# Srientifir Amorian. 

ESTABLISHED 1845

MUNN \& CO.,
Editors and Proprietors.
PUBLISHED WEEKLY at
No. 361 BROADWAY, NEW YORK.

## TERMS FOR THE SCIENTIFIC AMERICAN

 (Established 1845.)One copy, one year, for the U.S., Canada or Mexico....
One copy, six months, for the U. S., Canada or Mexico.

The scientific American supplement (Established 1876)


Buiding Edition of scientific American (Estal)lished $1 \mathbf{5 8 5}$.





Export Edition of the Scientifle American (Established 1898)




## The safest way to remit is by postal order, express monef order O. Readers are speciall requested to notiff the pu failur: delis, orirreularity in receipt of papers.

NEW YORK, SATURDAY, APRIL 2, 1898.

| Contents. |  |
| :---: | :---: |
| ated articles |  |
| Alaska, government hiterature ${ }^{\text {L }}$ Launch of . Wentucky" |  |
| American Navy, a Spanish view. Bicycle crank. Potts |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

## TABLE OF CONTENTS OF

Scientific American Supplement

For the Week Ending April 2, 1898.
I. I. $\bar{A}$ $\stackrel{\text { II. }}{\text { III }}$.








X.
$\times 1$.

##  <br> 





A spanish view of the american navy.
It is a matter of frequent remark that the average European is as densely ignorant on all questions relat ing to the United States as the average citizen of this country is well informed on European affairs. It is probable that outside of a comparatively narrow circle in England, France and Germany, the people of the old world have only the vaguest idea of the resources wealth and social and industrial development of the United States. They see the nondescript crowds that migrate yearly across the western ocean, and they grow accustomed to the thought that America is a huge agglomeration of unassimilated nationalities. They little understand that such is the size and virility of the American race that these myriads are absorbed without disturbing the national equilibrium or chang ing a line or shadow of the national countenance
Perhaps it is safe to say that in no European country is there so much misapprehension regarding the United States as in the very one which has good reason jus now to be best informed regarding us. The information which the Spanish press is giving out to the people is such palpable misinformation that one can scarcely attribute it to mere ignorance, and we are led to believe that the misrepresentation must be willful. One of the most striking instances of this is an article on the United States navy, which appears in a recent issue of the Spanish weekly, La Ilustracion, the "Harper's Weekly" of Spain. The United States has usually been credited in Europe with possessing a navy which, though small in numbers, is of the very lates pattern and includes some of the most original and effective types of ships in the world. The Spanish journal in question, however, lends itself to the task of persuading the Spanish public that our navy is made up of poor imitations of European ships, that it is "rnanned by hirelings who calculate, while they are fighting, what their valor, in cents, should be worth to them ;" that it is a "navy without traditions of any kind" ( ye shades of Farragut, Perry and Paul Jones!) and that therefore "it will be nothing remark able if in a short time we see all these" ill designed
and worse constructed "vessels go to the rubbish heap." The article opens by stating that ten years ago our naval efforts were confined to repairing the "Miantonomoh" and her class, which are built "partly of wood" (sic). We are informed that a navy yard has recently been started at Port Orchard, in Brambridge (sic), and that among other places where the navy keeps stores of a mmunition and coal is New Oskaut (New Orleans?) on the Atlantic coast. The map of Washington fails to show the name Brambridge, the Washington fails to show the name Brambridge, the
nearest approach to it being the name of Bainbridge Island, which lies about five miles distant from Port Orchard.
After our contemporary has displayed such an inti mate knowledge of our geography, we are not sur prised to learn that "important works for the manu facture of armor
have been established in Massachusetts under the direction of Mr. Bethlehem.' We are informed that these "works can compete with Krupp in Germany :" but lest our confidence and Spanish dismay at this information should be too pronounced, we are informed in the next paragraph that in creating our navy "the tests of armor and other work were unsatisfactory."
This "period of feverish activity was succeeded by . years of calm," after which there came " the wa with Cuba . - and the fear of a rupture with Spain," impelled by which we "proceeded secretly (sic) to construct armored vessels," until at length we had at our disposal "what seemed to be a respectable squadron." "Fortunately for us," our contemporary proceeds, "the great funnels and quantity of smoke of the Yankees need not frighten us," and in proof of this a list of the shortcomings of the ships is added, from which we select the following

The 'Indiana,' 'Oregon' and 'Massachusetts' sub${ }_{3}^{3}$ ' merge the armor plate"(presumably the belt) "entirely, and can only carry a full complement of coal in time of peace." "'The turrets of the 'Kerasage' (sic) and 'Kentucky' present some advantages; . . . but their axes are so badly arranged that the guns which they carry would be out of combat as soon as they began to "it cannot carry the torpedoes intended for it," but inf critic does not spare even the in-fate "Maine," but informs us that "its best speed was 16 miles" (it was $171 / 2$ knots), and that at this speed "it shipped water at the bow.
The "Katahdin" "cannot go into battle on the high seas," and "its crew cannot sleep on board for lack of space." The "Miantomoh" (sic), "Monadnock" and "Terror" "are provided with a central compart-
an eccentric and senseless idea." We are further informed that the stability of the "Baltimore" and "Philadelphia" is endangered by their heavy guns. and that the armored deck of the "Cincinnati" an her class "is a source of danger, rather than of de-
fense." Even the famous run of the "Columbia" across the Atlantic, at a speed of 18 knots, is dis credited on the ground that the last day's run "could
no longer be made under forced draught." As matter of fact, the whole run was made under natural draught.

This remarkably lucid and accurate account of our warships concludes by assuring the Spanish public that " the rest of the vessels are not worth mentioning."

## FOUR-CYLINDER LOCOMOTIVES.

The four-cylinder type of locomotive appears to be enjoying quite a run of popularity just now on the other side of the water. At least three of the leading English roads have built engines of this kind, and they appear to be giving satisfaction. The type is not un familiar in this country. The Strong locomotive reck oned the four-cylinder arrangement among its many striking novelties, and visitors to the World's Fair at Chicago will remember the James Toleman, an Eng lish engine with four driving wheels, the forward pair of which were driven by a pair of inside cylinders and the rear pair by two outside cylinders.

The object aimed at in the Strong engine was to re duce the amount of counterbalance weight in the driving wheels, and the James Toleman was designed with the view of producing an exceptionally powerfu engine without increasing the size of the cylinders and one that would provide sufficient adhesion without the use of side rods. The Strong engine fulfilled all its promises and has shown exceptionally good results on the Perdue testing plant. The James Toleman, how ever, owing to faulty design, was a failure, the boiler proving to be quite unable to supply the four cylin proving to be q
ders with steam.
Of the three new English engines above referred to the first is a four-cylinder simple engine built for the Glasgow and South-Western Railway. All cylinders are connected to the leading pair of driving wheels ; pair of $141 / 2 \times 26$ inch inside cylinders connect to two cranks set at 90 degrees, and a pair of $121 / 2 \times 24$ inch outside cylinders connect to crank pins set at 180 degrees to the adjoining cranks. This disposition of the cranks and pins enables one set of valve gear to be used for each pair of cylinders on each side of the en gine
Mr. Webb has built two experimental four-cylinder engines for the London and North-Western Railway one of them being a simple and the other a compound In the simple engine the four cylinders are all of one size, viz., 15 inches diameter by 24 inches stroke, while he compound has two 15 -inch ontside and two 191/ nch inside cylinders, the common stroke being 24 inches.
'The London and South-Western Railway is expert menting with an engine which has two outside cylin ders driving the rear pair of drivers, while anothe pair between the frames is coupled to the front drivers. This, it will be seen, is a similar arrangement to that on the James Toleman.
It is possible that the English designers are being driven to the use of four cylinders in their endeavor to increase the power of their locomotives. The height of he bridges and the width of tunnels in that country is considerably less than here. The track clearance dia gram for an English road limits the width of the locomotive to about $81 / 2$ feet and the height to about 13 feet, as against 10 feet and $151 / 2$ feet in this country Hence outside cylinders of more than a certain diamete cannot be used and the diameter of the inside cylinder is, of course, restricted by the clearance between the frames. The four-cylinder locomotive opens up some escape from these restrictions, although, if the cylinder capacity be enlarged, it will always be a problem to find space for the bigger boiler which will be necessary.
bill to increase the patent office force.
Notwithstanding the great interest in and the steady stream of appropriations now being made for military and naval purposes, it is to be earnestly hoped that a bill pending in both the Senate and House o Representatives for the allotment of a very modest ad ditional sum for the needs of the Patent Office will not be lost sight of. In no other department of the govern ment is it expected that the service shall be crippled or the expenses of properly conducting the business $b$ imited by the additions we are now making to the army and navy for coast defense and possible foreign contingencies, and it would seem ridiculous, if the subject were not really so serious to all inventors, to bring up any such idea of false economy in opposition to the proposed measure
The bill presented in both branches of Congress by Mr Platt, of the Senate Committee on Patents. S. 4168, and Mr. Hicks, of the corresponding House committee, H R. 7082, provides for the employment of an additiona Patent Office force involving an expenditure of $\$ 62,880$ a year, which, it is pointed out, is only a small proportion of the excess of fees over expenditures, in accounting for the moneys annually paid into the government by in ventors, manufacturers and owners of patents. To il justrate the particularity with which the bill has been drawn and the caution exercised that there shall be no oom for extravagance on the part of the Patent Office it is especially stated that the whole number of addi
tional employés shall not exceed four principal examiners, four first assistant examiners, four second assistant examiners, eight third assistant examiners, eignt fourth assistant examiners, four first-class clerks, four copyists, six laborers, six assistant messengers and six messenger boys. It will be admitted, we think, that the business of the Patent Office has been looked in.to with great attention to detail when so modest an appropriation therefor is so specifically guarded. But we hope that, with such inspection of the business, it did not fail to impress itself upon the members of the Committees on Patents of both branches of Congress that the present quarters occupied by the entire force for the prosecution of their work and the keeping of the necessary records are altogether too cramped and overcrowded for the attainment of the best degree of efficiency. More room an 1 better facilities, especially a well equipped laiooratory, are quite as urgently called for as the additional force of examiners, clerks, etc.
The especial reason for bringing forward this bill at present is found, not in the well-known fact that the Patent Office has been overworked for years, and the issue of patents thereby greatly delayed, but in the need which has arisen, as a consequence of the act of March 3, 1897, for a wore perfect revision and classification, by subjects matter, of all letters patent and printed publications which "constitute the field of search in the examination as to the novelty of invenion for which applications for patents are or may be filed." It is now made especially the duty of the Patent Office to see that an invention for which application for a patent is made shall not be patented or described in any printed publication in any country before the invention made by the applicant, and, ac cording to the report of Mr. Hicks, it is the intention by this appropriation to enable the Commissioner of Patents "to make examinations in a manner so thorough and complete as to insure the issuance of patents only for such inventions as are unquestionably new ; so that the patent when issued shall be an affirmative statement, certified to under the seal of the Patent Office, that the invention covered thereby is new, and has not been described in any patent or printed publication." It will be seen, therefore, that the design is to enable the Patent Office to make competent examinations of the whole field of invention-embracing more than a million issued patents and a vast accumulation of technical publications-the effort to do which is already constituting a great drag on the work of the office, which is now from two to seven months in arrears, and it being evident that "the office is strug gling with a load much too heavy for it to carry." The Commissioner expects that, with the additional appropriation, "the income of the office will be greatly increased by the more rapid and thorough disposal of the business and the increased number of applications which will be filed when it is assured that action upon them will be prompt and thorough.'

THE FRUITS OF CIVIL SERVICE REFORM
Civil service reform has now been on its trial for a period of about fifteen years, and each succeeding year has given stronger proof of its value in the practical re-
sults which have been achieved. In its recent annual report the Civil Service Commission points out that the merit system, as compared with the patronage system, is both more economical and more efficient. This is conclusively shown in a comparison of the few changes in employés under the merit system, as compared with the many removals under the patronage system. During five years preceding the classification of the New York Custom House there was an average of 275 re movals per year, whereas during the past two years the removals averaged only 50 per year and the resignation 30 per year. The figures for the civil service of the whole country are even more conclusive, for 75 per cent of
those holding unclassified positions were removed, while in the classified competitive service only 85 re signed. During the fifteen years of civil service reform the positions which are politically controlled have increased 37 per cent in number and 43 per cent in cost while the number of classified positions not subject to such control has remained the same. The economy of the merit system is further illustrated by the fact that the extension of the civil service rules in May of last year, by which a large number of hitherto unclassified positions were brought under the merit system, led to the abolishing of a number of positions which w found to be quite unnecessary.
In spite of the objection which has been urged against the merit system, on the ground that it renders employes too independent and encouraged carelessness in the performance of their duties, a rule was approved by the President in July of last year which prohibits removals except for cause and upon written charges On the general question we think that it is very doubt ful if any serious trouble of this nature has ever arisen If it has, it is immensely outweighed by the excellent results which have been secured, and it is a fact that the new rule has met with general public approval. It 18 argued that while the new rule in no way interferes with the proper exercise of discipline, it prevents abuses, guards against unjust removals, and insures that per
good behavior
One of the strongest arguments against the political system is that the tenure of office is for only a limited number of years, and the appointments being made on strictly political considerations, the new incumbent may or may not have any qualificationsfor the special duties of his position. An equally serious dra wback is the fact that the return of a political party to office is certain to deprive the government of the services of a greater or less number of employes who, during their service, have acquired valuable experience and efficiency. These points are dwelt upon at considerable length by the commission, who recommend that the scope of the civil service law be extended to embrace all positions to which it could be applied with advantage. It is specifically suggested that the municipal service of the District of Columbia, the staff of the Congressional Library, and the clerical force of the next census be brought under the civil service law.
Apart from the abstract principles involved in the question of removing the civil service from the field of politics, with which in the nature of things it has no proper connection, the financial aspects of the problem are of the highest importance. This is evident when we bear in mind that the total salaries paid out annu ally to the employes in the executive civil service amount to close upon $\$ 100,000,000$. Bearing in mind the statement in the report already referred to, that since 1882 , the year of the organization of the committee, the unclassified positions under political control have increased in cost 43 per cent while the classified positions have remained the same, it will be seen that civil service reform has an important bearing upon the finances of the country. Of the 178,717 employes in the executive civil service shown by a census of them ta ken last year, about one-half were in positions which were governed by the rules of the civil service.

## THE HEAVENS IN APRIL.

## ( AP

The mild nights of early spring are adorned with onstellations less brilliant than those of winter, but not less beautiful. Orion and Taurus appear, in the first half of the night, setting amid the lingering twilight, robbed of the dazzling brightness that characterized them when they were on the meridian in midwinter. Higher up glows Capella with a softened radiance, while the Milky Way stretches, like a vernal mist, across the sky from north to southwest. Over head, south of the zenith, is Leo, and north of the zenith the Great Dipper. Virgo is conspicuous in the east, and Arcturus, high and splendid, counterbalances Capella on the other side of the meridian, while, as Sirius is setting in the southwest, the Sirius of the north, Vega, appears rising in the northeast.
the Planets.
Mercury is an evening star, and there will be no better opportunity to see it this year than that presented about the 10 th of April, when it will attain its greates elongation east of the sun, and will not set until almost two hours after sundown. At the beginning of the month Mercury is in Pisces; at theend, when it passes between the earth and the sun, in Aries.
Venus also is an evening star, and gradually becoming more conspicuous, as it moves out of the neighbor hood of the sun. It is not far west of Mercury at the opening of April, but, after the latter turns in its course and begins to move sunward on the 10th, the two planets will draw nearer together, coming into conjunction on the 18th, when Mercury will appear be tween three and four degrees north of Venus. From that time on Mercury will cease to be a conspicuous object in the sunset sky, leaving Venus to reign alone there. Notwithstanding Mr. Percival Lowell's much exploited observations and theories, there is, as yet, no good reason for not regarding Venus as the most earth like of all the planets that circulate within or without the orbit of our terraqueous ball. The observations of it to be made during the present year should be of intense interest. At the beginning of the month Venus is in Pisces and at the end in Taurus, near the Pleiades
Mars is in the morning sky, and still too near the sun for easy or satisfactory observation. It moves in the course of the month from Aquarius to the border of Pisces and Cetus.
Jupiter in Virgo, near the star Eta, is a magnificen sight for all who can appreciate the wonder and beauty of celestial phenomena. Recent telescopic study has revealed the formation of new spots among its great colored belts, and at all times it is an entrancing object for the possessor of a telescope. It rises before sunset, and, as the evening advances, moves up the eastern sky clothe with the majesty proper to the mightiest of the planets.

What is that bright star?" asked a man who neve looks at the heavens except by chance
"The planet Jupiter."
"Why, I never saw such a star! Do they often look like that?"

Not many of them.
Possessors of telescopes may watch interesting phe

At 8:15 o'clock, Eastern standard time, Satellite I. will disappear, eclipsed by Jupiter's shadow. At 8:21 P. M. Satellite II. will begin to transit the disk of Jupiter, and at $9: 22$ its shadow will follow the satellite upon the disk and will occupy two and a half hours in crossing it. On the night of the 28 th an interesting observation may be made showing the effect of the position of the sun on the direction of the shadows of Jupiter's moons in relation to the line of sight between the earth and Jupiter. At 7:34 P. M. Satellite III. will pass upon the disk and begin a transit which will end at $10: 15$. But the shadow of the satellite will be so in clined to our line of sight that it will not appear on the disk until twenty-one minutes after the satellite itself has completed the transit.
Jupiter is very close to the celestial equator, and rosses it, moving northward on the 8th.
Saturn, whose rings are now admirably placed for observation, can be seen in the east, rising at the end of the month near 9 o'clock; but it will be much better situated for evening observation in May. It is in Ophiuchus, near Scorpio.
Uranus is near a little pair of stars, the Omegas, in Scorpio, and gradually gets closer to them in the course of the month. It rises half an hour or so ahead of Sat urn. Its approach to the Omegas will be interesting to watch with a field glass or a small telescope
Neptune, invisible to the naked eye, remains in Taurus.

THE MOON
The moon is full on the afternoon of the 6th o April, and in last quarter on the morning of the 13th The new moon of April occurs on the afternoon of the 20th, first quarter following on the evening of the 28th. The moon is nearest the earth on the 9 th and farthest from it on the 25th.
The greatest eastern libration occurs on the evening of the $3 d$ and the greatest western libration on the morn ing of the 17 th.
The moon's conjunctions with the planets occur as ollows
Jupiter on the 5th, Uranus on the 9th, Saturn on the 10th, Mars on the 17th, Mercury on the 21st, Venus on the 21st, Neptune on the 24th
There are several recognized meteoric showers in April, of which one, occurring on the 20th, may be worth observing. The meteors radiate from a point a few degrees west of the brilliant Vega, in the constel lation Lyra

## FORTHCOMING TELEGRAPHIC TOURNAMENT

During the electrical exposition which is to tak place at Madison Square Garden during the month of May, the Board of Control will hold a Fast Sending and Receiving Tournament which is intended to sur pass any contest of the sort that has yet taken place. As at present arranged, the events include
A message class for receivers, transmission thirty minutes, receivers to use typewriters of their selection. Novice class, open to persons not having an official record ; sending five minutes. Championship class, open to all, sending five minutes, with prizes for re ceivers. Ladies' class, free for all, sending five minutes Two-forty-word class, open to those not having an official record of 240 words or better, sending five minutes. Two-thirty-five-word class, open to all who have not an official record of two-thirty-five words or better sending five minutes. Two-thirty-word class, open to all who have not an official record of two-thirty words or better, sending five minutes. Two-twenty-five-word class, open to all who have not an official record of two twenty-five words or better, sending five minutes.
The judges of the contest will include leading officials of the great telegraph companies and the ditors of several leading electrical papers.
The best official records in contests of this kind wer made in 1893, F. J. Kihm and F. L. Catlin sending 248 words without an error, and R. C. McCready sending 249 words with 14 errors in five minutes. An interest ing feature will be furnished by Thomas A. Edison, who will make a phonographic record of the best transmissions, thus enabling contestants to listen at any time to the record of their own work.

## LAUNCH OF THE BATTLESHIPS "KEARSARGE" AND KENTUCKY."

On Thursday, March 24, there were launched at the Newport News shipbuilding yard the two most power ful ships of the United States navy, the "Kearsarge and "Kentucky." They are an improvement upon the Indiana" class, which they exceed in size, speed and fighting strength. They are of 11,525 tons displace ment and 16 knots speed, and protection is afforded by $161 / 2$ inches of steel on the belt and 15 inches on the barbettes and turrets. The main battery consists of four 13 -inch and four 8 -inch guns, and there will be fourteen 5 -inch guns in the secondary battery. The most remarkable feature of these ships is the double deck turrets, the 8 -inch guns being mounted above th 13-inch.
For a very full description and illustration of these ships the reader is referred to the Scientific AmeriCAN of January 29, 1898.

