


1.-Protected Cruiser "Baltimore."
 Deck, 21/2 inches on flat, 4 inches on slopes. Guns: Four
and machine guns. Complement, 386 . Date. 1888 .


Copyrighted, 1896, by W. H. Rau. 3.-Protected Cruiser "Raleigh."
Displacement, 3,213 tons. Speed, 19 knots. Maximum Coal Supply, 460 tons. Armor: guns, and thirteen 6 -pounders and smaller guns. Torpedo Tubes, two. Complement, 313 . guns, and th
Date, 1892 .

2.-Semi-protected Cruiser "Boston.
 11/ -inch deck amidships. Guns: Two
guns. Complement, 278 . Date, 1884 .



5. Protected Cruiser "Olympia"-Admiral Dewey's Flagship at Manila.

Displacement, 5,870 tons. Speed, 217 knots . Miaximum Coal Supply, 1,170 tons. Armor: Turrets, $31 / 2$ inches; barbettes and casemates, 4 inches; protective deck, 2 inches on flat, $43 / 4$ inches on slopes.


THE UNITED STATES NAVY-VIII. DEWEY'S FLEET AT MANILA,-[See page 216.]

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## ESTABLISHED 1845

munn \& Co., - - - Editors and Proprietors.
published weekly at
No. 361 BROADWAY, - - NEW YORK.

##  <br> the S'IENTIFIC AMERICAN PUblications. Scientific American (Established 1st5). Scentific American Supulement (Est. Scientif The combined subxcription be furnished upon application. <br> MUNN \&

NEW YORK, SATURDAY, SEPTEMBER 30, 1899.

## THE ARMS AND THE MAN

In the opening days of the Spanish war, when the eyes of the whole world were bent with close attention upon the combatants, there were two questions in every one's mind, the answers to which were awaited with no little interest: Would the ships of the new nary of the United States, excellent as they appeared upon paper, stand the searching test of a sea fight, upon paper, stand the searching test of a sea fight,
and would the officers and men, regarding whose tactical skill or amenity to discipline doubts were freely entertained abroad, prove equal to the exacting requirements of modern naval warfare?
'The answer came earlier than it was expected and from a far away and totally unlooked-for quarter. On that eventful morning of May the first, eighteen hun dred and ninety-eight, the fortunes of war gave to Ad miral Dewey the opportunity to declare that in the quality of its ships, in the daring and well considered enterprise of its officers, and in the deadly skill of it gunners, the United States had not fallen away from the splendid traditions of the past.
In discussing the arms and the man, it would be a gross injustice to that branch of the naval service whose field of operation is confined to the draughtingboard and the proving ground if we failed to do justice to the excellence of the little fleet which carried Dewey through the famous battle of Manila Bay. In every case the ships from keel to truck were the product of our own ship-yards and gun factories, and in the flagship "Olympia" was represented one of the most successful vessels ever designed for our own or any other navy. With her powerful and well pro any other navy. With her powerful and well pro tected batteries, the high freeboard, and unusual speed,
she embodied the characteristic features which have she embodied the characteristic features which have
marked the later cruiser designs of our construction de marked the later cruiser designs of our construction de-
partment. The other fighting ships of the fleet, partment. The other fighting ships of the fleet,
though of an earlier date, and, therefore, not possessing such all-round excellence as the "Olympia," were marked by the distinctively American feature of heavy batteries, the "Baltimore" carrying four and the "Boston"two 8 -inch, in addition to six 6 inch guns, the "Raleigh" one 6 -inch and ten 5 inch rapid-firers, and the gunboats" Concord" and "Petrel" carrying respectively six and four 6 -inch guns.
The hulls, engines, guns,mounts and ammunition were of American make. and had all been designed, built, and set afloat practically within the past ten years. Never, since 1883, when we began to build, had the material of the new navy been put to the test, and only the line and staff and the naval construciors knew just how much depended upon the verdict that would be rendered by the engagement of that carly Sunday morning. The result was seen before the sun had reached its meridian, in the utter destruction of the Spanish fleet, and the silencing of the fortifications under whose shelter it fought, at the cost of practically no injury whatever to the American ships.
It is no reply to this to say that the enemy's ships were altogether inferior. Mere negative qualities in Montojo's fleet may have increased, but they did not cause the disaster. It was the positive excellence of our engines, the accuracy of our guns, the reliable quality of our shells, that rendered certain (other things being equal) the victory of Dewey's fleet over the combined sea and land forces of the enemy; and no ungenerous attempts to minimize the obstacles to be overcome can affect the significance of the results. The sunken ships and silenced forts of Manila Bay were a tribute to the material as well as the men of the American navy.
But. after all, it is the qualities of the man upon which the thought and sentiment of the American peoplle are fixed in this hour of celebration. And in honoring Dewey by the present overwhelining outburst of enthusiasm, there is in the minds of the American people no intention to exalt the heroes of the far-away Pacific at the expense of those who won the far-away Pacific at the expense of those who won
the decisive victories by sea and land at Santiago. the decisive victories by sea and land at Santiago.
The destruction of Montojo's fleet at the opening of the war was not one whit more complete than the annihilation of Cervera's squadron at its close-the blockade of Manila has its counterpart in the impene-
trable cordon which was drawn around Havana and Santiago ; and the heroism of that midnight dash into the supposedly mine-strewn channels off Cavite found a worthy echo in the trip of the "'rexas" through the mine fields of Guantanamo Bay and the matchless self-sacrifice of the "Merrimac."
In passing in procession down the long line of triumphal march, Dewey and the men of the "Olyinpia" represent all that is best and bravest in the American navy. Every great war has produced its popular hero, and in its desire to select some one man to play worthily the role of returning conqueror, the nation has turned instinctively to the galiant sailor whose brilliant campaign in the far-away Southern seas struck the keynote of victory at the very opening of the war, and whose masterly diplomatic control of the difficult situation created by that victory has marked him as possessing at once the qualities of statesman and possessi
soldier.

THE NATIONAL EXPORT EXPOSITION.
Wherever American manufactured products are known their excellence is recognized. The gerius and ingenuity of mechanics trained in the workshops of the United States, where there is every incentive to the exercise of the inventive faculty, have produced machinery which has attained a world-wide celebrity and in many cases is the best obtainable. Likewise the finished products of various industries of the United States have obtained for themselves a commanding place in the world's markets. Our supremacy is shown in a very practical manner by our magnificent trade balance, which is proportionately increasing month by month. It is singularly appropriate that our entrance into foreign trade upon a large scale should be marked by some form of commemoration in this, the closing year of the century. The National Export Exposition at Philadelphia, which opened its dours September 14, is the first exhibition of its kind ever held in this or any other country, and is organized on broad and liberal principles. the object being to aid the American manufacturer to exhibit his products and to show him for comparison what is manufactured in other countries in the same line, together with the details of quality, quantity, and price, thus enabling him to study the markets of the world by viewing the collec tions gathered under one roof. Ample appropriations by Congress, the city of Philadelphia and the State of Pennsylvania, supplemented by generous contributions of the citizens of Philadelphia, provided money sufficient to carry out the plans of the projectors of the Exposition on a liberal scale.

The scheme of holding a national exposition of the manufactures of the United States specially suited for export was thought of by the officers of the Philadel phia Commercial Museum, and was first discussed publicly by a number of prominent citizens of Phila delphia in October, 1897. The ground was broken for the main building the last week of March of this year, and in less than six months handsome and commodi ous structures were reared, and every arrangement made for the opening of the Exposition.
Philadelphia is, perhaps, as good a location for such an exposition as could be wished for, as it is a city turning out over $\$ 600.000,000$ worth of manufactured products annually, and it is the seat of the Philadel phia Commercial Museum, which is in itself a unique enterprise. By this Exposition the country virtually challenges the world to produce articles as good and as cheap as those here exhibited, which vary from articles as small as a spool of thread to the largest locomotive. Our supply of raw material is unequaled, and our factories are splendidly equipped for manu facturing. The genius ad activity of American engineers in designing and constructing these plants have been the wonder of foreign experts, and Ameri can workmen have wisely never opposed the introduc tion of modern methods or labor saving devices as they do abro:id. Their characteristic energy, adapt ability, and ingenuity, have advanced American manu factures and made it possible for us to export many lines of goods which, a few years ago, would hav been considered to be out of the question. The work men are better paid, better fed and clothed, and live better in every respect than their foreign brothers, and at the same time we are enabled for the aforesaid rea sons to produce goods which, owing to their quality and price, sell without difficulty in the markets of the entire world. These facts are amply demonstrated by the Exposition, wh:ch, it is hoped, will begin a new er in the extension of American trade in foreign countries.

Other nations are constaıtly making plans to secure markets outside of their own dominions. While France Belgium and Germany established schools in which to educate their active men for commercial supremacy and while Great Britain and other Continental coun tries have opened bureaus for the systematic study of commerce and its relations to their manufacturing in terests in foreign fields, the United States remained al most alone as the only country which took no steps to warket her products outside her own dominion. Re cently, however, the excellence of our goods became
recognized abroad, and the result has been a constantly increasing demand. The manufacturer found himself confronted by foreign trade requirements of which he knew but little, and it has been the pleasant duty of the Philadelphia Commercial Museum and our consuls to inform them as to these requirements. and to day we have commercial experts all over the world, who are sending home reports for the benefit of our own manufacturers.
To supplement and complete this well-studied system for the introduction of American manufactures in foreign markets. it was necessary to take one further step; this was the development of a plan by which the buyers of American products in foreign countries could see for themselves our admirable methods of manufacture, the skill which we employ in making our goods and the superior materials which enter therein. To carry out this part of the work, the National Export Exposition was organized as it stands to-day, and now the foreign buyer can see a large and diversified exhibit of American wares, and it is gratifying to note that the governments of the whole world have been invited and a large number of delegates have been detailed to visit the Exposition and report upon it. Thus, the producer and the buyer from the four quarters of the globe will be brought together in close contact. It is not an international exposition but is intended solely to foster American trade. With this limitation the Exposition will admirably fulfill its purpose.

## THE EUPHRATES VALLEY RAILROAD

It is said that an Euclish syndicate has secured the concession from the Sultan of Turkey to build a railroad through the Euphrates Valiey to the Persian Gulf. If the scheme materializes, the railroad will run through the reputed site of the Garden of Eden. Biblical scholars have reasoned that this tract was in Mesopotamia, the district lying between the rivers Tigris and Euphrates, and if this is the case the railroad will traverse it. The project of building a railroad from Constantinople to the Persian Gulf was broached many years ago by the late Ferdinand de Lesseps, but his attempts were in vain. England and Lesseps, but his attempts were in vain. England and Russia have both tried to obtain a similar privilege.
At last Germany received permission to build a railAt last Germany received permission to build a rail
road from a port opposite Constantinople to Angora, and the Anatolian Railroad was the result. The extension of this railroad from Koniah, first to Bagdad and thence to Bassora on the Persian Gulf, has been a pet scheme of Emperor William, and according to The New York Herald, the move which the English syndicate is now about to undertake is a result of the entente cordiale between the two countries.
To Great Britain it means a new and shorter road to India, as five days may be saved, and to Germany it means a new field for colonization and a good feeder for a road already in operation. The first year the Anatolian Railway carried three hundred carloads of wheat, the second year seven hundred carloads of cereals. The railroad has done much to alter the character of the country, to build up towns, to open factories, and bring good European colonists to cultivate the soil. One of the chief obstacles to the progress of the country has been the shiftless Turkish inhabitants, who did not wish to use modern tools and have not sufficient ambition to try to get rich. They will not sit in the seats in the railway cars, but squat on the floor, so that at last it was necessary to take out the seats and leave the passenger coaches almost like cat tle cars. The sparse population of the district through which the railroad runs is an advantage for the new comers from Europe, who have no difficulty in finding all the land they require.
The climate of the different parts of Asia Minor and Mesopotamia is so varied that the greatest variety of products can be raised successfully in different parts of this broad domain.

## THE MAUSER PISTOL.

Dr. J. D. Griffith, of Kansas City, has just completed for the government an official test of the Mauser pistol in use by the German calvary, and it is under consideration for adoption by the United States. The test was made with targets and human bodies, and the results were most satisfactory. At ranges from 50 tc 500 yards the Mauser pistol is the most effective and deadly weapon of its kind ever invented, and up to the maximum range tried it is practically as good in the hands of a marksman as a Krag-Jorgensen, a Lee or a Mauser rifle. If nothing but flesh resists the passage of the bullet, it makes a round incision where it enters and a knife-like cut where it departs. Should a bone be in the way it is often shattered into fragments. The pistol shoots very accurately and will kili at a range of 500 yards. The bullets pass through a human body at that range. If the bullet should enter a vital organ, it would undoubtedly kill a man instantly, and would incapacitate a soldier if it struck a bone. The pistol fires ten shots without reloading, and can be emptied in less than three minutes. The bullets weigh 85 grains and have a lead core surrounded by a nickelplated copper jacket.

## THE HEAVENS IN OCTOBER.

The increasing crispness of the air in the middle of autumn imparts a livelier sparkle to the stars. But at this season of the year the greatest of the constella tions are absent from the evening sky, although their coming for the winter carnival of celestial wonders is already heralded by signs well known to the habitual stargazer. For the contemplative observer, who knows the order of the procession of the Zodiac, the southern and eastern heavens in an October night wear an as pect of preparation, an expectant and prophetic air, as if the curtain of the sky had been dropped in readiness and rose again when the vast and sublime spectacle hidden behind it is ready for exhibition.
While the northeastern quarter and the region over head are bright with Andromeda and Cassiopeia, Per seus and Cygnus, and the sheen of the Milky Way at tracts the eye west of the meridian, the south is occupied by the broad and scattered constellation of Aquarius, high above which the four chief stars of Pegasus, like golden corner marks, stake out a huge square of glonmy sky near the zenith. Low in the south at the same hour of the evening, say 9 or 10 o'clock, hangs a single sparkler of nearly the first magnitude, the lone Fomalhaut, which the Southern Fish carries like a flaming jewel in his distended mouth. Eastward the gloom deepens.

But the experienced lover of the stars will not be content with this early evening view. He will look out again at midnight, when Cetus will be upon the meridian, with Aries overhead, while in the east the curtain has been withdrawn, the spectacle is in ful swing, and the head of the celestial armies, with the Pleiades glittering like an oriflamme high in advance comes marching up the sky. Orion and his matchless cortege are on their way, foretelling the splendors of their winter reign. At the same moment when Sirius, the winter's prince of stars, is rising, Vega, the glory of the summer heavens, is setting, and thus the autumn sky, like the autumn landscape, is at the same time fuli of reminiscence and of expectation.

THE PLANETS
The constellation of Libra, a somewhat featureless province in the geograph $\dot{y}$ of the heavens, will, during October, shine with borrowed and unusual splendor It will be the scene of the assembling of four of the great planets, Jupiter the mightiest of all, Venus the most beautiful, Mars the enigmatical, and Mercury the eccentric. Jupiter is within the borders of Libra at the beginning of the month; the other three will arrive upon the field, coming from the west, before its close. All of the planets named, together with Saturn and Uranus, which lie further east, and Neptune which is in Taurus and rises before midnight, are evening stars. In fact, there is no planet left to play the role of morning star in October. Every one of the earth's sister planets, no account being taken of the tiny asteroids, is in the competition for evening honors, while the pale dawn must brighten as it can alone Unfortunately, however, this galaxy of evening stars will fail to create a furor among the admiring inhabitants of the earth, because, with the exception of Saturn, they are either so faint or so near the sun that only the initiated will be able to recognize them.
October will also witness the beginning of a remark able series of planetary conjunctions, culminating in November, and continuing through December. Six of the seven large planets besides the earth will be assembled in one quarter of the sky, in or near the zodiacal sign Scorpio, which I believe is of ill repute among astrologers. Some effects, interesting to mathematicians, in the great balance of forces that constitutes the stability of the solar system, are produced when nearly all the larger members of the sun's family of worlds have gathered on one side of the domestic of worlds have gathered on one side.of the domestic
circle, but all predictions of evil to the earth, or its inhabitants, proceedingfrom planetary conjunctions are, f course, based only on imagination or superstition.
Stated in detail, the planetary phenomena during October are as follows: Mercury is an evening star, passing from Virgo into Libra. It is so near the sun that it will not be easily visible until November. It is in conjunction with Venus on the 10 th at 6 A . M., when the apparent distance apart of the two planets, if they could be seen, would be only three-quarters of a degree. On the 25th Mercury will be in conjunction with Jupiter just before midnight. On the 23d Mercury reaches its greatest distance from the sun, which, in the case of a planet having so eccentric an orbit, and so short a period, must mean a fearful drop of temperature as compared with the heat endured only six weeks before.
Venus is an evening star, moving from Virgo into Libra, but, although slowly receding from the sun, it is too near the solar orb and too far from the earth to be well seen. It will brighten during the winter and attain its greatest brilliancy next May, within three days after the total solar eclipse, to which astronomers everywhere are now looking forward. It is in conjunction with the star Alpha Libræ at 1 o'clock P. M., on October 26. at which time an apparent space of
planet. On the 29th, at 8 P. M., Venus and Jupiter pass one another within a distance about equal to the apparent breadth of the full moon
Mars is an evening star, moving from Virgo into Libra. Like the others, it is too near the sun for observation.
on the 11th.
Jupiter is an evening star in Libra, and can easily be seen in the twilight at the beginning of the month, but it rapidly loses its brilliancy, as it is apparently swallowed up in the solar rays. It plays the greatest part in the planetary conjunctions of the month, meeting Mars on the 11th, Mercury on the 25 th, and Venus on the 29th.
Saturn is an evening star in Ophiuchus, and is the only planet that can be well seen in October. It appears in the southwest in the early evening, and its rings continue to present an admirable telescopic rings con
spectacle.

## spectacle.

Uranus in Ophiuchus and Neptune in Taurus are too faint to be interesting, except for the working as tromomer.

## the moon.

New moon occurs on the afternoon of the 4th, first quarter on the morning of the 12 th, full moon on the afternoon of the 18th, and last quarter on the morning of the 26 th . The moon is nearest the earth on the morning of the 16 th , and at the greatest distance about midnight on the 27th. The lunar conjunctions with the planets occur as follows: Mercury, the 5th Venus, the 5th; Mars, the 7th; Jupiter, the 7th Venus, the 5 th ; Mars, the 7 th ; Jupiter, the 7 th
Uranus, the 8 th ; Saturn, the 9 th ; Neptune, the 23 d .

## Electric lighting at the covent garden THEATER.

The new lighting plant of the Covent Garden Thea ter, London, presents many points of interest. It should be said, while called a "theater," it is really a great opera house in which masterpieces can be effectively staged. The old gaslight has now been entirely done away with, and a complicated system of electric lighting has been substituted, adding greatly to the efficiency of the stage setting.
In the stage lighting several novel features were introduced, the first being the provision for four colors, white, red, blue, and orange, for obtaining stage effects. This is probably the first time that orangecolored lamps have been used for stage work in England, the effects being previously obtained by burning white lamps at very low candle power. Of course, good effects may be obtained in this way, but the method is extremely wasteful. The switch gear is placed below the stage in a fireproof room, from which the electrician can obtain a full view of the scenes as lighted.

According to The English Electrical Engineer, from which we glean our facts, there are seven battens, six of which are 61 feet long and one 40 feet long, which is used to light the back drop or the back wall. Each batten carries 220 lamps of 16 candle power, divided in colors as follows: 80 white, 40 amber, 50 red, and 50 blue. For these battens no less than twenty-eight regulators with liquid resistance are provided, so that the illumination can be easily varied and changed in color without causing any flickering. There is one regulator for each color in each of the battens, so that they can be varied independently. Arrangements are provided by which the cables which supply the batten can be discontinued in case they have to be removed The battens have a rise and fall of 12 feet; in each of them four pilot lamps are installed, which can be controlled from a special switch on the stage switchboard They are used to give sufficient light to the stage hands without having an electrician operating the main switchboard.
The large battens weigh practically 16 cwt ., and are suspended by six $1 / 2$-inch steel ropes, an insulated support being placed between these ropes and the bridle chains to the battens.
There are five wing lights on each side of the stage The framework of the reflecting part is much the same as that of the battens, each being supported by lattice steel work and provided with an oak filling to carry the cables. In each of these wing lights there are seventy-five 16 candle power lights, of which thirty are white and fifteen are colored respectively amber, blue and red. The wing lights are supported on ladders which run on wheels on the mezzanine floor. By this means the wings have a travel of 16 feet; that is, 8 feet each way from their normal position. There are iron boxes and switches for the wing lights at the bottom of each. The proscenium lights, which are placed just in side the frame of the stage, each contain 50 white lights, 30 blue, 30 red, and 25 amber. They are similar in construction to the wing lights. In addition to the fixed lights, two circuits are run around the stage and are connected with plugs in various parts, from which portable lights can be applied to light ground-rows, transparencies, etc. Feed wires are run in canvas hose, which, by flattening out on the stage, is the least liable to cause accidents. The heary scenery can be run over such hose without damaging the cables.
The switch-room, which is placed below the stage at
one side, is built up of iron plates. Access to it is obtained by means of an iron door in the mezzanine floor, from an iron door in the orchestra, and by means of a trap-door and ladder from the stage. The main receiving switchboard and fuseboards are placed two floors below. The liquid resistance which is used is the most interesting point, and switches control the lights in the usual way. Iron wheels control one color or as many of the circuits of that color as may be required. Each regulating switch or "dimmer" works around the main axle, which is operated by means of a bicycle chain, which raises or lowers the cone in the liquid resistance cans in the cellar. When the lever is right home it short-circuits two contacts, which cut out the liquid resistance entirely. The resistance room is fireproof. The insulated cables are attached to terminals on the copper rods coming from the lead cones. The liquid used in the jars is zinc chloride.
In addition to the stage lighting, all dressing rooms, passages, and corridors, the "gridiron" and the "cellars" around and beneath the stage have been provided with electric lights. Wingfield Bowles, Esq., was the consulting engineer.

## AN IMPROVEMENT IN THE MANUFACTURE OF

 ARSENATE OF LEAD.*In a paper read before this Association at its meeting in August, 1897, the writer referred to a method of producing arsenate of lead by using nitrate of lead as a source of soluble lead. According to our chemist, Mr. F. J. Smith, arsenate of lead formed by this process is the diplumbic, or more exactly, a mixture of about one part triplumbic and two parts diplumbic, and not the triplumbic entirely, as is produced where arsenate of soda is neutralized with acetate of lead, as in the ordinary process of manufacture. Arsenate of lead made from the nitrate contains a slightly increased percentage of arsenic (about five per cent) ; and as the nitrate of lead may be purchased at a less cost than the acetate, the saving made where several tons are to be prepared is quite an item.
At the time when the diplumbic arsenate was first brought to the attention of this Association only a few experiments had been carried on. Since that date the insecticide has been tested in an extensive series of laboratory and field experiments, and in 1898 and again the present year by actual spraying operations in the field. A part of the results of the experiments have been published in the report of the gypsy moth committee, January, 1898, and without presenting the mass of details, from the numerous tests we may state in brief that in every case the arsenate of lead made from the nitrate has proved itself equal if not superior to that prepared from the acetate.
In preparing arsenate of lead by either process it has been found most economical to use a high grade of arsenate of soda, as the impurities, such as salt, in the lower grades neutralize a considerable part of the soluble lead before the reaction with the arsenate of soda can commence. The gypsy moth committee obtained from an English firm an arsenate of soda that showed on analysis $67 \cdot 5$ per cent of arsenic. This material costs when delivered, $\$ 0.052$ per pound. To make one ton of arsenate of lead there are required 888 pounds of this arsenate of soda at a cost of $\$ 46.18$, and 2,398 pounds nitrate of lead at a cost of $\$ 161.87$, the total cost being $\$ 208.05$. With the same grade of arsenate of soda, but using acetate of lead, there are re-
quired for one ton of arsenate of lead, 758 pounds quired for one ton of arsenate of lead, 758 pounds arsenate of soda costing $\$ 39.42$, and $2,593.8$ pounds acetate of lead costing $\$ 207.50$, a total cost for ingredients of $\$ 246.92$. This leaves a balance of $\$ 38.87$ per ton in favor of the arsenate of lead made from the nitrate. Where the proportionate amounts of arsenate of soda and acetate of lead are tied in a package as in the ordinary procedure, the dampness of the acetate of lead will set up a partial reaction, and thus a part of the value of the insecticide is lost. When nitrate of lead is used, there is but little of this partial reaction.

## ARRIVAL OF SIGNOR MARCONI

Signor Marconi arrived on the "Aurania," September 21. As we have already stated, he is to assist in re porting the races for the America's cup. He was accompanied by Messrs. Rickard, Bradfield, and Denshan, skilled operators who have been engaged with experiments on wireless telegraphy across the English Channel and who will be in charge of the instruments and send the messages to 'The Herald during the yacht races. Signor Marconi began his experiments in 1895, when he tried to establish communication between various parts of his father's estate near Bologna, Italy In 1896 he arrived in England, and after working in conjunction witr Mr. W. H. Preece, then chief electrician of the British post office, he gave a demonstration of the possibilities of the system during the volunteer evolution
Channel.
${ }^{*}$ A paper by A. H. Kirkland, of Malden, Mass., Assistant Entomologist of the Massachusetts State Board of Agriculture. Read August 19, 1899, at
the Ohio State University, Columbus, O., before the Association of Economic Entomologists, an affiliation of the American Association for the Advancement of Science. Revised by the author,

## ジィinutific Amprican．

with a peculiar composition，the basis of which is plaster and papier mache，which is more durable than the staff which was used at Chicago．The pavilions naturally received the greatest attention and they are admirable from an architectural point of view，as will be seen by our engravings．
Above the main entrance a large pediment contains
the numerous flagstaffs float the flags of all the nations which were represented in the International Commer－ cial Congress．The main building was designed by Wil－ son Brothers \＆Company，assisted for the permanent part by Ġ．W．\＆W．D．Hewitt，Philadelphia，architects． The main building is reached from the main eutrance by an esplanade，where the visitors will find numerous attractions which it is deemed necessary to have in all expositions．It is very sug－ gestive of the＂Midway＂at the Chicago Exposition．To the south of the main building is an Implement．Vehicle，and Furniture Building measuring 450 by 160 feet，and next to this is an open shed termed the Transportation Building．It is 450 feet long and $\%$ feet wide，and is provided with two tracks，so that it is available for the exhibit of rolling stock． The building offers every advantage for the haudling and disposition of these heavy products，and representative dis－ plays are made by the Baldwin Locomo－ tive Works，Pullman Company，and other manufacturers．
Unfortunately at the present time the space of many exhibitors still remains vacant，but exhibits are being rapidly in－ stalled，and in the course of a week or so the Exposition will be complete．The ex－ bibits are numerous and include most of the best known manufactures in Ameri－ ca．The booths are fitted up so as to $r$ resent an attractive appearance．The resent an attractive appearance．The
Pencoyd Works，builders of the Atbara bridge，easily carry off the honors by a splendid exhibit of their work．There is a great lack of novelties，but after all it

## THE NATIONAL EXPORT EXPOSITION AT PHILADELPHIA



GROUPS OVER MAIN ENTRANCE．


MAIN ENTRANCE．
entire area of 167,200 square feet is practically a single open space．While the Exposition is of an eminently practical nature，the artistic side has not been lost sight of ；on the contrary，the ornamentation and deco－ ration of the structure．though of a temporary charac－ ter which must of necessity be used in all exposition buildings，will delight the eye and will recall the ＂White City＂of 1893．The kuildings are covered
a group of thirteen figures representing＂Commerce；＂ other pediments typify the four continents．Numer－ ous groups of graceful figures symbolical of＂Trans． portation，＂＂Navigation，＂＂Labor，＂＂Electricity，＂ etc．，rest on pedestals Beside the pediments and over the main entrance there is a large quadriga drawn by four horses carrying a figure of＂Progress．＂Around the roof runs an iron balustrade of rich design，and from


PEDIMENT OF PAVILION


## VIEW OF THE ESPLANADE．

must be remembered that this is in no sense an inter－ national exposition，and it fulfills admirably the pur－ pose for which it is established．
Of special importance is the exhibition of foreign trade samples collected by special commissioners of the Philadelphia Commercial Museum．These are dis－ played on the second floor of the center pavilion． These agents visited all the important markets of the

September 30, 1899.
world, including China, Japan, Mexico, Central and South America, South Africa, England and the continent of Europe. The samples have been collected with special reference to the requirements of the various markets; they are intended to show the general lines most in favor. It will be found on examination that in most cases a better article of the same sort can be supplied from the United States at a fair price. The lines represented in the collection will repay expert examination, and such an opportunity to compare goods has never before been offered. Forty-one countries will send delegates to the commercial congress and 126 chambers of commerce will participate.

## A ROLLER-BEARING FOR BICYCLES.

A roller-bearing especially adapted for bicycles and machinery has been invented by Philip M. St. Louis, of Carmel. Wis., which, it is claimed, besides being cheap in construction, cannot bind or become disarranged.
Reterring to our illustrations, in which the bearing is shown applied to a bicycle and in sectional side elevation, it will be seen that concentric tracks are employed, secured to the axle of the bicycle-wheel, between which tracks is a bearing-ring formed or fastened on a cap attached to the hub of the wheel. Two sets of flanged rollers are employed, lying between the bearing-ring and the concentric tracks. The flanges of one set of rollers roll upon the flanges of the other set, the concentric tracks being grooved alongside their bearing-surfaces to receive the flanges, but without contacting with their peripheries. When the axle of


St. LOUIS' ROLler-bearing for bicycles.
the wheel is turned, the sets of rollers, being in contact with the inner and outer surfaces of the rotating bearing-ring, are made to turn in opposite directions and roll upon the fixed, concentric tracks. The flanges, besides separating the rollers, cause them to turn in unison.
By arranging the parts in this manner, the bearingring is placed between two sets of bearing-rollers, thereby forming double bearing-surfaces sustaining the weig't equally. The load is directed against the outer set of rollers at the bottom and bears against the inner set at the top, thus reducing the friction to a minimum so far as the vertical stress is concerned.

## THE CHAPMAN ELECTROMOBILE.

The chief objection to elec tric automobiles is their great weight and their limited radius of action. The advantages of electrically opvantages of electrically operated vehicles is their ease operation, safety and freedom from vibration. This makes them great favorites for the city, but their weight interferes with their general use for every-day purposes in the country. Our engraving shows a very light carriage built on the bicycle principle which does away with many of these objections. It was designed by Mr. W. H. Chap man, of Portland, Maine. Its weight is only 380 pounds. The bicycle frames were mad by a well known firm of mak ers of wheels, and the motors were made by the Belknap Motor Company. The wheels are 32 inches in diameter and are equipped with 4 -inch pnemmatic tires. The light pnemmatic tires. The light
skeleton body is hung between them. Although only intended for light work, the first carriage of this type has

## A ROTARY ENGINE WITH IMPROVED

## ABUTMENTS.

The rotary engine which we illustrate herewith is an improvement made by its inventor, James J. Callihan. of 2020 Melpomene Street, New Orieans, La., upon a similar engine which he has patented. Of our illus trations, Fig. 1 is a perspective view of the engine with parts broken away; Fig. 2 is a sectional side elevation; Fig. 3 is a section through the reversing-valve : and


THE CHAPMAN BIC̣YCLE FRAME ELECTROMOBILE $71 \cdot 12$ centimeters. The metric system may be used by
been used for a two weeks' tour in the country, always of course, keeping in reach of an electric light plant. 'There are two motors of one-half horse power. Each is geared to a rear wheel by means of a 10 -inch gear wheel and a pinion giving a reduction of 10 to 1 . Each is run independently. The storage battery is in front and may be used as a child's seat. Owing to their light weight, they can be easily removed for recharging, which operation consumes about two hours. In de sign the vehicle resembles a light cart, and there is room at the rear for a second battery, so that the distance traveled can be doubled Ordinarily, the carriage can be run 20 to 25 miles without recharging and the speed is from 15 to 20 miles per hour. The steering lever is in front at the right and the manipulating lever is in front of the seat. Owing to its lightness, it can be turned, stopped and started with ease.

## The iluseum of the Royal College of

 On the south side of Lincoln's Inn Fields lies the Royal College of Surgeons with its great museum behind, containing the Hunterian col lection. The building houses one of the most remarkable collections of everything which bears upon the medical sciences. The museum was endowed by John Hunter, who a century ago came to London to learn surgery. He be came possessed with the idea of starting a med ical and surgical museum in which every form of health and disease should be presented. Hespent $\$ 350,000$ in his own lifetime on his pet project, every cent of which he obtained by medical practice. He died in 1793, and it took six years to induce the government to spend $\$ 75,000$, which was all that was required for the purchase of the collection. It was bought by the nation and turned over to the custody of the Royal College of Surgeons, and the same amount was given to house it. The college it self has spent over $\$ 2,000,000$ in amplif ying and completing Hunter's design, and the Curators of the collection have included William Clift Richard Owen, Sir William Flower and lastly Dr. Charles Stewart. The museum besides containing skeletons and all kinds of human and pathological specimens, also has many curiosities, such as the clothes of a man struck by lightning, and there are many specimens illus trating miraculous recoveries from injurie usually considered fatal. In one gallery ther are the surgical appliances of all kinds, and here may be seen samples of instruments of the Roman surgeons, 300 years B. C., and also samples of the products of a Roman artificial limb manufactory.

## Russian weights and Measures.

By a recent ukase a standard of Russian weights and measures has been fixed. The unit of weight is the Russian pound, equal to 409,512 grammes, a vedro or pail must hold 30 pounds of distilled water at $16{ }_{3} / 3$ degrees Celsius, while the garnietz must equal 8 pountis of water. The unit of lengtht is the arshin, equal to

Fig. 4 is a detail showing the means employed for hold ing the abutment-valves in their normal positions. The novel features of the invention are found in the use of these abutment-valves and in their mode of operation.
The engine-cylinder is formed of two disks bolreit together and provided with recesses in which the piston and its three heads rotate. Tangent to the inner sides of the circumference of the piston-disk and extending through the cylinder are two apertures which receive blocks which are concaved at their in ner faces to form chambers for the abutment-valves and which are provided with steam-ports controlled by the abutment-valves. Caps cover the outer ends of the apertures and can be adjusted by means of screws to force the blocks snugly upon the abutment-valves The abutment-valves are journaled in the block-chambers and are provided with peripheral cavities receiv ing and passing the piston-heads. One of the abut ment-valve journals projects from the engine and has a flattened end (Fig. 4), which is embraced by flat plate springs whose function it is to hold the valves normally in position
Steam enters the cylinder through the ports upon opposite sides of the chamber which receives the abut-ment-valves. When the abutment-valves are in position shown at the right of Fig. 2, the ports are open. Steain can then pass through one port into the cylinder ; while through the other port the exhaust escapes from that portion of the cylinder on the opposite side of the abutment-valve. As piston-head passes the abutment-valve, the inlet ports are closed as shown to the left of Fig. 2.
By means of the reversing-valve illustrated in $\mathrm{Fi}, \mathrm{r}$ 3, steain can be made to enter at either side of the cylinder, so as to cause the piston to rotate in the desired direction.

## Blue Rays of Sunligh Over Mont Blanc.

 Lord Kelvin, writing to Nature from Aix-les-Bains, says that at five o'elock on August 27, from the balcony of the hotel, 1,545 meters above sea level and 68 kiloabove sea level and Blan Mont Blanc, he had an opportunity for observing what he had been anxious to see for five or six years, which was the earliest instantaneous light through very clear air and find wheth. er it was perceptibly blue or not. He was amply rewarded for his pains. He saw a blue light against the sky on the southern profile of Mon Blanc, which, in less than one-twentieth of a second became dazzlingly white, like a brilliant electric arc light.A FEW days ago three waterspouts passed Altantic City. N. J., and narrowly escaped colning in contact with several yachts. The water spouts passed at an estimated distance of three miles from the coast.

## The island of sulphir.

About thirty miles from the shore in the Bay of Plenty, North Island, New Zealand, is an immense rock or rather series of rocks three miles in circumfer ence which rise precipitously from the sea to a height of 860 feet. "White Island" is the name given to the spot, and the name is particularly appropriate because it is constantly enveloped in thick impenetrable clouds of white vapor which rise to over 10,000 feet in height, making White Island a conspicuous object fo many miles around. It is perhaps the most extraordi nary island in the world, and it is the subject of an in teresting article by James R. Falconer in the Septem ber number of The Windsor Magazine, and from this article we obtain our facts.
The island is practically one mass of sulphur, while the clouds of vapor constantly rushing from the craters are highly charged with acid fumes, which can be no ticed sixty miles away. The appearance from the sea is most imposing, the rocks rising abruptly from the waters. At first sight it seems impossible to effect a landing, but as the steamer sweeps around the south side of the island into Crater Bay, a beach comes into view, which though small is sufficient to admit of dis embarkation provided the sea is calm. This is the only level stretch on the island, the rest being great irregu lar rocks.

In the center of the island is an immense lake 50 acres in extent and 12 feet deep and it is 15 feet above the level of the sea. The water contains vast quantities of acid and the temperature is about $110^{\circ}$ Fah. It is dark green, and dense clouds of dark sulphurous fumes are constantly rolling off from this boiling caldron. At one side of the lake are blowholes, and the roar of steam as it pours forth into the air is deafen ing, and huge bowlders and stones are often hurled to a height of several hundred feet.
A boat brought fiom the ship can be launched on the lake, and the very edges of the blowholes may be safely explored, but the trip is by no means an enjoyable une, and only those who have inhaled fumes of acid can form any idea of their very overpowering nature when given off in large quantities from such an expanse.
Should the boat upset, death would be almost in stantaneous. When the boat was taken to the sea, it became so corroded that it dropped to pieces after all the passengers had been landed. The mouths of the blowholes are weird in extreme. Steam belche forth from every fissure and crevice in the rocks and ground, while the noise drowns all other sounds. The whole island is in a ceaseless state of agitation.
Except in the immediate neighborhood of the crater no sulphur is apparent on the surface, but by digging a little into the earth large beds of this mineral will be laid bare, for the island is practically one mass of sul phur mixed with a quantity of gypsum and one or two other substances. The White Island sulphur is much esteemed on account of its purity, and it can be employed for any purpose without any preliminary preparation. The older deposits contain about 90 per cent pure sulphur, and that around the blowholes 98 per cent. It is surprising that these immense deposit have not been more systematically worked. Some years ago a company was formed for working the deposits, but for lack of capital the scheme was abandoned and the amount of sulphur and gypsum exported at present is very small. In the event of a serious war, doubtless the island would immediately rise to prominence.

## Did Man Once Possess a Third Eye?

This query heads the following statement in a reent number of The Evening Telegram:
Deep researches as to the structure of the human body have recently furnished some startling facts regarding changes which man is at present undergoing physically.
It is believed that man was formerly endowed with more teeth than he possesses now. Abundant evidence exists that, ages and ages ago, human teeth were used as weapons of defense. Unintentionally, traces of such use are often revealed by a sneer. The teeth are sometimes bared, doglike, ready, as it were, for action.
The practice of eating our food cooked and the disuse of teeth as weapons are said to be responsible for the degeneration that is going on. The wisdom teeth, in fact, are disappearing. Human jaws, found in reputed Palæolithic deposits, have wisdom teeth with crowns as large as, if not larger than, the remaining molars.
In ancient times a short-sighted soldier or hunter was almost an impossibility; to-day a whole nation is afflicted with defective vision. It is almost certain that wan once possessed a third eye, by means of which he was enabled to see above his head. The human eyes formerly regarded the world from the two sides of the head. They are even now gradually shifting to a more forward position.
In the dim past the ear flap was of great service in ascertaining the direction of sounds, and operated largely in the play of the features. But the muscles
of the ear have fallen into disuse, for the fear of surprise by enemies no longer exists.
Again, our sense of smell is markedly inferior to that of savages. That it is still decreasing is evidenced by observations of the olfactory organ. But the nose still indicates a tendency to become more prominent.

## THE HAYNE SUSPENDED INK-WELL

The inkstand in general use up to the present time monopolizes the most valuable space on a desk, and is often a menace to books and papers because of its liability to be overturned, and usually necessitates an inconvenient reach every time the pen is filled.
The advantages of removing the ink from the surface of the desk are so obvious that it seems strange the suspension arrangement-practically applied in the Hayne Suspended Ink-Well illustrated herewithhas not been sooner employed.

The Hayne ink-well is manufactured by the Universal Specialty Company, of 151 Chambers Street, New York, and consists of a metal frame, the sides of which are provided with lugs, whereby it can be readily suspended from the bottom shelf of one of the pigeon holes of a roll-top desk by means of strong spring clips, or from the rack above a bookkeeper's desk. Within the frame are two flint glass ink bottles and a sponge cup. A third ink bottle can be substituted for the sponge cup when desired. The ink bottles are fitted with hard rubber tubes in such a manner as to render them air-tight and dustproof, preventing all evapora tion and congealing of the ink.

The construction of the bottle is such that the pen can be submerged only to a certain depth, thus the ink bottles which may hold two kinds of ink can be easily


## SUSPENDED INK-WELL

filled or cleaned by removing the front plate of the frame.
The entire table surface of the desk is left free and clear, and the device can be put on or taken from th desk in a moment.

## When You Weep-and why.

Tears are the common legacy of every human being, and if you shonld be asked whence they come and where they go, you would probably display a surpris where they go, you would probably display a surpris-
ing amount of ignorance about a very simple subject. ing amount of ignorance about a very simple subject. A writer in T
ers as follows
ers as follows:
Our eyes are always wet with tears, not only when we weep, but always. Our eyeballs are subjected to a constant flow of the lachrymal fluid, even when we are asle p , and were the stream to cease only for an hour, miserable indeed would be the lot of the human creature.
At the outer corner of every eye is what is called the lachrymal gland, which nestles under the overhanging bone of the forehead. This organ secretes the fluid which flows over the eyeball to the inner corner, and there it disappears through a little orifice, whence it is in turn conducted to the nostril. That is why you require so many extra handkerchiefs when you have a cold.
Now comes the question, How do the tears find their way to the nose? Examine your eye in the mirror, and you will find a small elevation upon the lower eyelid, near the nose. Place your finger upon the lower eyelid just below this small elevation, so as to turn it outward. There you will see a small hole, like a pin prick, and there you have found the little passage which conducts the tears in to the nostrils.
This little orifice, for various causes, frequently be comes obstructed, in which case you are bound to weep incessantly until relief is afforded you by the removal of the obstruction.
The overflow of tears which follows some great grief
is created by the lachrymal gland under pressure of mental emotion.
Why are tears salt? Literally, our tears are distilled from the very springs of our inmost vitality, for they are separated by marvelous machinery and chemistry from the arterial blood freshly circulated from the heart ; and as this contains about six or sever parts in one thousand of saline constituents, so tears contain one-third per cent of chloride of sodium, besides a very small proportion of other salts, ninety-eight per cent being water. The office of this alkaline fluid is to clear, clean and moisten the cornea, which, having no blood vessels, would, of course, wither and dry up without this moisture, and we should become blind.

## Thermodynamics of the Human Machine.

In a paper published recently in the Comptes Ren dus, M. A. Chauveau gives particulars of a series of experiments made to determine the thermodynamic economy of the human machine. The apparatus con sisted of a pair of treadmills, each three weters in diameter, mounted on the same shaft. One of these treadmills was surrounded by a small chamber which was calibrated as a radiation calorimeter. A brake could be applied to either wheel at will and served to botb regulate the speed of rotation and to measure the energy exerted. The sped chosen was 80 revolutions per winexerth, with ute, wis to an effective work of 68 calories p bration of the calorimeter was effected by means of an electric current passing through heating coils in the chamber. It was thus easy to determine the output of heat required to maintain this chamber at any given temperature above that of the room in which it was placed. According to The Engineering and Mining Journal, the first series of experiments gave very uniform results. When the subject was doing useful work at the rate of 64 calories (units) per hour, he also radiated from his body extra heat amounting to 199 calories per hour. The efficieney of the human me chanism was therefore about $24 \% 3$ per cent.

## Automobile News

The Motor Age has just appeared in Chicago and is published by the Cycle Age Publishing Company. It is filled with a number of interesting articles and will undoubtedly prove interesting to its readers. The form, however, is rather sma!l for a paper devoted to motor carriages.
The Automobile is published at 150 Nassau Street, New York city. There are now two papers issued under this name, and The Automobile Magazine will be a third. The specific Automobile to which we refer consists of sixteen pages and contains a number of articles and notes on the automobile industry. It is quite well illustrated.

There is one place in New York where electric car riages are received and stabled and batteries charged at any time during the day. The batteries are charged in position or put on a small truck and taken to the charging-room. In a short time there will probably be facilities for charging storage batteries in every large stable in our cities.

## American Enterprise in Siam.

A former citizen of New Haven, Conn., Mr. Wallace J. Palmer, in traveling about the world, especially in the Far East, was particularly pleased with Siam. Haring had some experience in operating Florida hotels, he opened one on a small scale in Siam. The American patronage made him prosper, and among the visitors was the King of Siam, who after a few visitations liked the place so well that he made Mr. Palmer his chief caterer.

The relations between the two grew quite cordial until the king at last generously gave Mr. Palmer a large plot of land in the center of the city of Bangkok on which he is to erect a $\$ 200,000$ hotel structure. Land in Bangkok is said to be quite expensive. This practical recognition by the king of American enterprise is another example of how American ideas are being advanced in foreign countries.

## nicrobes in Telephones.

According to The Medical Record, Dr. W. H. Hill, of the bacteriological laboratory of the Boston Health Department, recently made an examination of thir teen public telephones in that city. In several of the transmitters harmless microbes were found, butan inoculation of guinea pigs failed to reveal the presence of any pathogenic micro-organisms. The report states, however, that this examination has demonstrated the possibility of infectious diseases, particularly diphtheria and tuberculosis, being conveyed from one use of the telephone to a subsequent user. He suggest that the receiver as well as the transmitter be also cleaned and disinfected. Precantions of this nature are more necessary in public than in private tele phones, as in many cases public telephones are used by persons who are unfamiliar with the instrument and insist u pon placing their lips in close contact with the transmitter.

Capt. Bulatowich, the head of the Russian Abyssin ian expedition, has discovered in South Africa a hither to unknown range of mountains; it has been christened Emperor Nicholas II. Range.
Pencils made from slate dust moulded by hydraulic pressure are made in large quantities in Tennessee They are much more popular than the solid-cut slate pencils. One concern last year made $25,000,000$ moulded pencils.
At the Pasteur Institute in Paris, 1465 persons were treated in 1898, and all but three were cured. For the thirteen years from the foundation of the Institute to the end of the year 1898, 13,181 persons were treated in Paris, and out of this number only 99 died.
Mr . Walter Wellman arrived in London August 28, and has undergone the first surgical operation for straightening his right leg, which was severely injured when he fell into the snow-covered crevasse during his polar expedition. The operation was entirely successful.
By a fatrof rock which occurred recently at Niagara Falls the Horseshue Fall has again been restored to it proper shape from which it derives its name. Of lat years the Fall has been nearly V-shaped, destroying much of its natural beauty. From 1842 to 1890 it is stated that $275,000,000$ cubic feet of rock had fallen away.

The lighting of the Paris Exposition will call for 20,000 horse power. At the Paris Exposition of 1853 the motive power was only 350 horse power ; in 1867 620 horse power; in 1878, 2.500 horse power; in 1889 5,500 horse power ; in 1900 it is thought that 45,000 horse power may possibly be needed, but about onehalf that will probably answer.

On Sunium's marble step the excavators have laid bare the foundations of the thirteen marble columns that give the promontory its modern name, Cape Colonna, and have found inscriptions showing that the temple was dedicated to Poseidon and not to Athene, as was supposed. It corresponds with the temple o Poseidon on the island of Aegina opposite.

An aquarium will be one of the attractions at the Paris Exposition. A dark incline will lead visitors to it, and suddenly they will feel as if transported to the very bottom of the sea, in the midst of marine land scapes and inhabitants of the ocean. Immense glas tanks will form the aquarium proper; the buttresses, pillars and girders which will form the frames of the tanks and hold the glass together will be entirely concealed under rocks.

A pair of joined $t$ wins resembling the Siamese twins were recently presented before the Academy of Medi cine of Rio Janeiro, Brazil. According to The Medica News, they were united by a band of soft tissue a the upper part of the abdomen, posteriorly and later ally. It was thought that an operation for the division of the band seemed feasible, but incision into the band revealed the fact that the kidneys of the twins extended through it and that this division might prove fatal, and the operation was abandoned.

On July 19, between 8 and 9 o'clock P. M., in the vicinity of Erie, Pa., according to The America Naturalist, the waters of Lake Erie suddenly rose in a single wave about 6 feet high which advanced upon the shore, and after a few moments quietly subsided to its normal level. Five miles west of Erie the ris was between 3 and 4 feet. Three distinct rises wer bserved. The first and second rises were about fifteen minutes apart, the second and third about half an hou ppart. Fifteen miles east of Erie the rise was about 6 feet, and but one wave was observed.

An Irish lord has found it necessary to invoke the aid of the divining rod in order to obtain a wate supply for his property. A Dublin professor has been investigating the phenomena connected with the rod and has arrived at a conclusion which is favorable to divination. He believes that hidden water exerts an influence over the muscles of the person holding the rod, and the involuntary twitching gives the signal. There is so much water in Ireland, however, that there is nothing remarkable in discovering water in almost any part of the country. Divining rod frauds are rampant in the United States, and evidently they are not less frequent in Great Britain.

A section of the famous mpundu tree at Chitambo which marks the place where Dr. Livingstone died, has been removed and will be sent to England for preservation. Two or three years ago, Mr. Weatherley visited Chitambo's and reported that the tree was in an advanced state of decay and would probably disappear altogether in a short time. The Roval Geographical Society decided that the best course to pursue would be to cut out the section of the tree which bears the inscription and have it sent over to England for preservation in the rooms of the Society. The place where the tree stood is marked by two telegraph pcles held in place by stays of telegraph wire, and a large stone cairn has been erected around these poles. In time it is expected that a permanent memorial will be built.

A great gas holder has just been completed for the corporation of Birmingham, England, which is 264 feet in diameter and 160 feet high when extended to its full height. Its storage capacity is $8,250,000$ cubic feet
There were three hundred and twenty-five competit ors for the prize for an improved garbage and refuse wayon, which was offered some time ago by the London County Council. The accepted design has four sliding covers, with wind guards raised eight inches above them; it has also a tipping screw.

The tides are now utilized for generating power at Pout l'Abbé, Finisterre, France, during fourteen hours a day. At flood tide the water flows through the canal two and one-half miles inland into a pond in the rear of the power house, and returns to the sea at ebb tide. The total fall is $7 \frac{1}{2}$ feet, and 80 horse power is gene rated by turbines.

The Illinois Central Railroad is experimenting with an inspection car driven by a gasoline motor. The experiments have been very successful, and it is proba ble that the road will adopt this kind of a car on all its divisions. It is really an "automobile of the rail," and should come into general use where the old hand work inspection cars are used. Twenty-five tiiles an hour is the average speed of the car. A gallon of gaso line will ordinarily run the car for seventy-five miles.
Russia has objected to the Sultan's mounting pneu matic guns at the northern entrance to the Bosphorus, on the ground that such action implied that he doubt ed the Czar's friendliness. The result is that the Sul $\tan$ inas canceled the contract for the pneumatic guns which were the work of a New York company. It is said that the Sultan got the idea of employing pneu matic guns from the accounts of the actions of the United States dynamite cruiser "Vesuvius" in the war between the United States and Spain.
There is a small station on the Chesapeake and Ohio Railroad, near Cincinnati, called California. The town had developed away from the station, and the railroad company has moved it to the center of the town. The building measured $60 \times 25$ feet and was one story high. Iron shoes were fixed under the structure, which was raised by jacks. An engine was then hitched on, the rails were greased between the engine and the build ing, and in exactly four minutes the station was conveyed a third of a mile and the men were rolling it on a new foundation. The work of changing the location of the station occupied only one hour and fifty minutes.

For the Suez Canal Company Messrs. William Simons \& Company, Renfrew, are about to begin the construction of a great hopper dredger. The vessel, which is specially intended for improving the entramee of the canal at Port Said, will be 270 feet in length, 48 feet in breadth, aud 19 feet deep amidship. She will have hopper capacity for 2.200 tous of dredging, and the bucket-ladder will dredge to a depth of 40 feet. The lifting capacity of the vessel will be 1,500 tons per hour, each of the buckets lifting about two tons of material Messis. Simons \& Company have also recently received an order to construct a powerful twin-screw dredger for Japan.-The Engineer.
The United States steamer "Michigan" is said to be the oldest iron steamboat afloat. It was constructed at Pittsburg, 1841-43. The parts were transferred to Erie, put together and launched in 1843. The origiual machinery, with the exception of the boilers, is still in her and in good condition, and, according to Cassier"s Magazine, there are two direct-acting engines, the paddle wheels being of the radial kind, 21 feet 6 inches in diameter. The vessel has been in continuous service until the present time, over fifty-five years, and is apparently as good for service as ever. Her armament is six 6 -pounders, two 10 -pounder rapid-fire guns, and two machine guns. Of late years her principal occupation has been in the instruction of the United States naval uilitia at the different lake ports.
Trials have been recently made in England of a device for shutting a railway carriage door, the object being to enable the guard to close and lock all of the doors of the train simply by turning a handle in his doors of the train simply by turning a handle in his
compartment, which we would call a "caboose." According to The Practical Engineer, coupressed air was the agent employed, and was conveyed along the train by the aid of flexible couplings like those used for the Westinghouse air brake. Under each coach is fitted an air cylinder with a piston actuating a pair of hori zontal rods which slide in guides under the footboards on each side of the train. The doors are connected by suitable devices so that when the guards bring the rods into action, with the aid of air valves, the doors are opened simultaneously. A spring connection renders the whole operation very gentle and noiseless. If the passenger's finger should be in the way, it would only prevent the door from closing, and would not injure it The locking is managed in a similar way, and it is a extraordinary thing that abroad railway passengers have accepted for so long a period such crude fastenings for railway doors, and the new device is a step in the right direction.

The British Association for the Advancement of Scince, at Dover, exchanged courtesies with the French Association, at Boulogne sur-Mer, on September 13, by means of wireless telegraphy.
A plant capable of developing 12,000 horse power has been built at Snoqualmie Falls, and the current will be transmitted to Seattle, twenty-six miles away. Thi falls are 270 feet high. The transmission line is to 1 : of aluminum, which has been made by the aid of water power at the Niagara Falls works.
The Niagara Falls Power Company has called for bids for the construction of a new wheel pit. This pit will be over 400 feet long, 20 feet wide and 180 feet deep. It will be located on the inlet canal opposite the present power plant. There will be room for at least ten 5,000 horse power turbines in this pit.
An electric telemeter for indicating gas pressure has recently been successfully tried in Detroit, where the pressure at the office in the city is communicated to the gas works, a voltmeter being used which is calibrated to read in terms of gas pressure, and a recording instrument is connected in parallel to it so that a permanent record of variations and pressures is kept.
The burning out of the fuse on one of the new motor cars of the Fifth Avenue line of the Brooklyn Elevated Railroad. September 11, resulted in a fire which almost destroyed the car and badly damaged the other car which it was drawing. The accident was the first of its kind in connection with the third rail system in its kind in connection with the third rail system in
Brooklyn. The fire department was called out, and the copflagration was extinguished.
A Brooklyn trolley car, at Sands and Adams Streets, jumped the switch, bumped over the tracks on the road, and brought up with a crash against the front of a house. The car, after leaving the tracks, had leaped the curb on the opposite side of the street, mowed down an iron fence, and struck the front of the building with much force. A wreeking car was sent for and the car was pulled out of Dr. Bodkin's front yard and replaced on the rails.
Electricity from a traveling crane injured one of the workmen in a large concern which builds steam engines. He sued the company for damages, and has recently obtained a decision in his favor, in the Rhode Island Supreme Court. The men have been shocked a number of times, and rubber gloves have been furnished to them. The court held that the insulation between the motor and the hauling chain should be so complete that its use would involve no risk of injury by electricity.
The Canadian Niagara Power Company has commenced preliminary work in connection with the development of power of the Canadian side of the river, by awarding the contract for boring testing holes along the line of the tumel it contemplates building. The test holes will be 200 feet deep and $41 / 2$ inches in dianeter. They will be bored with a diamond drill in order that a core of the rock will be brought to the surface and saved for inspection by contractors who desire to bid on the work.
Long distance telephone conversations, or rather a series of conversations, recently occurred between parties in New York and St. Lonis. The total cost of them was said to be about $\$ 3,000$; most of the talking was done at uight, and the bill for one continuous conversation amounted to $\$ 716$. This figure indicates that the talk must have lasted into the high-priced day hours, for anyone can converse from eight o'clock in the evening to six o'clock in the morning for $\$ 600$, the rate being $\$ 1$ per minute. Special care was taken to avoid interruption by operators cutting into the line.
A. Hecker, in Zeitschr. Elektrotechn., states that trolley poles must be allowed considerable up-anddown play in cases where the height of the overhead conductor above the rails is very variable. It often happens that when a trolley leaves the wire, the pole breaks a number of guard wires before the car comes to a rest. The author proposes to dispense entirely with springs in the trolley base and to substiture for them a coil and plunger mechanism traversed by the main current. If the trolley should be thrown off the conductor, the excitation of the magnet ceases and the trolley pole falls down by gravity out of haru's way.

An extraordinary accident occurred to a trolley car at Sing Sing, N. Y., on September 11, which recalls Robert Louis Stevenson's "Dynamiter," in which a man carrying a box of dynamite is jostled by a woman so as to cause the explosive to fall, though it does not explode. In the present instance a ton of dynamite was on a cart when it was struck by a troiley car, and a wheel was taken off the wagon and the vehicle was turned over. The driver of the wagon fell back in a half faint, and he knew it would be useless to run, even if he had not been paralyzed with fear. The motorman was also so frightened for a moment that he could not back away from the wreck. One of the passengers yelled "Dynamite," and they all beat a precipitate retreat, and there was little curiosity evinced when a new wagon was obtained and the dynamite was transferred.

NAVIES OF THE WORLD.
viil.-United states
With the present article on the United States navy, we bring to a close the series on the navies of the world which has appeared in the Scientific American at regular intervals during the past few months. The retiarn of Admiral Dewey and the completion of the two
strength of the various navies as represented by the ships that were either buiit or building at the begin ning of the year 1899. In that comparison we found that judged on a basis of total displacement and reck oning only ships that were fairly well up-to-date, the United States stood fourth in rank, the number of ships and total displacernents being as follows :


First-class Battleship "Oregon." Class of Three Ships. Displacement, 10,288 tuis. speed, 16.8 knots.


First-class Battleships "Kearsarge" and "Kentucky." Displacement, 11,525 tons. Speed, 175 knots.


Armored Cruiser "Brooklyn." Displacement, 9,215 tons. Speed, $21 \cdot 9$ knots.


First-class Battleship "Maine." Class of Three Ships.


latest battleships of the new navy form a conjunction of circumstances that renders the publication of an article on the American navy particularly opportune, the one event calling to mind the men and the other the material that have united to raise the American navy to its present high standing among the navies of the world.
It will be remembered that, as an introductory article to this series, we published a comparison of the

Great Britain, 290 ships, total displacement 1,557,522 tons; France, 144 ships, 751,629 tons; Russia, 86 ships, 453,899 tons; United States, 67 ships, 303,070 tons; Germany, 73 ships, 299,637 tons; Italy, 65 ships, 286,175 tons; and Japan, 46 ships, with a total displacement of 211,857 tons.
Battleships.-In looking over the accompanying table of the ships of the United States navy, one is struck with the fact that the major !ertion of the dis-
down on purely defensive lines, and our earliest firstclass battleships of the "Oregon" type were officially listed as "coast-line battleships." So also the monitors, five of which were a legacy from the post-bellum and pre-reconstruction period, constitute a purely defensive fleet, a fact which was half understood before the Spanish war, and needed only the test of war to make it a certainty. Latterly, however, the Navy Department has paid special attention to sea-going and


First-class Battleship "Kearsarge." Also "Kentucky."
 sil. Date, sgss


Displacement, 9,215 tons. Speed, $21 \cdot 9 \mathrm{knots}, ~ M a x i m u m ~ C o a l ~ S u p p l y, ~ 1,461$ tons. Armored Cruiser "Brooklyn."

7.-Armored Cruiser "New York."

 four Gatue. to hed gns. rorpeat rubes, two. cominment, 50 wate,

9.- First-class Battleship "Oregon." Also "Indiana" and "Massachusetts."


8.-Monitor "Puritan." Class of Ten Ships

Displacement, 6,060 tons. Speed, $12 \cdot 4$ knots. Maximum Coal Supply, 314 tons. Armor:
 Tate, $18 \%$ to 1882 .

10.-First-class Sea-going Battleshpp " 10wa."

 pounder, fort 1-pounders, four Colts, two field guns. Torpedo Tubes, four. Complement, 50 , J,




NAVIES OF THE WORLD-VIII. UNITED STATES,
fable of ships built or building in the united STATES NAVY.

| $\begin{aligned} & \text { description of } \\ & \text { TYPE. } \end{aligned}$ |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| 10 Battleships. | 13 | 11,010 | 143.130 | 167 |
| $\begin{aligned} & \text { Battleships, } \\ & 10 \text { to } 20 \text { years. } \end{aligned}$ |  |  | -•• | - |
| Battleships. Old or refitted. | $\ldots$ | $\ldots$ | $\ldots$ | $\ldots$ |
| Totals............ | 13 | $\ldots$ | 143.130 | $\ldots$ |
| $\begin{gathered} \text { Co a st } \begin{array}{c} \text { Defense } \\ \text { Vessels. } \end{array} \end{gathered}$ | 11 | 3,551 | 40,261 | $12 \cdot 2$ |
| Armored Cruisers. 9,000 tons and up. , | 1 | .... | 9,215 | $21 \cdot 9$ |
| Armored Cruisers, $7,000$ to 9,000 tone. $\}$ | 1 | $\ldots$ | 8,20] | 210 |
| Armored Cruisers. 1 below 7,000 tons. | $\ldots$ | $\ldots$ | $\ldots$ | $\ldots$ |
| Totals............. | 2 | $\ldots$ | 17,415 | $\ldots$ |
| Protected Cruisers ! 10,000 tons and up. | $\ldots$ | $\ldots$ |  |  |
| Protected Cruisers <br> 7.0.0 to 10,000 ) tons | 2 | 7,3i5 | 14,750 | $22 \cdot 9$ |
| Protected Cruisere , 4.0(1) to 7,000 tous | 6 | 4,539 | 27,234 | 19.6 |
| Cruisers. <br> 2.000 to 4,000 tons. | 11 | 2,974 | 32.710 | 18.4 |
| Totals ........... | 19 | $\ldots$ | i4,604 |  |
| $\begin{gathered} \substack{\text { Small Cruisers! } \\ \text { and Gunboats. }} \end{gathered}$ | 22 | 1,237 | 27,210 | 160 |
| Grand totals. | 67 |  | 303,070 | $\cdots$ |

sea-keeping qualities, with the result that in the fine vessels of the "Alabama," "Maine," and "New Jersey" classes we shall possess ships of the line which will be the match of any foreign battleships either for offense, defense, or ability to keep the sea in all weathers.
An excellent feature of our fleet of battleships is the fact that they are all in the class "ten years old or less:" moreover, twelve out of the thirteen are of the first class. The only second-class battleship is the "Texas," of 6,315 tons displacement and 17.8 knots trial speed. She was built at the Norfolk navy yard, the keel being laid in 1889 and the ship going into commission in 1895 . Her plans were purchased abroad and subsequently modified before and during the construction of the ship. A strange fatality seemed to attend her earlier history, and the popular prejudice engendered by her many mishaps was not removed until she demonstrated her good fighting qualities during the bombardment of Santiago and the destruction of Cervera's fleet, in both of which she played a prominent part. It was at the close of a single-handed engagement with the Socapa battery that the "Texas" received a shell through her port bow which killed one of her crew and temporarily put the whole 6 -pounder forward battery out of action. In the naval battle of forward battery out of action. In the naval battle of
a few weeks later, she was severely damaged in her a few weeks later, she was severely damaged in her
superstructure by a 5.5 -inch shell from one of Cervera's superstructure by a $5 \cdot 5$-inch shell from one of Cervera's
cruisers: The "Texas" is an excellent sea boat, thanks to her lofty freeboard; but her arrangement of battery is somewhat out of date. The two 12 -inch guns are placed "en echelon" within a central redoubt of 12 .inch steel amidships, each gun being carried in a turret protected by 12 -inch armor. She has a partial 12 -inch belt and a 2 -inch protective deck. 'The intermediate battery consists of six 6 -inch guns, and the secondary battery is made up of twelve 6 -pounders, six 1-pounders, four Hotchkiss guns, and two Colts. She has two torpedo tubes and carries a complement of 389 officers and men.
The earliest and best known first-class battleships of the navy are the "Oregon;" "Indiana." and "Massachusetts." Designed for coast-line service, where they would be within comparatively easy reach of a coaling port, they exhibit a high development of offensive and defensive qualities in the way of guns and armor at the expense of sea-going qualities, as represented by high freeboard, large coal supply, and liberal berthing accommodation for the crew. At the time of their launch they were, for their displacement, the most heavily armed and armored ships afloat ; and even today it is only the introduction of the rapid-fire gan that enables more modern battleships to show a greater total energy of gun-fire in a given time. Taking the "Oregon" as being probably the best constructed vessel of the three, if we may judge by actual performances in service, we note that on a displacement of 10, 288 tons she combines the following features : A waterline belt amidships of 18 -inch Harvey steel, with main barbettes and turrets of 17 and 15 -inch and secondary turrets of 6 -inch steel. In the two main turrets are four 13 -inch guns, and within each of the four secondary turrets is a pair of 8 -inch guns carried at a height of 26 feet above the waterline. The intermediate battery also includes four 6 -inch rapid-fire guns carried amidships on the main deck. The secondary battery is made up of twenty-nine 6 and 1 -pounders and ma-
chine guns, carried chiefly upon the boat deck. While this is a tremendous combination of offensive and defensive elements, it is liable to be severely handicapped by the very low freeboard of 12 to 13 feet, which in a seaway would bring the 13 -inch and 6 -inch guns into uncomfortable proximity to green water. Not that these vessels are for a moment to be spoken of as un-seaworthy-the 14,000 -mile run of the "Oregon" from seaworthy-the 14,000 -mile run of the "Oregon" from
the Pacific to the Atlantic settled this question for good-but as compared with ships of 20 to 25 feet freeboard, carrying all their heavy guns at heights even greater than this, the "Oregon" and her class would be at a decided disadvantage considered as gun plat forms. A comparison of the accompanying illustrations of the "Oregon" and the "Alabama" will show the great gain secured in the latter ship by the addition of a lofty spar deck extending from the bow aft for two-thirds of the ship's length.
The next battleship to be built after the completion of the "Oregon" class was the "Iowa." As compared with the "Oregon" she is of about 1,000 tons more displacement aind 17 knots trial speed, and to her was given a right to the title of "sea-going," by the pro vision of a spar deck with a freeboard of about 20 feet. The total bunker capacity was increased from 1,597 to 1,795 tons. On the other hand, the main battery was decreased in power by substituting 12 -inch for 13 -inch guns, while six 4 -inch rapid-fire guns took the place of the four 6 -inch guns of the "Oregon" class. The "Iowa," like the "Oregon," is now in Pacific waters, and like her she was conspicuous in the operations of the Spanish war.
Following the "Iowa" come the two battleships "Kearsarge" and "Kentucky," the first of which is now undergoing her official trials, and the other rapidly approaching completion at Newport News. As compared with the "Oregon," the "Kearsarge" is a bout 1,200 tons larger, displacing 11,525 tons, and her contract speed is one knot greater, being 16 as agrainst 15 knots. The "Oregon," however, made 16.8 knots on her trial, and the preliminary trials of the "Kearon her trial, and the preliminary trials of the "Kear
sarge" indicate that she will probably make 17.5 or sarge" indicate that she will probably make $17 \cdot 5$ or
17.75 knots on her official test. In the "Kearsarge" 17.75 knots on her official test. In the "Kearsarge"
the good features of the "(Oregon" are retained and the faults are remedied. The freeboard is a foot or two greater than that of the "Oregon," or say 14 feet-not as much as one could wish, especially in view of the concentration of weight near the bow and stern, due to the double turrets, but still an improvement over the earlier ships; the weight of the intermediate battery of 8 -inch guns has been reduced about two-thirds by throwing out four guns and two turrets altogether and mounting the other two turrets upon the roof of the 13 -inch gun turrets; and the intermediate battery has been strengthened by the substitution of fourteen 5 inch rapid-fire guns, which are carried behind a 6 -inch armored casemate amidships on the main deck.
The double turret is an iunovation as daring as it is novel, and it has been a fruitful source of discussion among naval officers and architects. That the device is economical in weights may be judged from the fact that the all-round fire of the four 8 -inch guns is as great as that of the eight guns on the "Oregon," the latter ship never being able to fire its 8 -inch guns dead ahead or astern because of interference with the 13 -inch guns. Moreover, the turning machinery and ammunition hoists are so superbly protected by the 15 -inch armor of the 13 -inch turrets that their chances of being dis abled are extremely slight. On the other hand it must be admitted that a well-directed shell might disable all four guns of a double turret at once, and the crowding of four sets of hoisting gear so closely together is undesirable and might lead to serious delay in all four guns of the system. Only the test of service can determine the actual merits of the device. The principal particulars of the armor, batteries, etc., of this fine ship will be found below the half tone engraving of the vessel. Special attention should be drawn to the fact that the waterline armor is carried right up to the stern, being four inches thick at this point.
Following the "Kearsarge" and "Kentucky" come the three sea-going battleships of the "Alabama" class. The "Alabama" was launched in 1898 and has recently undergone a builder's trial. She is of the same displacement, coal capacity and contract speed as the "Kearsarge," but there the likeness ceases. In the first place a lofty spar deek with a freeboard of about 20 feet as in the "Iowa" extends from the bow for twothirds of the length, and above this is carried the forward pair of 13 -inch guns at an elevation of about 24 feet above the water. This deck not only improves the sea-going qualities, but it also affords splendid berthing accommodations for the crew. The 8 -inch gun has disappeared altogether and the intermediate battery is made up of fourteen 6 -inch rapidfire guns, with the resulti that the total energy of gunfire per minute is greatly increased though the destruc tiveness of the 6 -inch shell is far less than that of the 8 -inch. The 6 -inch rapid-fire battery is distributed on two decks. Eight of these guns are carried on the main deck within a central citadel protected with 6 inches of steel, two are mounted forward in 6 -inch casemates, one on each bow, and two amidships in case-
mates on each beam on the spar deck. The after pair of 13 -inch guns is carried on the main deck. The armor is $161 / 2$ inches on the belt, $51 / 2$ or 6 inches on the sides above the belt, 14 inches on the turrets and 15 inches on the barbettes. The contract speed is 16 knots and will probably reach 17 knots or more on the official trial.

The "Alabama" must always be a notable battleship for the reason that she is the first of a type which for the reason that she is the first of a type which
seems likely to become permanent. The type has been reached by a process of selection; and it represents the embodiment of the experience of our own and other warship builders the world over. The later ships, of the "Maine" and " New Jersey" classes, are simply improved "Alabamas," incorporating as they do the later ideas as to speed, armor, and batteries, with such increase in displacement as is rendered necessary.
Thus the plans of the "Maine,"which originally called for a 16 -knot ship, have been changed to admit of her making the more modern speed of 18 knots. Twenty feet were added to the lengrh, and 1,000 tons to the dis placement. This enlargement, together with the reduc tion in thickness of the armor, due to its higher resisting qualities, and the saving in weight due to the substitution of the 12 -inch for the 13 -inch gun, have enabled the coal capacity to be increased and a more liberal amount of stores to be carried. The bunker capacity is 2,000 tons, and two additional 6 -inch guns appear in the intermediate battery, making sixteen of thistype in all. The three vessels of the "New Jersey" class, authorized last Congress, and purposely "held up" as to their construction by the tactics of a few politicians who succeeded in imposing impossible re strictions as to armor, will conform in general to the "Alabama" and the " Maine," but will contain some new features of interest, which were illustrated in our issue of September 9,1899 . As they are not yet under construction these ships are not included in the table of the navy above given. The plans have not been finally decided upon. but the particulars will probably be as follows: Displacement, 13,503 tons ; speed, 18 knots ; coal supply, 2,000 tons. Armor : belt, 9 to 4 inches; central casemate, 6 inches; 14 -pounder battery, 3 inches; main turrets, 12 inches; 8 -inch tur rets, 6 inches. Battery : Four 12 -inch, four 8 -inch twelve 6 -inch rapid-fire ; sixteen 3 -inch rapid-fire, and sixteen 3 -pounders, besides many smaller guns. The personnel throughout the navy will welcome the re turn of the 8 -inch gun. The four guns of this caliber will be carried in turrets one on each beam amidships. All the guns of these ships and the "Maine" class will be of the new, long caliber smokeless-powder type, with improved breech mechanism, and the energy and rapidity of fire will be increased proportionately.

The adjoining table, for the particulars of which we are indebted to the courtesy of Rear-Admiral O'Neil, shows what an increase of energy and decrease of weight has been effected by the improvements which have taken place during the past decade in the ballistics of our naval guns. Thus, we find that the use of smaller calibers, higher velocities, and rapid-fire breech mech anism has not only raised the total muzzle energy of the guns of the main battery in one minute's firing from 137,015 foot-tons in the "Oregon" to 337,716 foot tons in the "New Jersey," but the proportion of the weight of these guns to the displacement has been re duced from 3.60 per cent in the former to $2 \cdot 78$ per cent in the latter vessel.

COMPARISON OF MAIN BATTERIES.

| 1. | 2. | 3. | 4. | 5. | 6. | 7. |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |
| $\text { "Oregon" an. } \begin{gathered} \text { Class....... } \end{gathered}$ | 10,288 | 413 -in. of 35 c:als. $88 . \mathrm{in}$. of 35 cals . $46-\mathrm{in}$. of 40 cals. | 371 | 137,016 | 3,458 | 306\% |
| "Iowa" | 11,340 | 412 in . of 35 cals 88 -in. of 35 cals. $64-\mathrm{in}$. of 40 cals . | 294 | 111,582 | 3,119 | 253\% |
| "Kearsarge and Class... | 11,525 | $\begin{aligned} & 413 \text {-in. of } 35 \text { cals. } \\ & 488 \mathrm{in.0} 35 \text { cals. } \\ & 145 \text { - in. of } 40 \text { cals. } \end{aligned}$ | 338 | 200,984 | 4,558 | 12.98 |
| $\begin{gathered} \text { "Alabama " and } \\ \text { Class. } \ldots \ldots . \end{gathered}$ | 11,5\%5 | 413 -in. of 35 cals. 146 -in. of 40 cals | 326 | 235,764 | 5,458 | 2\%8\%\% |
| $\begin{gathered} \overline{\text { Maine }} \overline{\text { Class. and }} \\ \hline \end{gathered}$ | 12.500 | $\underset{16}{4} \underset{6}{12 \mathrm{in} \text { in. of of }} 50 \mathrm{cals}$ cals. | 336 | 357,852 | 5,929 | 2.68\% |
| New Jersey $"$ and Class.. | 13,500 | $\begin{array}{\|c\|} \hline 4 \\ 4 \\ 42 \text {-in. of } 40 \text { cals. } \\ 12 \\ 12 \text {-in. of } 45 \text { cals. of } 50 \text { cals. } \end{array}$ | 376 | 337,716 | 5,229 | 2.78\% |

Monitors. - The monitor is a legacy of the civil war, and the fact that as recently as last year Congress authorized the construction of four of this archaic type of vessel proves how largely, even in such a weighty matter as warship construction, a legislative body may be swayed by sentiment and tradition. Including the new monitors now under construction, we have a dozen of these home-keeping craft. With these, as being more like them than it is like any other ships in the
navy, we have included in our table the armored ram "Katahdin." Four of the monitors are of the "Miantonomoh " type, and one, the "Puritan," is an enlarged "Miantonomoh." Their keels were laid as long ago as 1874, and after ten years had elapsed only the iron hulls and old fashioned engines were completed. Subsequently to 1875 they were again taken in hand, modern armor being placed in position, and modern breech loading rifles mounted in the turrets. The "Mianto loading rifles "." Monern "are sister ship nomoh," Monadnock," and "Terro," are sister ships of 3,990 tons and 105 nots spe The armament con sists of four 10 -inch breech-loading rifles carried in two turrets, besides two 4 -inch rapid-fire guns and eight smaller rapid-fire guns and machine guns carried on the superstructure. The side armor is 9 inches thick amidships and 5 inches at the ends. The barbettes carry $111 / 2$-inch and the turrets $71 / 2$-inch armor. The "Puritan" is a much larger vessel than these, with a displacement of 6,060 tons and a speed of 12.4 knots. The full particulars are given below the accompanying engraving of the vessel "The "Monterey" which, in engraving of the vessel. The "Monterey," which, in common with the "Monadnock," is now in the Philip pines, the two vessels having crossed the Pacific under their own steam, is a modern vessel in all particulars. She is of 4,084 tons displacement, 13.6 knots speed, car ries a 13 -inch belt and 8 inches on the turrets, and carries a main armament of two 12 -inch and two 10 -inch guns. The four monitors of the "Arkansas" class, which are now under construc tion, are considerably smaller than the ves sels above mentioned, and must necessarily be confined strictly to harbor defense. On a displacement of 2,755 tons, they will have a speed of 12 knots and will carry two modern 12 -inch guns in a barbette turre armored with 10 inches and 12 inches of steel There will be a battery of four 4 -inch gun carried at the four angles of the superstruc ture. The "harbor-defense ram" "Katahdin," as she is officially known, was built purely for ramming. She has an armored turtleback deck, varying from 3 to 6 inche in thickness, and when her total weight of 2,155 tons is being driven against the enemy at a speed of 16 knots she is supposed to be a very formidable weapon. Among the offi cers of the navy, however, she has alway been an unpopular craft, and it is not likely that her design will ever be repeated
Armored Cruisers.-In the class of ar mored cruisers we have at present only two vessels. the "New York" and the "Brooklyn," although three powerful ships of 12 , 000 tons were authorized by the last Congress. Both the "New York" and the "Brooklyn" were brought into special prominence in the late war. The "New York" was the flagship of Admiral Sainpson, and as such she was a conspicuous vessel in the blockade of Havana, the bombardments of San Juan and the Santiago forts and the blockade of Santiago Harbor The "Brooklyn" as flagship for Admiral Schley was first identified with the flying squadron at Hampton Roads and later became famous as the vessel picked out by the Spaniards for their concentrated fire when they made their sortie from Santiago, and the leading ship in the long pursuit of the "Cristobal Colon." The full particulars of these vessels are given beneath their respective engravings. Before passing on to a consideration of the protected-cruiser class, attention should be drawn to the fact that it is in the armored-cruiser class that we ought to make the first and largest addition to our navy. These vessels combine the mobility of the cruiser with much of the powers of attack and defense of the battleships. With a sufficient fleet of armored cruisers afloat, we would be prepared to meet a sudden concentration of armored ships in any part of our widely extended possessions.
Protected Cruisers.-Our earliest efforts in the creation of a new navy were confined entirely to the construction of protected cruisers of high speed. and powerful batteries; and though of late years we have somewhat neglected this class and our attention has been directed more to the construction of battleships gunboats, and torpedo boats, we have a fine fleet of uineteen effective ships of the protected class, ranging in displacement from $2,000 \mathrm{up}$ to 7,375 tons. The largest and fastest are the twin ships "Minneapolis" and "Columbia," of about 23 knots trial speed and 7,375 tons displacement. These were originally built as commerce destroyers, a work for which their speed and enormous cruising radius render them exceptionally qualified. Of ships bet ween 4,000 and 7,000 tons displacement we have six: the "Chicago," 4,500 tons and 18 knots; the "Newark,". 4,098 tons and 19 knots: the "Baltimore," 4,413 tons and $20 \cdot 1$ knots : the "Philadelphia," 4,324 tons and $19 \cdot 7$ knots; the "San Francisco," 4,098 tons and 19.5 kuots; and the famous "Olympia," Admiral Dewey's flagship at Manila, 5,870 tons and 21.8 knots. The "Chicago," "Baltimore," and "Olympia"
carry, each, four 8 -inch guns as their main battery, the intermediate battery consisting in the "Chicago" of fourteen and in the "Olympia" of ten 5 -inch rapid-fire guns; in the "Baltimore" the intermediate battery consists of six 6 inch guns. The three other vessels carry a main battery of twelve 6 -inch guns. All of these ships have complete protective decks.
By far the most effective of them all is the "Olympia," for in addition to her greater displacement, she has the advantage of about 2 knots greater speed moreover, she carries her main battery in turrets, and her protective deck is heavier, reaching a thickness of $43 / 4$ inches on the slopes. A finer vessel for her size it would be difficult to find, and because of its historic associations the name "Olympia" will take its place as one of the most famous in the annals of the United States navy.
There are eleven cruisers in the navy of from 2.000 to 4,000 tons displacement. These are the "Atlanta" and "Boston," 3,000 tons and 18.2 knots, and the "Charleston," 3,700 tons and 18.2 knots, each carrying two 8 -inch and six 6 -inch breech-loading rifles; the "Cincinnati" and "Raleigh," 3,213 tons and 19 knots, armed with one 6 -inch breech-loading rifle and ten 5 . inch rapid-fire guns; the "Detroit," "Marblehead," and "Montgomery," unprotected cruisers of 2,089 tons and 18.5 knots, carrving ten 5 -inch rapid-fire gums; and


ADMIRAL DEWEY ON BOARD THE "OLYMPIA" AT VILLEFRANCHE
breech-loading rifles. In the unarmored composite gunboats of the "Annapolis" and "Marietta" type we have six useful vessels of 1,000 tons displacement and speeds of from 12 to 13 knots. Each carries a main battery of six 4 -inch rapid-fire guns. Other vessels in this class are the "Topeka," 1,700 tons and 16 knots, carrying eight 4 -inch rapid-fire guns, a re-armed iron cruiser purchased during the war; the training ship "Chesapeake," 1,175 tons, propelled entirely by sail power : the steel dispatch boat " Dolphin," 915 tons and 15.5 knots, carryiug three 4 -iuch rapid-fire suns, and the "dynamite gunboat" (as she is called) "Vesu vius," armed with three 15 inch dynamite guns.
This brings us to the close of our necessarily brief review of the ships of the modern American navy and to the close of our series on the navies of the world. Comparing our relative strength now with what it was fifteen or sixteen years ago, when we entered in earnest upon the stupendous task of creating from the ground up, as it were, an entirely new navy, we have just cause for congratulation. At that time the United States had no place upon the list of modern navies or if it had, it was that of a poor sixth ; to-day it not only raks as of the not it has outgrown in strength the fleets of Italy and Germany, and ranks easily as fourth in power and efficien $\cdot \mathrm{y}$. As to the personnel, it is unnecessary to do more than point to the records of the Spanish war, where both officers and men have shown that dash and good shooting are today, as of old, the distinguishing characteristics of our navy.

Lithium Minerals and Their Utilization.
Probably it is not generally known to manufacturing chemists in the United States that this country has vast resources in lithium mineral which have never been exploited. Lithium is classed as one of the rare elements, and is indeed rare in its metallic form, but its compounds are not rare in occurrence or in commerce. We do not know what their usefulness might be if their supply were large and cheap, but at present the use of lithium salts, especially the carbonate, is chiefly in the preparation of lithia water, which is used extensively for medicinal purposes in such diseases as rheumatism, due largely to an excess of uric acid in the system. There are some natural lithia waters, but a good deal of what is sold as such are artificial. The consumption of lithium carbonate for this purpose in the United States is variously estimated at from 40,000 to 200,000 pounds per annum, all of which is obtained from Germany. The average value of the salt at New York in 1898 was $\$ 4.22$ per pound. Consequently, it is evident that there is a good business in sight for some one who will undertake its manufacture in this country, although it should not be expected that the price would keep up if the supply were increased largely.Engineering and Mining Journal.

The Current Supplement
The current Súpplement. No. 1239, has many articles which will interest our readers. The front page is taken up by a fine engraving of the design for the Na-
the recently acquired "New Orleans" and " Albany," of 3,600 tons and 21 knots. carrying six 6 -inch and four 4'7-inch rapid-fire guns. The latest and most effective of these ships are the two last named, and it is sin cerely to be hoped that the revised plans for the six new 3,500 -ton cruisers will be based upon the admirable design embodied in these two boats.

Small Cruisers and Gunboats.-In this class are included twenty-two vessels, of an average displace ment of 1,237 tons and average speed of 16 knots. The most important of these are the three gunboats "Ben nington," "Yorktown," and "Concord," the last of which did excellent work in the battle of Manila Bay. Which did excent work in tons displan Manila Bay these vessels are of 1,710 tons displacernent and 16
to 17 knots speed. The "Concord " and "Bennington" to 17 knots speed. The "Concord" and "Bennington" mount six 6 -inch breech-loading rifles in the main battery, and the "Yorktown" has been re-armed with six 5 -inch rapid-fire guns. Next to these in size are the light-draught gunboats "Helena," "Nashville," and "Wilmington," of 1,362 tons and 15 to 16 knots, carrying each eight 4 -inch rapid-fire guns. They were designed for shoal waters and river service and are admirable vessels for the purpose. The "Castine" and the "Machias" are punboats of 1,11 Castine" and the "Machias"are gunboats of 1,11 tons and 16 knots , armed with eight 4 -inch rapid firers. The "Bancrot," 835 tons and 144 knots carries four 4 -inch rapid-firers, and the little "Petrel," 892 tons and 11.8 knots, will ever be memorable as hav ing formed one of the Manila fleet on the 1st of May, 1898, where, at the close of the fight, she was sent into the shoaler waters of Cavite to complete the destruc tion of the Spanish fleet. She carries four 6-inch
tional Pavilion at the Paris Exposition. Plans of the Exposition grounds and of Paris showing the methods of communication are also given. "The Automobile Club of France" is an article by Francis P. Mann. "The Prolongation of the Orleans Railway" describes an important engineering work. "In the Philippines" describes some of the interesting scenes which are tak ing place in our new territory. "How Clay Pipes are Made" describes a novel industry in an attractive manner. "Prehistoric Man in America" is an abstract of an address delivered by the American Association for the Advancement of Science by Dr. F. W. Putnam. "The Beginnings of the Science of Prehistoric Anthropology" is by Prof. Thomas Wilson. "The Present Position of the Investigation of the Malarial Parasite" is a timely article upon a subject which is interesting the scientific world. "The History of the Umbrella" is a curious article.

Contents


RECENTLY PATENTED INVENTIONS

## Bicycle-Appliances.

shaft-bearing.-byron E. Foss, Chicago, ill. his bearing for crank-shafts diseter. Bearing ope are normally seated in the ends of the casing and are ongitudinally open at oae side. On the shaft are bea ng.collars; aud on opposite sides of the bearing-collar etaining-collurs have their edges turned inwardly. These etiuning-collars form the side walls of raceways in whic ne wall of each being turned toward the other. Ball lso roll in the latter race.waye.
rest.-alexander G. Shields, L'Anse, Mich. The bicycle-rest comprises members adapted for attachardly a extending lugs with which lege are pivotally co wardy. extending lugs with which legs are pivotally con-
nected. Downwardly and out wardly inclined block between adjacent lugs govern the angle of the legs
relatively to the bicycle. A member adapted to be secured to the bicycle-frane has clips to receive the leg when folded.

## Hallway-Contrivances

switch.-Charles Troup, Watszka, III. The preeut invention is an inprovement upon an operative meventor. With the fised and switch rails a tripping device is connected, adapted to be a ted on by car-wheels. A rod xtands alongeide the track and is comected with auto natic mechanism for shifting the switch-rails. When locomotive or car passes over the siding, traction is ap plied to the rod and hence to the automa ic mechanism, position into position for the siding.
adjustable seat..-Thomas B. Mason. Trenton, morme The seat consists of a stavide a seat sally mounted so as to have free movement in any direc tion and provided with a bicycle-saddle secured to a tubular post resting on a spring surrounding the standard son that there will be no jar. When it is necessary for the motorman to rise, the sad Il2 will be carried up with
hii n hy the esuansion of the spring. The saddle is hin a by the expansion of the spring. The
collapsible seat anin head-rest.-Henry Shis iuvention provid. rail way-car seate, so as th frovide a support for the head of a traveler. The seat and back are furnished with pillow upon which the h add may be reclined. The im proved chair may be very compactly folded and place conveniently carried in a valise or hand satchel. The chair can also be used on the sea-shore

## Hiscellaneous Invention

ELECTROMEDICAL APPLIANCE. - John E non conducting front and back portion. Electrodes re located on the outside of the belt, and have fastenngs extending into the space between the front and
back portions of the belt. A wire is located between these portuns of the belt and electrically connects the through the belt to the outside in order to form a $\mathrm{m}: ~$ or counecting the belt with a source of electricit.
artificial bait.- Edward T. Dukes, quitman, a. This inventor has provided an improvement in will move like a minnow the bait has a body composed of a thin plate of aluminium resembling innow and twisted spirally to insure its rapid rotatio j-ctions are provided to aid as propellers in securing the lith side of the axial line and are so attached as offer the least resistance to the rotation of the bait-body ad to be readily removed and replaced.
hydraulic-dredge. - Peter Kirk, Kirkland, Wash. This machine for dredging gold-bearing sands
and gravel covered by water comprises a vertical rotary mast and two horizintal supporting arme. A vertical hydraulic pipe is adjustably mounted on the upper arm and passes through the lower arm. The pipe has inner and outer tubes with a boring-head at its lower end. On the lower arn a turning mecbanism for the hydraulic pipe is mounted. At the upper end of the hydraulic pipe is a receiver provided with pipes for carrying away
the sand and gravel. There are no valves and working the sand and gravel. There are no valves and working
parts; and the machine carries the full power of suction and force to any depth required.
SASh-LOCK - (Eeorge E. and Lowell Parker, rovement in locks for securing upper and lower an imtogether, so that they cannot be raised or lowered withont first freeing the lock. The locking mechanism is iuclosed within a casing having bearings for two lockingbolts which cross each other at right angles. One of the
boits is adapted to enter a recess or hole within oue of he sashes and the other bolt is adapted to enter recesse each provided with a central yoke or crank, which cranks mutually engage with each other, so that one bolt may be reciprocated by turning the other.
DETACHABLE CONNECTION FOR ELECTRIC fixtured. - Stacy g. Read, Bridgeport, Comn. On the stage it is often a matter of importance quickly to Lange the incandescent lamps, in which operation the h.inal screw and socket are too inconvenient. In the pre-
s:ath invention a fixed base is used having two parallel grooves. Two metal plates connected with the feedwires are secured to the face of the base outside the grooves and project over the major part of their width. A socket-base has two projecting L-shaped aruse in
electrical connection with the conductors of the fixture, which arms cuter the grooves and engage the plates so
that the fixture can le quickly slid into and out of place. harness-buckle.-- James a. Giavitr. Waitshurg, Wash. The haruess-buckle provided by this ninventor is especially adapted for use as a trace-buckle,
but can be used equally well upon light or heavy har-
ness. The conetruction is such that the buckle can be
cheaply manufactured and can be readily manipulated to efect a conection or decomnetion between two atraps The buckle is entirely free from springs an. can be op.
rated as readily with gloved as with ungloved hands. Jack-Charles W. Doane, West Lake, La. This ack comprises a body portion in which a lifting-scre screw, which mechanism includes a lever provided at it outer and with spaced lugs and with a block arrange centrally. An extension handle is adapted to be re ceived between the lugs and is provided with fingers ranged to embrace the block. The jack can be operated pwardly or downwardly, and can be used for pushing post.
signal-Lantern.-Thomas m. Crepar, Siwa Ressels, Mocks, and the like is the purpose of this ind ion. The lantern cumprises a burier and two giobes different colors, one of the globes being fixed relatively to the burner and the other clobe being movable into an ctuve position around the burner for the lantern to dis play a danger-signal, or into an inactive position for the boat mor
Boat for land or water. Jean p. Bou Lesqie, Manhattan, New York city. This invention
provides a combination boat and wagon. The hull of the vessel has a driving-shaft, the ends of which are dapted to receive supporting-wheels. A tuck is de tachably connected with the forward portion of the
boat and is provided with a steering device. A pro peller-shaft is adjustably geared with the drive-shaft and the drive-shaft is, in turn, connested with a moto torage-chambers are provided for power. The motic gent used is compressed air.
CONCENTRATOR. -Joseph Woodham, Longbeac Wash. The invention is an improvement in concentr dors adapts. particularly for use in connection with place ocking, curved trough having angularly-shaped ritte extending across its bottom and stirring projections pins projecting upwardly from its bottom. The swinging motion will cause the pins to pass back and forth hrough the water, while the water, by rason of its iner ia, will be at rest. Consequenty, he material is co inually stirred. so that the gold may readily seti, carbonating apparatus. - Juhn Walte avanna. Ill. The apparatus is more especially designe and is composed of a receptacle provided with an inle or the liquid to be carbouated, in which receptacle foat is located which controls a liquid-supply valve. A
pipe extends through the float and is provided wi pipe extends through the float and is provided wis openings in the upper and lower portion of the float,
$\omega$ fill the latter with gas and drain the liquid thererom.
neckitie.-Gustave Selowsky, Manhattan, Ne York city. The tip of the collar-band of a necktie is so
made that it can be utilized entirely for engagement with the fastening-pin of the tie. The band is made horter than usual, thereby economizing in material, but
nevertheless so arranged that it can be applied to greater range of variously-sized collars than formerly. DEVICE FOR MAKING CIGARETTES.-Josep b. Popentagen, Chicago, hi. This invenion provid a portable device for making cigarettes, which device
can be comfortably carried in the vest-pocket and can be used in direct connection with a tobacco-pouch. The a garment, so that the tobacco may be drawn from its pouch, packed in a shaping-section of the device, and passed from the section into a wrapper of the usual type prepared to receive the packed material.
PUZZLE.--Joun J. O'Brien, Manhattan, New York city. The puzzle comprises a box and a die; the box
being so arranged that after inserting the die, it will be difficuli to discharge the die from the bos. Only a per on familiar with the puzzle can thus displace the die. SMELTING-FURNACE--Josepr V. Otten, Iola
Kan. In the general method of usiug naral fuel in zinc-smelting, there is an enormous waste and considerable expense. The present invcution reduces the cost of constructing and operating smelting-furnaces by dispensing with the use of a blower-plant, the initial pres ound sufficient to draw in all the air necessary through propariy-constructed burners. The inventor also proand avoids all blowpipe action. The flue-opening are so arranged that the heated gases pass between and
around each bank of retorts before pass ny out at the flue-opening, which is opposite the heat-side of the retorts.
theatrical appliance.-Frederic S. Lotto Manhattan, New York city. A patent has been pranl o this inventor for an appliance which, when all parts are assembled, will represert a piano. By pulling upon cords or ropes, the casing will fall apart, several
loosely-hanging gtrings will be disclusel, and the piano will apparently be completely demolished; nevertheles a perfect.
intact.
gat
gate-Latch.-William a. Jeffers, Mulberry Ark. In a casmg having a slot in its wall, a elide is nounted having shoulders working in the slot to limit
se slide's movement. Keeper-fingers project outardly from the siide, and a latch is mounted on one he fingers and adapted to swing against the other. pin is movably mounted in the casing and is allapted th engage any one of a series of openings in the slide so a
to hold the slide adjustable. The latch can be conveniently adjusted to suit the variatious in the position of the gate, and can hence be arrangel to compensate for the sagging of the gate.
device for sealing packages.- Henry m Humpherr. Plainfield, N. J. The paratinu or wax paper
package has its uppar edges bromght together and bent upon themselves to form a fold. A sealing-plate is provided, having a Hange hetween which and the body of plate is firmly and immovably clamped, wherety a

## of which it is made

SASH-CORD fastener. - Richard bohrisc Chicago, Ill. The fastener has two cheek-pieces adapted o lie on each side of bolt-holes through which a fastening-bolt may be passengage with secures to ach che with each other. By means of this fastener the cords may be disconnected so that the sash can be removed from the frame.
lacing. - Peleg J. Congdon. Providence, R. This lacing is applicable to shoes and corsets, and is a sififener in the form of a split tube located at the tip of the lacing, the split clamping a
side of the lacing, and giving a neat appearance to the whole.

## Designs.

L.AP-Robe.-Mrs. Magoin B. The lap-robe is designed to rest in us? upon the seat. the bed of the carriage then forward a returned tion extends up sufficiently high to protect the lap of the rider, and is provided at its sides with flaps which lect he rider at the opposite sides of the vehick RATCHET-bAR FOR WINDOW-FASTENERS. William L. and Challes T. Fields, Cedar Bluff. Va One face of the ratchet-bar is composed of a series of orm sh ulders adapted to receive a latch on the sash as to hold the latter at various elevations Below the eries of inclined surfaces is a flat protuberance with her edge of which the latch is adapted to enga wosition. The bar is also provided with a scalloped edge.
pold Note..-Copies of any of these patents will be furnished by Munu $\&$ Co. for ten cents each. Please state
the name of the patentee, title of the invention, and date of this paper.

## NEW BOOKS, ETC

Lexikon der Metall-'Technik. Redi girt von Dr. Josef Bersch. Vieuna
A. Hartleben. 1899. 6-10 installments Price, paper, 70 cents each
Die Moderne Chemie. Eine Sch derung der Chemischen Grossindus trie. Von
Vienna: Ar. Wilhelm Bersch.
Hartleben. 1899. 6-10 installments. Price, paper, 70 cents each.

With.the tenth instalment both of these works have very first harts completed. At the appearance of the he exceptionally broad in cope and exhoustive in treat The first halves as a whole certainly deser the unstinted praise which they have received, and the favor.
Modern Plumbing, Steam and Hot Lawer. Heativg. By James J. lishing Company, i8 Rose Stree 1899. 8vo. Pp. 397, 300 illustrations.

The author has had many years of practical contac water plants and plumbing work, and he has rery wisely decided to elucidate his text diagrams reproduced on a large scale. The resalt ha been a work which can be used to advantage by ever plumber even though he may not be a sanitary enginee It 18 specially adapted for the plumber, the heating eng neer, the builder and the architect, and all of them them.
Heat and Heat Engines. A Study
the Principles Which the Principles Which Underlie the Plant. By Frederick Remsen Hutton. New York: John Wilev \&
Sons. London: Chapman \& Hall, Limited. 1899. Pp. xxi, 553. Price
$\$ 5$. ${ }_{\$}{ }_{\$}$
This volume supplements "The Mechanical Eugineer ing of Power Plants "by the sume author. In the pres-
ent volume he deals with the question of design of apparatus and treats the sulbjeet in a thorough and scien tific manner. Probably no one is better fitted than Prof. Hutton to deal with the subject on which even great authoritices have failed. It is a most admirable book which we can confidently recommend to all except begimers who have some difticulty in understanding mathematice, but as a reference book for them it will be
iuvaluable.
Lanidscape Gardening. Treatise on Out-Door Art. With Sundry Sugges tions for Their Application in the Commoner Problens of Gardening.
By F. A. Waurh. New York Oy F. A. Waugh. New York:
Orange Judd Coupany. 1899 II.
lustrated. Pp. viii, 152. Price 50 cents.
An excellent little book on the subjeet has been needed for some time. There are wonderful opportunities open to all architects and gardeners and we regret
to say that in the majority of cascs these opportunities are lost. because people do not know how to analyze or understand a landscape. The perusal of this book while it will not make landscane sardeners, will i, wt the reader
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science and will thus enabie him intelligently to lay out mall private grounds.
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hints to correspondents. Names and A ddress must accompany all lettere
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information and not for pubbication.
 some answore require not a little research, and.
though we encieavor to repy w at al either by lettet
or in this aepartment. cach must take hie turn.


 Winerals sent for examination should be distinctly
marked or labelea.. (7722) J. R. E. asks: 1. Is there any definite relation between the length of a static spark and the voltage? A. There is a relation between the voltage
and length of spark given across an air gap, but not a simple relation. You will find something on this point in Thompson's "Electricity and Magnetism," price $\$ 1.40$ by inail. Also an article in the "Proceedings of the American Institute of Electrical Engineers," vol. x. giving voltage and spark length. 2. Do the uranium salts fluoresce to any extent under influence of the $\mathbf{X}$ rays? A. The simplesalts of uranium do not fluoresce strongly
in Roentgen rays. 3. Would it he possible, by suspend-
in ing a suitable collecto at hight 500 , by suspend which is connected to a terminal and Leyden jar, and to another terminal and Leyden jar connecting a ground wire, to obtain a static discharge? A. Certainly, if the
air was charged to any extent. At any time there would air was charged to any extent. At any time there would
be considerable electrification of the balls. You only be considerable electrification of the balls. You only
describe a modification of Franklin's experiment with the kite, an experiment which we should advise you not to repeat during a thunderstorm
(7723) W. V. asks: If an ounce of iron and a ton of iron should be dropped from the same height at. tine same time, would they both reach the
ground at the same time? A. This matter was put to groud test of experiment by Galileo at the Leaning Tower of
the Pisa early in the 17 th century, with two balls of lead,
weigiing one and ten pounds respectively. The followers of Aristotle had tounts respectively. The colls would fall in proportion to their weights, the heavie one falling the faster. Galleo pointed out. the fact that
the lighter one would reach the ground first because the the lighter one would reach the ground first because the
air would resist the fall of the larger one more than it wonid that of the smaller. He had previously demon strated the law of falling bodies that the velocity under the action of gravity is independent of the mass of the body. Experiment confirmed his position. The small
ball reached the earth first. In a vacium all bodies fall with the same velocits, through any distance. As a practical statement. it may be taken as true that sinall
dense boodies will conform to the theoretical laws, falling any distance less than $\geqslant 00$ feet, in the atmospliere. But with an ounce and a toll there wonld be a perceptible differenc:. The ounce ball would fall the faster. Facts like this are now-a-days demonstrated by even cle-
mentary students in almost every class in physics in the comutry.
(r724) H. M. G. asks how to make an ever-2ealy pad for rubber stamps. A. The followlng is
said to be a cushion that will give color permanently. It consists of a box filleci with an elasti: composition,
saturated with a suit:ble color. The cuslion fultills its purpose for ycars without being reneweit, always contallus sufficicie
sphere, and long as a reomant of the mases or composition remains in the box or receptacle. This cushion or pad is too soft
to be self-supportius, hits should be heid in a low, flat pan. and have a $p$-mananent cloth cover. The composi6 parts glyce ine, and 6 parts coloring matter. A suite 6 parts glycel ine, and 6 parts coloring matter. A suita-
ble black color cau be made from the following mate-

| lycerine, part absolute alcohol, 2 parts water, 1 part etian soap, $\frac{1}{5}$ part salicylic acid. For red, blue, or t, 1 part gelatine glue, 2 parts aniline of desired r, i part absolute alcohol, 10 parts glycerine, 1 part etian soap, and $\frac{1}{5}$ part salicylic acid. The following two additional recejpts used for this purpose : Mix dissolve 2 to 4 drachms aniline violet, 15 ounces alol, 15 ounces glycerine. The solution is poured on cushion and rubbed in with a brush. The general hod of preparing the pad is to swell the gelatine with water, then boil and add the glycerine, etc. 2. Aniviolet, 90 grains; boiling rain water, 1 ounce; to ch is added a little glycerine and a small quantity of ssses. The quantities of last two ingredients will with the season. but half a teaspoonful will be amfor the quantities of violet and water specified. <br> 7725) A. C. B. asks: Is there a simmethod of making oxygen? A. Oxygen may be ained on a small scale very readily by simply heating close retort a mixture of 4 parts chlorate of potash 1 part black oxide of manganese. If large quantiare desired, the continuous process of T. Du Motay be employed. The principle of this pro cess resides the fact that the manganates and permanganates of ash, soda and baryta, the ferrates and chromates of same bases, and in general all metallic oxides and ds which will form. with potash, soda, or baryta, ary compounds capable of superoxidizing, possess property of yielding their oxygen at a more or less vated temperature, when they are submitted to the on of a current of steam. Theee bodies, thus deoxed, also possess the property of reoxidizing themes when they are exposed to a temperature more or great. The atmo sphere is therefore the constant rce from which the oxyden is derived. The mode of ration is the following: One of the binary compounds enumerated is placed in a distilling versel, whether he maximum or minimum state of oxidation. If the mpound is in the latter condition, it is oxidized by ans of a current of air mechanically drawn over it; if the former stage, it is deoxidized by means of a curt of steam. The oxygen and steam, on issuing from mouth of the retort, pass together into a condenser, ere the steam is separated by condensation, while the gen passes over into a gas holder, and is there coled. When all the utilizable oxygen has been disened by the steaming process, the action of superoxiion by means of the air current is recommenced. By alternate process the oxygen is generated as long as y be required. |
| :---: |

INDEX OF INVENTIONS
 United States were Issued for the Week Ending SEPTEMBER 19, 1899,

AND EACH BEARINGTHATDATE

## Adding and subtracting machine, Ball \& Riggs... 633,37, Alarm. See Burylar alarm. Automotor burse <br>  <br>  <br>  <br> Bfiling press. J. B. Smit t. Barrel Shield. W. F. Trasie Basket making machine, D <br>  <br>  <br>  <br>  <br>  <br>   <br> Beycle toe thp bin. A. .hiem (reissue)............ Blackboeards or slates, writing surface for, W. H. <br> Keeran Blacking bair, shö, Burns \& Minnick Blind, window. P. A. Lathem <br> Bow te ester. coin controthem, J . T. Meilion Boiler furnace. C. W. Baird.......... <br>   <br>   <br>  <br>  <br>  <br>  <br>  <br>  <br>   Carding engines. means for securing card ciot ing to cylinders of. J. Dodd.  



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of the Mark，and it owners afterwards to procure protection for their
Trade Marks．Great bardship uften arises in this manner．The only way to prevent such a course is
for the American merchant to register his Trade Marks in the countries with which he has commercial



## T原 

PERFORATED METALS ：


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 Thill coundicating．Grimiths \＆\＆ Tie plate，a．j．justable．F．Burger
Timber pocket ．A．Aoer
ime recorder worm me recorder，wrkmans j ．W．Deiiber．
Tire for wheels of road vebicles，resilient，





Track sanging apparatus，pneumatic，J．H．Ha



 achive．．M．Bell．
Valve．J．F．Menk



Venicle，motor． F ．H．Mistosaras．


Vine pulling machine．A．R．Muns
Vise．quik action A．Katzki．．．．．
Voting machine．J．Roser．．．．．．．
Wagon brake E．Roberison．
Washer cutter，J．A．Heinz．
Wasting
Water closect．Pine．J．A．J．Ziegler et

Weighing machine．F．Hi．R．ichard．
Weighing m achine feding device
Weight and pressures．indicator，E．MeGarven．，
weldink wire fabrics，machine for electrically，
c．Perry．．．ab．
Wheel．See Paddie wheel．Traction wheel
Whater wheel．



## DESIGNS

Badge．H．Schaeffer
Badge，et
Badge etc w Tarran

 Door or window securer．G．E．Jo bnson．．．．．．．
Garment，bifurcated nether，J．A．Scriven．
31,538


Spoons，etc．handle for．，Sor stobrnal， C ．J．Piiling
Spoons．forks．etc．，handle for， L R．Horton


TRADE MARKS．


olour．whe Hammond $\&$ Carney．

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ics of the bicycle and detailed drawings of an auto－ The following copies of the ican sopplem cnies of the scientific Amer－ mobiles of different types，with many inlustrations
of the vehicles，motors，boilers，etc．The series make a very valuable treatise on the subject．Tbe
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 $112,1178,1195,1199,1206,11210$ ，SUPLEMEMENT No．
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