Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year. postage included..$3 20
One copy, six months, postage included..1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each; additional copies at same proportionate rate. Postage prepaid.

Remit by postal order. Address

MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all newsdealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of *seven dollars*. Both papers to one address or different addresses as desired.

The safest way to remit is by draft, postal order, or registered letter.

Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Term for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies, 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

NEW YORK, SATURDAY, MARCH 28, 1885.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 482,

For the Week Ending March 28, 1885.

Price 10 cents. For sale by all newsdealers.

A NEW COMMISSIONER OF PATENTS.

The President has appointed as Commissioner of Patents Mr. Martin V. Montgomery, of Michigan, a well-known lawyer, a man of marked ability, vigor, and industry. He has always been noted for his thoroughness of research and for his success in accomplishing whatever he undertakes; but his undertakings of responsibilities have been rare; in fact, he is celebrated for his declinations of many proffered places of honor and profit, which ordinary people would have been only too glad to accept. Judging from his antecedents, the new Commissioner is not likely to allow the Patent Office to remain very long in its present unsatisfactory condition. All persons connected with the establishment will be expected to wake up to renewed exertions, and use every endeavor to put an end to the harassing delays of business which have for so long a time obstructed the usefulness of the bureau.

The new Commissioner has already entered upon his duties. We wish for him every possible success. The interests committed to his charge are of great magnitude, and we trust they may be wisely administered.

PATENT OFFICE EXAMINATIONS OF NOVELTY OF INVENTIONS.

The duties of the Commissioner of Patents are principally deducible from two sections of the Revised Statutes of the United States. In the interpretation of these enactments, the Commissioner, to a certain extent, is guided by the decisions of the courts. But notwithstanding all this, one great feature of the work of the Patent Office is that all of its staff are a law unto themselves. Each examiner acts for himself independently upon each application. His action may, and generally does, have reference to the law as laid down by the judges of the higher courts. That such reference may be omitted has very recently been proved in the practice followed in the registration of labels and trade marks. This special departure from the law, as laid down by the Supreme Court of the District of Columbia, has already been fully discussed in these columns.

Section 4,886 of the Revised Statutes states, as the necessary qualifications for a patentable device, that it shall be useful, new in this country, and shall not be described in any foreign printed publication, nor be patented abroad by another, nor be in public use for two years in this country. Furthermore, the patentee must be the first inventor. Such are the terms of patentability. In section 4,893 the Commissioner of Patents is directed to cause an examination of alleged new inventions to be made, to see if they are patentable under the law, and it is specially stated the patent shall be granted if such examination prove title to the privilege, and if it prove also "that the same" (invention) "is sufficiently useful and important." Thus it appears that the Commissioner of Patents has very arbitrary powers granted him. He is the judge of the utility of every device presented, and is at liberty to refuse a patent because the particular invention does not meet with his approval.

As it happens, a rigid application of this clause of usefulness is impracticable. The general utility of a device can seldom be correctly prophesied or foretold. There are so many patents, some of such restricted application, that only trade experts could form a judgment on many of them. Presumably for this reason, the question of utility is not very deeply gone into by the Office. It is sustained in this by the courts, it being usually held that the patented device is useful enough to come within the definition of the statute. But if the impracticability of this investigation of utility be urged, how much more impracticable does the search for novelty become. The invention must be new as far as all printed publications and patents are concerned. In patents alone this must give something like a million of references to be disposed of in one way or another. The American patents make up nearly one-third of the sum in question. To these must be added the Canadian, French, English, Belgian, and German patents as the most important. The field seems a vast one to cover, and is really such. No matter how accurately this great array of documents is arranged and indexed, a real search through it will always involve much labor and time. Then ,the literature of the arts of all nations has to be studied. The search through the patents is comparatively insignificant compared to this examination. All the records of science in different languages, up to the latest dates, are the field to be gone over. Then, after literature and patent records have been exhausted, the novelty of the device is to be determined as affected by public use for over two years in this country. The other branches of the work are very much increased by this. The whole of the United States are to be traversed, and any anticipating device of two years' standing is to be found. Complaints of the delay of business of the Patent Office are frequent. Can such complaints be just, in view of the immense amount of work required before the granting of a patent?

Such complaints would be manifestly unjust, were the search above described really prosecuted to an end. But the truth is that it is not, and never will be. The Patent Office does not begin to exhaust the subject of novelty. This is proved every year in a multitude of court cases. Anticipations without number are annually shown in infringement suits. And these anticipations are not confined to unpatented structures that might well have escaped the Office's attention. Frequently they are found among United States and English patents, the simplest of all the grounds of the search.

In view of the fact that the courts so often nullify the work of the Patent Office, and that the search made by the Commissioner under the statute counts for nothing, it appears very questionable whether such system should be continued. When a patent is applied for under the existing *regime*, a very considerable delay in its granting is the regular thing. Such a delay is supposed to be necessary for the purposes of the search. But when the routine of the Office has exhausted itself, and the patent has been granted, the latter has no particular standing in court. It amounts to very little more than a registration. The novelty of the thing patented is inquired into just as if the Patent Office had made no investigation of it. If anticipating devices are found, the patent is declared invalid for the purposes of the suit at issue. No blame is attached to the Commissioner; the declaration of invalidity of a patent is too common a thing in the circuit courts to attract any attention, except from those interested.

The state of the case may be thus summed up: The Commissioner of Patents attempts to perform an impracticable task in ascertaining the novelty of an invention. To perform it, however imperfectly, he feels authorized to delay the granting of patents sometimes for several months in some of the rooms. He recognizes to its full extent this evil, and seeks for an abatement of it by asking for more examiners. In all this he overlooks the fact that the work would not be properly done, even if he had an army of officials to help him.

An impossible task is assigned him. No search can be conclusive. He can only strive to make it measurably good, if he will not dispense with it entirely. As we have before stated, we believe that the search, such as it now is, could be done in much less time than is devoted to it. Even with the present force and present system of searching, we do not believe in the necessity of the delay of business. But if the Commissioner will not abandon the search altogether, he should make it commensurate with his staff. He should settle on a maximum period of delay, and not let more time be devoted to any application. The imperfect examination now accorded is valueless in the courts, and from the force of circumstances the Patent Office certification of novelty always will be. The plain duty of the Commissioner would seem to be to shorten operations, and measure the extent of his examination by the number of his subordinates. We believe that as a rule the presumptive novelty afforded by a patent is well worth the government fees. But in the case of an important patent, it is rarely worth the long delay to which so many patents are now subjected.

It will, of course, be understood that when we speak of the plenary power of the Commissioner in granting or withholding patents we do it without losing sight of the right of appeal from his decisions. But inside of the Office his control is absolute, and is only subject to the higher court.

THE WORKING POWER OF MAN.

I have been puzzled by the very various figures given in engineers' and mechanical hand-books for the force or working power of man.

I think that, as compared with the standard English horse power, 33,000 foot pounds per minute, they vary from $\frac{1}{5}$ to $\frac{1}{17}$. The experiments quoted as those from which engineers and physicists have derived these various data disagree curiously in their products and in the deductions made from them by their authors.

It is difficult to estimate the work done with spade, shovel, axe, or wheelbarrow. But there is one application or use of human strength which gives absolute and correct minute results which, it seems to me, should be exploited and published.

When a man or any human being ascends a stair of regular grade, he lifts his own weight. If he carries in his hand a watch with seconds hand, he can note the time occupied in the work of ascending one, two, or three stories, and this height multiplied by his weight will give the absolute quantity of work done—foot pounds lifted—and this result divided by the time or parts of the minute will give the work per minute; dividing this again by 33,000 ft. pounds, the work of one horse power per minute, we will have a fraction of a horse power as the comparative measure of the man's work or force. If he ascends a tower stair until compelled to stop for breath, he will thus ascertain his extreme and ultimate force, power, strength. If he ascends rapidly till exhausted, he will accomplish in shorter time than when moving deliberately the work of which he is capable. Moving slowly, his effort will be longer continued, but he will in time reach a limit. By a series of experiments in this line by men of different forms, weights, ages, and condition of health and training, very interesting results can be obtained for the physiological study of the human constitution. It would be interesting to determine the rate of increase and average of strength with advancing age; at what age a pound of flesh, blood, and bone in a normal human being is capable of exerting the greatest force. Lately the following experiments were made:

A man of nearly 69 years of age, weighing 214 lb., ascended a broad winding stair from first to second story of a house; height 14½ ft., weight raised 214 lb., time 16 seconds, rate of work per minute 11,665 ft. pounds; then the horse power during ¼ minute is at the rate of 0·353 H. P. Again, a man of the same age ascended two stories of the new Pension Building at Washington. This included 4 flights and the necessary landings; there are no winding stairs; weight 220 lb., height 42¾ ft., time 74 seconds, work done per minute 7,627 ft. pounds, horse power 0·231. Again, a man of about 69 years of age ascended to the third floor of the new Pension Building. First floor 20 feet, second 22·75 feet, time to 2d floor 29 seconds, to 3d floor 66 seconds; work done: 1st story, 4,400 ft. lb., rate per minute 9,109 lb., H. P. 0·276. 2d to 3d, work done 5,005 ft. lb., rate per minute 8,125 lb., H. P. 0·2462. Whole ascent 42¾ feet, work done 9,405 ft. lb., rate per minute 8,550 lb., H. P. 0·259. Another man, about 72 years of age, weighing 180 lb., ascended another similar stair 42¾ feet in 63 seconds; work done per minute, ft. pounds 7,328, H. P. 0·222.

For a short time the first experiment shows a man of nearly 69 years putting forth without suffering an effort greater than ⅓ of a horse power; but when the effort was continued for about 1¼ minutes, the average result was rather less than ¼ horse power. The other, older, man developed during 1 minute, or 63 seconds, a force of 0·222 H. P., or rather less than ¼ horse power. Looking into the details of these experiments, we find that the man of 69 lightly clad put forth for ¼ minute a force of 0·353 H. P., ascending a height of only 14½ feet. Rather more heavily clad, he put forth during ½ minute the force of 0·258 H. P., and during the following ¾ minute of 0·2118 H. P. The average during 74 seconds being 0·231 H. P. An older and lighter man exerted for 31 seconds, say ½ minute, the force of 0·2338 H. P., and for another half minute immediately following the first half, 0·2127 H. P.; average during 1 minute, or 63 seconds, the force of 0·222 H. P. Again, the man of 69 years, with a heavy overcoat, weighed 222½ lb. He ascended 20 feet by stairs in 15 seconds, work done 4,450 ft. pounds, at the rate of 17,800 ft. pounds per minute, which is an exertion of 0·54 H. P.—over ½ horse power. A younger man, 151 lb. weight, ascended 61¾ ft. in 49 seconds; work done 9,324 ft. pounds, at the rate of 11,417 ft. pounds per minute, equal to 0·346 H. P.

M. C. MEIGS.

Washington, D. C., March 18, 1885.

ASPECTS OF THE PLANETS FOR APRIL.

MERCURY

is evening star until the 27th, when he changes his rôle to that of morning star. He holds the place of honor on the planetary records of the month, being the only member of the sun's family that contributes interesting incidents to the annals of April, for the month is specially uneventful and monotonous as regards the movements of our usually lively and active brother and sister planets. The most noteworthy incident in Mercury's course is his greatest eastern elongation. This event occurs on the 8th, at 2 o'clock in the morning, when Mercury is 19° 26′ east of the sun. The present is the most favorable time of the year for a sight of Mercury as evening star with the naked eye. An intelligent observer cannot fail to find him if the weather conditions are favorable, and the directions given are faithfully carried out.

Three conditions are required for the most satisfactory view conceivable of Mercury at eastern elongation. The event must take place at the season of the year when the twilight is the shortest, in order to have a darker background of the sky for the exhibition. The planet must be in aphelion, or farthest from the sun, in order to have the elongation, or distance from the sun, the greatest possible. The planet must be at his greatest distance from the ecliptic, or sun's path in the heavens, on the north side, a necessary condition for the best observation of all the planets under all circumstances in the northern hemisphere.

These three conditions never occur together, for such is the position of Mercury's orbit that when the elongation is greatest possible, the planet is south of the sun, and not so well situated as when the elongation is less, and the position of the planet is north of the sun. We therefore never see Mercury under the most satisfactory combinations.

At the present elongation, the twilight is nearly the shortest, and the position of the planet is at his greatest distance north of the sun's center or north of the ecliptic. But the elongation is 19° 26′ east of the sun instead of the maximum, 27° 47′. He is therefore far distant from aphelion, which, traveling with his amazing swiftness, he will not reach until the 11th of May.

In spite of these drawbacks, the smallest and swiftest of the planets will be a charming object in the early evening sky from the beginning to the middle of April. No other planet is like him. Not a fixed star can be compared with him in brilliancy when seen under the same light, unless it may be Sirius, which he somewhat resembles, shining with a white light, though we have seen him take on a golden aspect or a rosy hue. Easily as he may be seen in this latitude, it is almost impossible to detect his presence in the central and northern portions of Europe. It was a life-long sorrow to Copernicus that he never had a glimpse of the little planet that travels nearest to the sun.

We give Mercury's position at elongation, though he will be visible for eight or ten days before and after the event. On the 8th he sets about 8 o'clock, nearly an hour and three-quarters after the sun. The best time for observation is three-quarters of an hour after sunset, about 7 o'clock. The observer should command an unobstructed view of the northwest horizon, and note carefully the point where the sun sank below the horizon. Mercury will be found about 9° north of the sunset point. There are no large stars in his vicinity, but he is plainly visible to those who look in the right place. An opera glass is a valuable aid in picking him up. Before the 8th he will be farther south, and after the 8th, he will be farther north than at elongation.

Even when found he is easily lost, hiding himself in the twilight glow, and then suddenly reappearing, as if taking a conscious pleasure in baffling the curiosity of those who are earnestly seeking to behold his face. Audacity is the prominent characteristic of the smallest of the planetary brotherhood. The most painstaking observer has not succeeded in finding out the cause of the incomprehensible acceleration of his perihelion point. It is generally conceded that astronomical science has at present no means capable of solving the problem.

Mercury persistently hides from human view any small planet or planets that may make their swifter circuits within his own orbit, though practiced observers have traveled nearly round the globe, hoping to discover intra-Mercurial prizes during total eclipses. He manages as faithfully to keep the secrets of his physical organization concealed within his own domain, or in the dense atmosphere that possibly surrounds his solid crust.

We know little more about him than we did when the telescope was first invented. Amateur astronomers with ordinary telescopes have seen bright spots on his surface indicating a diurnal rotation of about twenty-four hours; blunted cusps and an irregular terminator, interpreted as the shadows of mountains, eleven miles high; a departure from a spheroidal form; and even a hole through the center. Practiced astronomers, with the largest telescopes in the world, fail to see these marvels on the disk of our swift-footed brother, and give little credence to them.

Nearly all that is known of Mercury may be comprised in a few lines. He has phases like the moon. At eastern elongation, he appears like a half moon; before that event he is gibbous, and after that event he takes on the form of a crescent. These are his aspects while evening star, which occur in reversed order while he is morning star. When beyond the sun, he is round and small, his diameter being 5″. When nearly between the sun and the earth, he takes on the phase of a very slender crescent, his diameter being 10″ or 12″.

There is reason to hope that the astronomy of the future holds within its grasp the key to many scientific secrets, and that human ingenuity will succeed in finding out something more concerning the planet whose close proximity to the sun renders him an exceedingly difficult object for accurate observation.

On the 27th, at 10 o'clock in the afternoon, Mercury is in inferior conjunction with the sun, passing between the earth and sun, completing his course as evening star, and reappearing on the sun's western side to run his short course as morning star.

On the 28th, he encounters Venus, and the planets are in conjunction, Mercury being 1° 42′ north. This event, occurring the day after Mercury's inferior conjunction, shows how near both planets are to the sun and how entirely they are hidden in his rays. It may seem strange that Mercury, having just passed between the earth and the sun, and Venus nearly ready to pass beyond the sun, should be side by side in the sky. But this is the way they would look to an observer on the earth if they were visible.

The right ascension of Mercury on the 1st is 1 h. 47 m.; his declination is 12° 57′ north; his diameter is 6·4″; and he is in the constellation Aries.

Mercury sets on the 1st soon after half past 7 o'clock in the evening; on the 30th he rises at half past 4 o'clock in the morning.

JUPITER

is evening star. He is beautiful to behold as he makes his way over the celestial road, followed by his twinkling attendant Regulus. Planet and star keep about the same distance from each other during the month, for Jupiter is in stationary aspect, and varies little in his bearings. It is well to enjoy the present beaming aspect of the Prince of Planets, for his course lies southward, and he is approaching the aphelion of his orbit. More than six years must intervene before, in 1892, he comes round to perihelion and his greatest northern declination, when he will again take on his most superb aspect.

The right ascension of Jupiter on the 1st is 9 h. 56 m.; his declination is 13° 52′ north; his diameter is 40·4″; and he is in the constellation Leo.

Jupiter sets on the 1st at a quarter before 4 o'clock in the morning; on the 30th he sets at 2 o'clock.

SATURN

is evening star, and he is a lovely object in the western sky, making his transit before it is dark enough for him to be visible, and sinking below the western horizon before midnight when the month commences. He, like Jupiter, is nearly stationary during the month.

The right ascension of Saturn on the 1st is 5 h. 12 m.; his declination is 21° 52′ north; his diameter is 16·6″; and he is in the constellation Taurus.

Saturn sets on the 1st soon after half past 11 o'clock in the evening; on the 30th he sets about 10 o'clock.

NEPTUNE

is evening star, and fast approaching the sun. He is the first of the four great planets to disappear below the horizon.

The right ascension of Neptune on the 1st is 3 h. 18 m.; his declination is 16° 31′ north; his diameter is 2·5″; and he is in the constellation Taurus.

Neptune sets on the 1st about half past 9 o'clock in the evening; on the 30th he sets at half past 7 o'clock.

URANUS

is evening star. He is, on the 1st, 12 m. east and 35′ north of Eta Virginis, a third magnitude star in Virgo, having changed his position but little since his opposition. He may still be seen with the unaided eye, though the telescopic view is more satisfactory.

The right ascension of Uranus on the 1st is 12 h. 2 m.; his declination is 0° 33′ north; his diameter is 3·8″; and he is in the constellation Virgo.

Uranus sets on the 1st shortly after 5 o'clock in the morning; on the 30th he sets soon after 3 o'clock.

VENUS

is morning star, is very near the sun, and will soon pass beyond the great orb.

The right ascension of Venus on the 1st is 0 h. 19 m.; her declination is 0° 34′ north; her diameter is 10″; and she is in the constellation Pisces.

Venus rises on the 1st at a quarter after 5 o'clock in the morning; on the 30th she rises a quarter before 5 o'clock.

MARS

is morning star, creeping slowly on his course, receding from the sun and approaching the earth. April closes with Neptune, Saturn, Jupiter, and Uranus as evening stars, and Mercury, Venus, and Mars as morning stars.

The right ascension of Mars on the 1st is 0 h. 7 m.; his declination is 0° 12′ south; his diameter is 4·2″; and he is in the constellation Pisces.

Mars rises on the 1st about ten minutes after 5 o'clock in the morning; on the 30th he rises soon after 4 o'clock.

THE MOON.

The April moon fulls on the 29th at 14 minutes after 1 o'clock in the morning. The waning moon is in close conjunction with Mars and Venus on the 14th, the day before her change. The new moon of the 15th is at her nearest point to Mercury and Neptune on the 16th, in conjunction with Saturn on the 18th, with Jupiter on the 23d, and with Uranus on the 26th. There is nothing of special interest in these conjunctions, for they are either invisible or moon and planet are far apart as they pass on the star-spangled road.

Our fair satellite, however, gets up a charming exhibition on a more southern belt of the earth's territory between the limiting parallels of 28° north and 38° south latitude. She occults the planet Venus on the 14th at 3 o'clock in the afternoon. The close conjunction occurring in this vicinity, for moon and planet are at that time only 6′ apart, becomes, farther south, an occultation beautiful to behold. The slender crescent, only ten hours before new moon, occults the fairest of the stars, at that time nearly a full orb. But while the moon hides Venus, the sun's bright rays hide both moon and planet. Conjunction and occultation are, therefore, invisible to the naked eye, and, in this respect, we are as well off as our southern neighbors. The phenomenon may be observed with the aid of a powerful telescope, for through its light-gathering glass the brilliant planet may be followed in full daylight until she is nearly ready to pass beyond the great luminary. It is tantalizing that an occultation of Venus should occur under conditions so unfavorable for observation.

Furniture Polish.

The subjoined simple preparation is said to be desirable for cleaning and polishing old furniture. Over a moderate fire put a perfectly clean vessel. Into this drop two ounces of white or yellow wax. When melted, add four ounces of pure turpentine, then stir until cool, when it is ready for use. The mixture brings out the original color of the wood, adding a luster equal to that of varnish.