players
CLAMP－BAND．－Thomas W．G．Coor，Manhatta New York city．The deeign consists of a flanged neck band for lamp and gas－globe fixtures and provides
simple means for removably，yet firmly holding the simple in means
globe in socket．
Note．－Copis af a these patents will be furn ished by Muni \＆Co．for ten cents each．Please stat the name of the
of this paper．

NEW BOOKS ETC
F．Berger＇s French Method．By rançois Berger．New York．1899．

The author is the well known teacher of the French language，and he has been particularly successful in his ure to be interesting．

Mannheim and its Harbor．Mann heim．1899．8vo．Pamphlet．

This is an interesting pamphlet prepared by the sta cellent map．The intended erection of large factories in
che the neighborhood of Mannheim naturally attracted the conomic advantages countries to the extraordinary intended to give the English reader an excellent idea of

Business and ©exsonal．
charge for insertion under this head is One Dollar a
line for each insertion ：about eioht words to a line ddvertisements must be received at publication offic as early as Thursday morning to appear in the follow Marine Iron Works．Chicago．Catalogue fr For logging engines．J．S．Mundy，Newark，N．J U．S．＂Metal Polish．Indianapolis．Samples free． Pocket Folding Umbreilas．Grove \＆Stover，Luray，Vt Handle \＆Spoke Mchy．Ober Mfg．Co．．Chagrin Falls， Ferracute Machine Co．，Bridgeton．N．J．，U．S．A．Fu Inventions developed and perfected．Designing and
． Ma Machinery for R．K．contractors，mines，and qua The celebrated＂Hornsby－Akroyd＂Patent Safety Engine is built by the De La Vergne Refrigerating Ma
chine Company．Foct of East 138 th Street，New York． The ber ricity is＂Experimental Science，＂by Geo．M．Hopkin by mail，\＄4．Munn \＆Co．．publishers， 361 Broadway，N．

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nd other Books for sale by Munn \＆Co．， 361 Broadway．

## ramictatuis

 hints to correspondents． Mes and Ad dress must accompang all leters



$\qquad$
（7771）G．R．F．asks：Can you tell me what tauric acid is，or where it can be procured？A．We
lo not kuow any such acid as tauric acid．There is a chemical called taurine，which was made first from the bile of an ox．It is an acid．This may be the substance
for which you inguire．Taurine can be bought at any holesale druggist＇s．
（7772）W．C．P．and others．－－Inquiry as been made for further partculars regarding the use graphic plates．Make a bath of ammonium persulphate one part and water twenty or more parts．After fixing nd thoroughly washing the negative to be reduced，place has proceeded nearly far enough．Next place the neg tive for a few minutes in a ten per cent solution of so dium sulphite．After this wash it well and dry．This he deeper layers of the film，and upon the silver in thicker portion of the plate more than it does the thin－ cer parts of the plate．This is the especial advantage letin of the Photo．Club，Paris，1898，8， 232.
Answer to query 7744：If we take a clock spring of a given weight in its unwound or natural we find a definite amount of heat energy is evolved dur－ ing the chemical reaction．Now，we know that after winding up a clock spring each atom of matter in the spring has had a definite amount of external energy ap－ plied to it during the process of winding and each atom of matter in the spring bas been distorted from its natural cal change，anch as takes place between the metal and the acid，each atom tends to essume or return to its na－ tural position．While undergoing this chemical change the atoms，separating from each other，are gradually coming back to their natural position，and in doing this they evolve a definite amount of heat energy．The heat evolved in this manner is proportional to the energy ap－ phed to the spring during the process of winding．There－
fore，if we apply a given amount of energy to a clock spring to wind it up，and immerse it in a given strength of acid，the heat energy evolved will be that evolved by undergone plus the heat energy evolved by the atoms when returning to their natural position．From this it will be readily seen the energy applied to wind the spring is used to straighten out each atom of matter in union in the state of a metal．－A．E．D．［The answer都 is the one which has been given over and over this question．It is simply a speculation，based apon the doctrine of the conservation of energy．We have hat a coiled spring would produce any more heat when dissolved in acid than the same spring would produce if dissolved when uncoiled．Till this is done the answer tion pructically．This is what we meant by our former
the note under No．7744．－Evs．］

INDEX OF INVENTIONS For which Letters Patent of the United States were Issued for the Week Ending DECEMBER 5, 1899.

And each bearina that date

| Addiug manhine, E. Le Fevre, <br>  <br> Air cimpressor. J. H. Hopps. <br> Air hentiong mud aparitating apparatuis. E. E. F. Porter <br>  <br> Asparagus bunching apparatus, $\mathbf{G} . \mathbb{R}$. Houghton <br> Atomizer and nebulizer, C. J. Seltzer |
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Tree felling device. E. Burke.
Trolley whee, J. . Ospood...


Truck, tong, W. J. Bunyea.
Truck, warehouse J. B. Dovie
Truss, L. A. \& C. Smith.....


(Continued on pape 399)

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