shown was to be shipped, when completed, to General Coxey, the leader of the famous "Coxey Army," which marched to Washington last year.

This is an example of one of the heavier machines produced, others running as high as 45,000 pounds each. The general view of the main shop shows a very complete plant and indicates the great facilities possessed by the company for work of the heavier class.

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, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
Remit by postal or express money order, or by bank draft or check.
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, for the U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries within Postal Union *eight dollars and fifty cents a year.*

Building Edition of Scientific American.

THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, $5.00 a year. To foreign Postal Union countries, $6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign Postal Union countries, $11.00 a year.

Export Edition of the Scientific American,

with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN, published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 50 pages, profusely illustrated. It is the finest scientific, industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. $3.00 a year, post paid to any part of the world. Single copies 25 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. MUNN & CO., Publishers,
361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

☞ Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK. SATURDAY, JUNE 1, 1895.

Contents.

(Illustrated articles are marked with an asterisk.)

Art products, American, in Germany..... 344
Birds, bower, New Guinea..... 340
Birds, misfortunes of..... 341
Boiler, steam, Reeves'*..... 340
Books and publications, new..... 348
Bordeaux mixture..... 341
Cables, large, transporting..... 344
Crustacea, flying..... 347
Drug stock deterioration..... 345
Earth's crust, breaking of the..... 342
Electric candle, the..... 345
Engines, gas, for electric lighting*..... 341
Fan motor, the Weed*..... 342
Glass, stained, industry*..... 345
Greenland expedition, scientific, 1895..... 347
Gun, bursting a 15 inch..... 345
Heating by exhaust steam (6540) 349
Heavens, the, in June..... 338
Horse power of boilers (6538)..... 349
Incandescent filaments, temperature of..... 347
Inventions, recently patented... 348
Iron and steel protection..... 345
Irrigation by wind..... 342
Laryngoscopy, direct..... 347
Leather staking machine, Holmes*340
Money drawer, Daley's*..... 340
Moon, story of the..... 338
National Machine Company works*..... 337
Patents, decisions relating to.... 346
Patents granted, weekly record. 349
Prune rust..... 344
Pulleys, belt, about, patents on.. 346
Quicksilver mines in Spain..... 339
Railway speed, fast..... 344
Screw propeller, the..... 340
Streets of Rome, the clean..... 342
Telephone, Berliner, decision.... 338
Telephone, the, as alarm clock.. 345
Thermo battery, a new..... 346
Transmitter, telephone, new..... 339
Wheat, specific gravity and weight of..... 346
Whistles, chime (6538)..... 349
Windows of stained glass*..... 345
Wrench, Delhommer's*..... 342

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 1013.

For the Week Ending June 1, 1895.

Price 10 cents. For sale by all newsdealers.

PAGE

I. BIOGRAPHY.—James Dwight Dana.—The life of the great American geologist.—Early development and long maintenance of his powers.—Striking events in his career..... 16196

II. CHEMISTRY.—Chemical Industry at the Chicago Exhibition.—A review from the French standpoint of the chemical exhibit at the Columbian World's Fair..... 16192

III. DECORATIVE ART.—Design for Interior Decoration.—A suggestion for a modern hall and stairway.—1 illustration..... 16187

IV. ELECTRICAL ENGINEERING.—Opportunities in Electrical Engineering.—By A. A. ATKINSON.—An excellent view of the field of electrical engineering, addressed to the young man..... 16189

V. ENTOMOLOGY.—The San Jose Scale (Aspidiotus perniciosus, Comstock).—By Professor C. V. RILEY.—Mode of spreading.—The treatment of this destructive insect by gas and washes.—An eminently practical paper for the California fruit raiser..... 16195

VI. GEOLOGY.—The Gold Belt of California.—By H. W. TURNER.—An elaborate geological review of the gold-bearing region of California and its geological and mineralogical characteristics..... 16197

VII. MEDICINE AND HYGIENE.—A New Micro-organism Discovered in Pork.—By FRANK J. THORNBURY, M.D.—A very dangerous organism found in American pork..... 16194

Legislative Prevention of Blindness.—The prevention of bad eyesight by legislation directed to the extirpation of the causes.. 16190

VIII. MISCELLANEOUS.—A Decorated Kite.—A giant kite, representing a circus performer.—1 illustration..... 16190

Kite and Flag Flying.—A curious achievement at the dedication of the Washington Arch in this city.—Details of the kites used to carry up the American flag.—2 illustrations..... 16190

IX. NATURAL HISTORY.—The Ounce or Snow Panther.—A Central Asian panther now in the menagerie at the Museum of Natural History of Paris.—History of the specimen and description of the life habits.—1 illustration..... 16194

X. NAVAL ENGINEERING.—H. M. Torpedo Boat Destroyer Ardent.—A Thornycroft ship developing a speed of nearly 28 knots.—Details of her trial.—1 illustration..... 16188

Leak Arresters for Ships.—An interesting application of cellulose for closing leaks in ships, with experiments on its use in practice..... 16188

XI. PHYSICS.—The Cause of Luminosity in the Flames of Hydrocarbon Gases.—By Professor VIVIAN B. LEWES.—Conclusion of Professor Lewes' important article on the artificial production of light by flames..... 16193

XII. RAILROAD ENGINEERING.—Cast Iron Chilled Car Wheels.—By WILLIAM W. LOBDELL. Cast iron wheels for cars.—Their defects and merits, and how they should be treated..... 16189

XIII. SANITARY ENGINEERING.—Manufacture of Manure from Town's Refuse.—The manufacture of artificial fertilizer as conducted in Manchester..... 16186

XIV. TECHNOLOGY.—Bleaching.—A recent invention for bleaching in vacuo, with section of the apparatus.—1 illustration..... 16187

Manufacture of Distilled Carbonic Acid Water.—A recent developed industry, the production of chemically pure carbonated drinking water.—6 illustrations..... 16191

Manufacture of Matches in France.—A most interesting article on a great industry, describing the processes and apparatus.—Their effects upon the system of the operatives of the phosphorus.—13 illustrations..... 16184

THE BERLINER TELEPHONE DECISION.

It seldom falls to the lot of the federal government to appear so conspicuously in the courts as it has within the last few days and to accept in succession two such important and far-reaching defeats as those it has suffered in the income tax decision before the United States Supreme Court and in the Berliner patent decision in the United States Circuit Court of Appeals. It is not long since we noted in these columns the decision rendered by Judge Carpenter in the Circuit Court, in the suit brought by the government to annul the Berliner patent. The decision declared the patent to be invalid; it was based on the ground of wrongful delay in procuring the issue of the patent, in implying a want of diligence on the part of the applicant, all which seemed to afford a most equitable ground for declaring the patent invalid.

The second ground was more of the statutory class, referring to the issue of a prior patent to the same applicant for the same invention. On the 18th of May the United States Circuit Court of Appeals, to which the case had been brought on appeal by the Bell Telephone Company, reversed the decision of the Circuit Court, but allowed the appellee, which is the government, to file a motion as to the form of the judgment to be entered with a brief in support of the same. The decision, while a great triumph for the Bell Company, is somewhat tempered by this last clause, as the government has on file a motion to amend the bill so as to allege a tacit understanding with the officials of the Patent Office in the matter of the delay of the Berliner patent, which, if proved, would go to show possibly an absolute fraud. The case cannot be fully discussed until the rendering of the opinion of the Circuit Court. The United States will carry the case to the Supreme Court.

THE HEAVENS IN JUNE.

The planetary maneuvers in the evening sky during June will be not less attractive than they were in May. Mercury will not only be visible after sunset during the first half of the month, but that shy planet will perform an exceedingly interesting evolution with Jupiter. On the first of June Mercury will be seen about 6° west, or on the sunward side, of Jupiter. But, in consequence of its more rapid motion eastward, it will approach the giant planet, gaining about three-quarters of a degree upon the latter every day, and on the 8th will overtake it, passing on the north at a distance of only 47′. The nearest approach will occur at 10 o'clock in the morning. Afterward Mercury will continue to forge ahead of Jupiter until the afternoon of the 18th, when it will turn back and begin a rapid flight sunward, meeting and passing Jupiter on the south at a distance of 2° 34′ at 9 P. M. on the 21st. Then it will again distance its great competitor until it disappears in the solar rays.

Jupiter itself practically passes off the stage this month, getting too near the sun at the close to be well seen. It is still in the constellation Gemini.

Mars will remain in view a little longer than Jupiter, but the ruddy planet has moved so far away in its orbit that it no longer possesses any special interest as a telescopic object, while for the naked eye it has sunk into comparative insignificance. The question whether Mars has or has not an atmosphere sufficient to support life resembling that of the earth has not yet been settled to the general satisfaction of the disputants. Mars passes from Gemini into Cancer early in the month and continues in the last named constellation during the remainder of June.

Venus, which so completely outshone Jupiter during May, will grow still brighter in June. There is an education in the science of light in a study of the causes which make a planet less than 8,000 miles in diameter appear so much brighter than a planet more than 86,000 miles in diameter. The primary cause is, of course, the comparative nearness of the former to the sun and to the earth. Venus, seen with the telescope, will be very near the half-moon phase at the end of the month. She is moving eastward and southward and will be in conjunction with Mars on June 5th at 5 o'clock in the morning. From Gemini she passes on the 5th into Cancer, and from Cancer on the 25th into Leo.

Neptune in Taurus is too near the sun to be observed.

Saturn, remaining in Virgo, some 10° almost directly east of Spica, is the most attractive planet on the list for telescopic observation. The smallest telescope worthy of the name suffices to reveal the principal charm of Saturn, the wonderful system of rings suspended above its equator. It gives the observer a picturesque sense of the enormous distance across which he is looking to recall, while his eye is at the telescope, the fact that those rings measure almost 170,000 miles from end to end of the elliptical figure which they present. There is no lack of exhibition space in the solar system.

The spectroscopic discovery, made by Professor J. E. Keeler, of the Allegheny Observatory, that the rings of Saturn actually consist—as Maxwell long ago mathematically proved that they must do—of swarms of small satellites or meteorites, is one of the finest of recent achievements in practical astronomy. Professor Keeler's proof, which is wonderfully interesting as well as convincing, consists in photographs of the spectrum of the planet and its rings, which show the spectral lines displaced in such a way as to indicate that the inner edge of the ring system revolves around the planet nearly a mile and a quarter in a second faster than the outer and nearly two miles and a quarter faster than the outer edge. The movements of the various parts of the system as thus ascertained agree satisfactorily with the velocities that satellites revolving around the planet at corresponding distances should have according to Kepler's third law of planetary motion.

Uranus remains near the star Nu in Libra and some 3° nearly east of Alpha Libræ. It is about equal in brightness to a star of the sixth magnitude and can consequently be seen with the naked eye. It may be recognized with the aid of a field glass by noticing for several nights in succession its position with reference to small stars near it. If careful charts are drawn of the field of view, the motion of the planet will soon become manifest, and such an exercise is good discipline for a beginner in stellar observation.

June opens with the moon just past first quarter in Virgo. The moon fulls at 6 o'clock on the morning of the 7th in Sagittarius, reaches last quarter in Pisces at 6:28 A. M. on the 15th and becomes new moon in Gemini at 4:51 P. M. on the 22d. The second moon of the month reaches first quarter at 1 minute past 9 o'clock on the morning of the 29th, when it will be in Virgo, about 8° west of Spica.

The moon visits the planets in June as follows: Saturn on the 4th, at 12:58 A. M.; Uranus on the 5th, at 2:56 A. M.; Neptune on the 21st, at 4:33 P. M.; Mercury on the 23d, at 12:14 P. M.; Jupiter on the 23d, at 1:43 P. M.; Mars on the 25th, at 6:27 A. M.; and Venus on the 25th, at 11:11 P. M. This last will be a comparatively close conjunction.

The astronomical summer begins at noon on the 21st.

Among telescopic objects for amateurs that will be well situated for observation this month (in addition to those described last month which still remain in view) are the following:

The great star cluster, M 13, in Hercules. This is an impressive object even when seen with only a 3 inch or 4 inch telescope. Those who have 4½ or 5 inch telescopes may try them upon the binary star Zeta Herculis. The distance of the components at present does not exceed a second and a quarter.

More interesting to the ordinary star gazer in search of the picturesque, and easy to divide with a 3 inch glass, is Alpha Herculis. Here a striking contrast of color will be noticed, the larger star being orange and the smaller emerald green. The distance is about 4½ seconds. Rho Herculis, whose components are nearly a second closer than those of Alpha, shows the combination of a white with a green star. Still another interesting double in Hercules is the star 95, whose two components are 6″ apart, the larger being green and the smaller red.

A good 4½ inch telescope, and sometimes even a smaller aperture than that, will show the celebrated companion of the great red star Antares in Scorpio. The distance is three seconds, and the color of the little companion is a vivid green. This is one of the finest sights among the double stars. While surveying Scorpio the observer should not neglect to look at Beta, a very easy double, which also exhibits a contrast of colors. The larger star is white and the smaller blue, the distance being about thirteen seconds. Its neighbor Nu is a fine triple, with which a 4 inch glass, or even a 3½ inch, is easily capable of dealing. The two nearest stars are about a second and three-quarters apart; the farthest star is distant forty seconds. For a beautiful combination of orange with blue look at the star 39 Ophiuchi. The components are twelve seconds apart, so that even a 2 inch glass will separate them.

As remarked last month, these objects cannot be readily found without the aid of a star atlas, a book that ought to stand next to the dictionary in all households where intellectual recreation is favored.

GARRETT P. SERVISS.

THE MOON'S STORY.*

BY SIR ROBERT BALL, LOWNDEAN PROFESSOR OF ASTRONOMY AND GEOMETRY AT CAMBRIDGE, ENG. FORMERLY ROYAL ASTRONOMER OF IRELAND.

I do not think there is any chapter in modern science more remarkable than that which I here propose to describe It has, indeed, all the elements of a romance. I am to sketch an event of the very greatest moment in the history of this universe, which occurred at a period of the most extreme antiquity, and has been discovered in the most remarkable manner.

The period of which I write is far more ancient than that of the Pyramids of Egypt, or of any other monuments erected by human effort. It is even more early than that very remote time, hundreds of thousands of

* Communicated to the SCIENTIFIC AMERICAN by the author.