Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

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

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VOL. XXXVII., No. 15. [NEW SERIES.] *Thirty-second Year.*

NEW YORK, SATURDAY, OCTOBER 13, 1877.

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No. 98,
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Terms.—SCIENTIFIC AMERICAN SUPPLEMENT, one year, postpaid, *five dollars*. One copy of SCIENTIFIC AMERICAN and one copy of SCIENTIFIC AMERICAN SUPPLEMENT, one year, postpaid, *seven dollars*. CLUBS.—One extra copy of the SUPPLEMENT will be supplied gratis for every club of five SUPPLEMENT subscribers at $5.00 each.

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THE FIRE IN THE U. S. PATENT OFFICE.

On the morning of September 24, a fire broke out in one of the attic model rooms of the Patent Office, in Washington, which destroyed part of the upper portion of the west and north wings of the building. It is not known how the fire originated, but spontaneous combustion among patented chemicals in the upper part of the building is assigned as a probable cause. The edifice above the third story was filled with printed documents and models, the latter made of light inflammable wood. The roof was also of wood. The fire, therefore, had abundant material whereon to feed, and made rapid headway.

It is gratifying, however, to know that all the lower portion of the building, which is fireproof, and in which the active affairs of the Patent Office are conducted, escaped permanent injury. None of the original patent documents were lost: all drawings, specifications, files, etc., remain intact, together with all caveats, assignments, and pending applications for patents. Consequently there will be no interruption of business.

The fire merely swept away a portion of the upper works of the edifice, and, perhaps not unfortunately, destroyed a great accumulation of rubbish. The re-roofing will be rapidly pushed forward, and it probably will be so carried out as to render the business facilities of the Office better than before the fire.

LEVERRIER AND HIS WORK.

In the death of Leverrier the world loses its most eminent astronomer; but unlike many great disciples of science, he bequeaths to posterity not unfinished work which none but a master mind equal to his own could complete, but the record of undertakings carried to successful endings, and together aggregating the noblest astronomical achievement ever accomplished.

Urbain Jean Joseph Leverrier was born at St. Lo, in the old Department of Normandy, France, on March 11, 1811. He was a close student and obtained honors in the Polytechnic School, which entitled him to a choice of employment in any of the select branches of the public service he might desire. Choosing the position of engineer attached to the administration of the government tobacco monopoly, in order that he might possess the necessary facilities for the continuation of his studies, his attention was first directed to chemical experimentation, and in 1837 he published his first original investigations, announcing a new combination of phosphorus and oxygen. His preference, however, was for mathematics, and in 1839 he began the colossal astronomical task, the termination of which he himself announced to the French Academy of Sciences on December 21, 1874.

In order to reach a just estimate of this vast work, it is necessary to recall the fact that in the solar system the mass of the sun is so great that that luminary is capable of swaying the motion of all the planets without being himself disturbed. Although the planets exert an attractive power on the sun, still if their joint attraction were exercised upon him in a straight line, he would not be disturbed by a space equal to his own radius. So vast then is the controlling power of the sun that even the greatest disturbance in the entire system (that resulting from the mutual attraction of Jupiter and Saturn) is inconsiderably small in comparison. But the fact still remains that the planets do disturb each other in varying degrees, and the more massive the planet the greater its influence upon its neighbors. Consequently and conversely, if we know how much one planet disturbs another, we have a means of determining the mass of the influencing body.

This determination was the object of Leverrier's inquiry, and he set to work to examine into the motions of the seven planets known at the period when his labors began. It is scarcely possible for any one, not conversant with the delicate and intricate toil of the astronomer, to appreciate the multitudinous perturbing causes which in such an investigation it becomes necessary to take into account. Some idea may, however, be gained from the fact that in determining the earth's motion around the sun—but one part of his subject—Leverrier reviewed and discussed nine thousand distinct observations. "Our conclusion is," he says, referring to these, "that the observations of the sun leave much to be desired, on account of systematic errors affecting them; and there is no discordance between theory and observation which cannot be attributed to errors in observing."

Still, from these imperfect data, he estimated the sun's apparent monthly displacements and deduced therefrom an estimate of the distance of the sun, showing that the generally accepted figures were too large by between three and four millions of miles.

Meanwhile, by a most careful analysis of all available observations of Uranus, Leverrier had satisfied himself that that planet was undergoing disturbance by some unknown body. He was in the position, to borrow Professor Proctor's illustration, of an observer who, traveling (say) along a canal, should observe "that certain waves, which had long been of a particular size, began to grow larger. Suppose that, struck by this, he instituted a careful series of measurements of their size, and at last satisfied himself that they had increased. . . If, however, while he had satisfied himself by his wave measurements that the waves had really increased in size, he had also satisfied himself that during his observations the increase had reached its full extent, and had even begun to give place to a slow decrease, tending to restore the original size of the waves, he would manifestly have here an indication which might serve to tell him of the very spot where the disturbance had taken place." Something of this kind had happened in the case of Neptune; and when Leverrier's analysis of the motion of Uranus was finished, it was seen that the displacement had reached its maximum and was beginning slowly to decrease. In order to produce these perceptible effects—and many years were occupied in their production, for it is now known that Uranus only completes his circuit in 84 years, while Neptune requires 164 years—Leverrier assumed that another planet must exist; and from the observed perturbations of Uranus, he calculated the orbit and position of the unknown world. On the 1st of January, 1847, six months after Leverrier had completed the calculations, the planet was found within two degrees of where Leverrier predicted it would appear on that date.

We pass over the long discussion among astronomers as to whether Leverrier or the English observer Adams was the true discoverer of Neptune; both overcame enormous mathematical difficulties, but whether Adams first conceived the existence of Neptune or not, Leverrier certainly earliest made known the discovery to the world.

The quite recent supposed discovery of an inter-Mercurial planet, which afterwards proved to be a sun spot, brought M. Leverrier's investigations into the motions of Mercury prominently forward. He long ago determined that the movements of Mercury, as observed, did not accord with those calculated. "This result," he says, "naturally filled us with inquietude. . . Long years passed, and it was only in 1859 that we succeeded in unraveling the cause of the peculiarities recognized." There exists, he states, in the neighborhood of Mercury, doubtless between that planet and the sun, some matter as yet undiscovered; but whether it consists of one or more small planets or other more minute asteroids, or even of cosmical dust, he does not positively assert. The present opinion is that the meteoric and cometic matter existing in the sun's neighborhood in enormous quantities, produces the perturbations of Mercury; but Leverrier clung to the belief in Vulcan, and manifested the most intense interest in every alleged discovery of that planet. When Lescarbault believed that he had found the inter-Mercurial world, Leverrier was one of the first to abruptly present himself and to demand how the discoverer had dared "to commit the grave offence of keeping your observation secret for nine months. I warn you," he continued, "that I have come here with the intention of doing justice to your pretensions;" and then he examined Lescarbault's primitive apparatus, cross-questioned him sharply, and finally departed, overwhelming the supposed discoverer with his congratulations. How Liais upset this discovery by showing the imaginary Vulcan to be a sun spot is well known; and a repetition of similar experience recently is said to have left the great astronomer disappointed and unhappy.

Leverrier's examination of the motions of Venus resulted in tables of wonderful accuracy. His study of the motions of Mars revealed the influence on that planet of the asteroid zone. Summing up his work, Professor Proctor says: "Beyond question he has deduced from the observed motions of the planets all that at present can be deduced as to the masses of the different known and unknown parts of that complex system which occupies the space ruled over by the sun."

In 1853, M. Leverrier became Director of the Observatory in Paris, which post he occupied until 1870, when he resigned, but in 1872 he resumed its duties, which he has since continued. He took the greatest interest in the large telescope recently erected at the observatory. "It comes none too soon," he replied coldly, when congratulated on its completion; and he at once set to work, hoping by its aid to settle the question of the inter-Mercurial planet. His labors were severe, his rest constantly broken. The task was too much for a man sixty-six years of age, whose life had been one of incessant toil, and he sank under it. His death occurred on September 23d.

MODELS DESTROYED BY THE PATENT OFFICE FIRE.

The Superintendent of Models at the Patent Office gives the number of patented models destroyed as about 87,000. To these should be added the postponed and rejected cases, say about 49,000, making in all about 136,000. The following list will give a pretty accurate idea of the classes destroyed:

Class 1. *Aeration and Bottling.* Aerated liquor apparatus and processes, soda fountains, fire extinguishers, barrel-filling, bungs and vents, bottling, bottle stoppers and washers.

Class 4. *Baths and Closets.* Includes baths, water and earth closets, urinals, washstands and basins, sinks, stench traps, water closet appliances, and water traps.

Class 6. *Beehives.* Includes apiaries, bee feeders, fumigators, honey boxes, moth traps, and swarm indicators.

Class 10. *Bolts, Nuts, Rivets, and Washers.* Consists of varieties of the articles and machines for making them. Of this class the following were saved: Nutlocks, taps, dies, and plates for screw and nut making; but all machines for making these articles were destroyed.

Class 13. *Brakes and Gins.* Machinery for the treatment of raw cotton, flax, and hemp; hair and oakum pickers, and husk splitters.

Class 14. *Bridges.* Includes everything connected with bridges and arches, their piers and abutments, trusses and

girders for bridges, floors, and roofs, iron trusses, piers, and columns.

Class 15. *Brushes and Brooms.* Includes everything connected with brooms, brushes, mats, mops, and machines for making them.

Class 17. *Butchering.* All relating to slaughtering and skinning animals, dressing their carcasses, cutting meat, sausage making, catching animals for slaughtering, hair cleaning, and brine tubs.

Class 20. *Carpentry.* Includes all the woodwork of houses (except trusses and girders), iron laths, wood laths, and machines for nailing them, scaffolds for building, ladders, fire escapes, wood and metallic blinds.

Class. 21. *Carriages and Wagons.* All relating to the construction of wheeled vehicles, sleighs, trucks, barrows, velocipedes, and their fittings.

Class 22. *Casting.* All appliances, machines, modes, and tools used in foundries, excepting type-foundries.

Class 31. *Dairy.* Includes all machines and appliances for milking, butter and cheese making, except milk coolers and testers.

Class 37. *Excavating.* Everything relating to excavating, boring, and grading, well curbs, Artesian wells, post hole borers, sand pumps, submarine excavators, etc.

Class 39. *Fences.* Includes also gates, posts, post drivers, wire stretchers for fences, etc.

Class 40. Files, rasps, and machines for making, redressing, and sharpening.

Class 45. *Furniture.* Basin clamps, blacking boxes and holders, broom hangers, cigar racks from this class are destroyed; but the whole of the class, except these few articles, is saved.

Class 47. *Garden and Orchard.* Includes tools (not machines) for digging, cultivating, and preparing the soil, planting, transplanting, weeding, protecting, potting, and forcing plants and trees; orchard culture, destroying insects, gathering fruit, sorghum strippers, and maple sap gathering.

Class 49. *Glass.* All relating to the composition, tools, machines, presses, furnaces, pots, and other apparatus for manufacturing, cutting, and roughing glass, modes of manufacturing glass articles, and some processes for ornamenting glass.

Class 51. *Grinding and Polishing.* Everything relating to the modes, apparatus, tools, processes, and appliances for grinding and polishing glass, metal, stone, and wood.

Class 53. Includes everything relative to the manufacture of hardware; but not the articles when manufactured.

Class 55. *Harrows.* All devices for scratching, rolling, and pulverizing the soil; also corn and cotton-stalk choppers and pullers, and stone gatherers.

Class 56. *Harvesters.* This includes all kinds of machines and implements for gathering and securing the crops (excepting hand hay rakes and forks), all the models of which, with the exception of the cutters for harvesters and about thirty of the old models of reapers and mowers, were destroyed.

Class 57. *Hoisting.* Includes every appliance used in elevating all kinds of solid materials, loading machinery, stump extractors, capstans, and windlasses.

Class 59. Consists of horseshoes and machines for making them. The former were saved and the latter destroyed.

Class 60. *Hose.* Most of this class was saved, but hose couplings, bridges, and spanners were destroyed.

Class 61. *Hydraulic Engineering.* All relating to aqueducts, canals, dykes, harbors, breakwaters, docks, quays, sub-aqueous explorations and works, piles, improvement of rivers, etc.

Class 64. *Journals and Bearings.* Includes all journals, bearings, shafting, couplings, lubricants, lubricators, belt shifters, tighteners, pulleys, and universal joints.

Class 65. *Kitchen Utensils.* Apple corers, slicers, and parers from this class were burnt, but all the remainder was saved.

Class 72. *Masonry.* Includes all structures of stone, brick, concrete, and iron, plastering and plasterer's tools.

Class 74. *Mechanical Powers.* All relating to horse powers, arrangement of gearing, brakes for machinery, cranks, pitmans, treadles, modes of converting, multiplying, reversing, and transmitting motion, pawls and ratchets, rope clutches, eccentrics, cams, traction wheels, spring motors, fly wheels, and tide powers.

Classes 75 to 82. Relate to metal working, all the models of which were destroyed, with the exception of tacks, staples, nails, spikes, machines for threading sheet metal caps, eyelet machines, tuyeres, alloys, nut locks, wood screws; screw taps, plates and dies; manufacturing sewing machine shuttles and cop tubes, machines for making, upsetting, and bending tire, manufacturing carriage axles, lining axle boxes, tire setting and cooling, farrier's tools, anvils, machines for twisting metal, and the manufacture of spinning rings.

Class 83. *Mills.* All the cases relating to machinery for grinding bark, cane, coffee, grain, gunpowder, paint, spice, and sugar; flour bolts, rice cleaning, hulling, and polishing; smut, scouring and hulling machinery in general.

Class 85. *Nails.* This class includes the different varieties of nails, spikes, tacks, and staples, which were saved, and the machinery for making, all of which was destroyed.

Class 86. Includes machinery for the manufacture and preparation for market of pins and needles, all of which was destroyed except one of Crosby's.

Class 90. *Ores.* Apparatus, machines, and processes for crushing and grinding ore, stone, coal, or bone; for separating ores of precious metals, mechanically or by amalgamation.

Class 94. *Paving.* Includes all patents relating to the materials, compositions, making, repairing and sweeping sidewalks and roadways; paver's tools and machines; garbage boxes; vault covers and lights.

Class 97. *Plows.* All machines employed for plowing, breaking, digging, trenching and paring the soil, cultivating crops, digging roots, and laying tile.

Class 98. *Pneumatics.* This includes all mechanical applications of air and other elastic fluids (excepting motive power engines), balloons, and ventilation.

Class 100. *Presses.* Includes presses of every description, except hydraulic, printing and copying, the last two of which, with their appropriate class No. 101, were saved, but the hydraulic and the other presses were destroyed.

Class 103. *Pumps.* This class includes all machinery for pumping or elevating liquids, hydraulic engines, jacks, presses and rams.

Classes 104 to 106. *Railways.* This includes everything relating to the roadway, cars, and their fittings.

Class 107. *Manufacture of Railway Irons.* Includes every machine or process for manufacturing or repairing rails, car irons, axles, tires, wheels, and metal fittings.

Class 108. *Roofing.* All cases relating to the materials, compositions, and varieties of roofing, apparatus for roofing, skylight operators, eave troughs and brackets, roof fenders and spouts.

Class 110. *Saws.* Includes everything relating to saws and sawing machinery.

Class 111. *Seeders and Planters.* All machines and devices for sowing and planting seeds and distributing fertilizers. These were all destroyed except the cotton seed planters, of which only a few were lost.

Class 113. *Sheet metal.* Includes all modes, machines, and tools for the manufacture of articles from sheet metal.

Class 119. *Stabling.* All relating to the care of horses, cattle, sheep, and poultry; shelters, stalls, preparation of food, feeding, and currying.

Classes 121–2–3. *Steam.* From this class (which includes all kinds of steam machinery, locomotives, etc.,) traction engines, lubricators, and steam and air brakes have been burnt. The remainder being saved.

Class 125. *Stone Lime and Cement.* Includes mining, quarrying, boring rock, stone, marble and slate working, artificial stone; lime, mortar, concrete and cement.

Class 130. *Thrashing.* All machines and devices for husking, thrashing, shelling, winnowing and stacking.

Class 131. *Tobacco.* Includes all processes, machinery and appliances for the manufacture and use of tobacco.

Class 134. *Tubing and Wire.* All methods and machines for the manufacture of tubing and wire.

Class 137. *Water Distribution.* Includes well tubing, filters, pipes, couplings, fountains, hydrants, irrigating devices, street sprinklers, and railway water tanks.

Class 138. *Water wheels.* All the models of the different kinds of water wheels, chutes, forebays, penstocks, and gates for water wheels.

Class 140. *Wire working.* Includes the manufacture of wire articles of every description, all of which were destroyed except wire cloth and looms for making it, and machines for making wire heddles.

Class 141. *Wood Screws.* This class includes the different varieties of patented screws, most of which were saved, and the machines for their manufacture, all of which were lost.

Classes 142–3–4–5. *Wood working.* All the models of these important classes, which include all machines and tools for working wood (except saws and sawing machinery, which are also destroyed—see class 110), were burnt.

If a model cannot be placed under any of the above classes, it may, as a rule with very few exceptions, be considered as saved.

NOTES OF PATENT OFFICE DECISIONS.

The appeal from the decision of the Board of Examiners-in-Chief, in the matter of the application of Phillips, for improvement in paper, has been decided adversely to Phillips. The purpose of his invention was to make a paper suitable for the manufacture of paper bags and other like articles, which should be cheap and strong, and at the same time possessed of a good finish. To this end he provided two vats in his paper machine, one of which contained bleached pulp, and the other unbleached pulp, from the same stock and of the same quality. A layer of bleached pulp was superposed upon one of the unbleached, and the two felted and compressed together during the progress of the continuous web through the machine. The effect was to make a paper having a bright exterior surface from the presence of the bleach pulp, and at the same time possessed of the requisites of cheapness and strength from the use of the unbleached.

It was admitted by the applicant that the prior English patent, No. 834, of 1864, resembled his invention not only in the manner of making and the machinery devised for the purpose, but also in the resulting product. The English patentee claimed a compound paper for the purpose of making paper hangings, consisting of a lower layer of the inferior coarser pulp, and an upper layer of finer pulp deposited thereon, and united together as pulp into a single continuous web during their passage through the machine. Phillips, however, rested the merits of his case entirely on the ground that his particular article, a compound paper made of bleached and unbleached pulp, presumably of the same stock and quality, was new to the trade in view of the state of the art, and was therefore patentable. The Commissioner affirms the decision of the Board of Examiners-in-Chief, rejecting Phillips' application for a patent, and holds that, while there was nothing in the English patentee's specification which would lead to the conclusion that his finer and coarser pulps were made from the same stock, yet it was evident that he selected these finer and coarser qualities of pulp for the same purpose proposed by Phillips. He insured a good finish on the exterior by the finer pulp, and strength and durability by the coarser pulp beneath. The bleached pulp which Phillips proposed to employ was well known in its characteristics, and had been in use in the art for a long period of time past. Applied to the unbleached pulp it gave a superior finish, and at the same time made a stronger paper than would be the case if it were used alone. These qualities, however, were set forth in the English patent. Phillips, therefore, had done nothing more than substitute one well known pulp for another, where both performed the same office in the same way and produced the same effect. It might evidence judicious selection to take the bleached pulp in preference to another light one from a different stock, but this involved no invention.

The decision of the Board of Examiners-in-Chief in refusing the claim of James Greaves for a patent on the substitution of polygonal shafts and corresponding sleeve-shaped revolving bearings for round shafts and splines, on the cylinders of a carding machine, is reversed by the Commissioner on appeal and the claim allowed. The condensing cylinders were represented as several feet in length, and were arranged in parallel rows, between which passed the material that was to be condensed. For the accurate and successful operation of the machine, it was necessary that the opposite cylinders should be exactly parallel; but it was found that, upon the end to which the pinion was applied for rotating the cylinder, the round shaft, with its spline, pressed upon by the pinion in its rotation, was rapidly worn, and to such an extent that, after a use of comparatively few months, that end of the shaft would drop and leave the upper and lower cylinders out of parallel with each other. On the other hand, the polygonal shaft being kept from rotation within the pinion by means of its corners instead of the spline, the wear was distributed more uniformly; and further than this, when in operation, the forcible rotation of the pinion acting upon the corners tended to hold the shaft, even when worn, in an exactly central position, so that the wear, although as great perhaps as in the round shaft and spline, became a matter of comparatively little importance, so long as the shaft was of sufficient size to be turned by the pinion. Therefore the Commissioner holds that, while a polygonal shaft is generally a well known equivalent for a round shaft and spline, yet, in this particular connection with the condensing cylinders, the former performed a new and highly important function, not contemplated or called for by any of the previous uses, and was therefore patentable.

Litharge.

Litharge is an oxide of lead, prepared by scraping off the dross that forms on the surface of melted lead exposed to a current of air and heated to a full red, to melt out any undecomposed metal. The fused oxide in cooling forms a yellow or reddish semi-crystalline mass, which readily separates into scales; these, when ground, constitute the powdered litharge of commerce. Litharge is also prepared by exposing red lead to a heat sufficiently high to fuse it. English litharge is obtained as a secondary product by liquefaction from argentiferous lead ore. In grinding litharge, about one pound of olive oil is usually added to each hundredweight, to prevent dust. Litharge is employed in pharmacy to make plasters and several other preparations of lead. It is used by painters as a dryer for oils.

Black Finish for Brass.

Make a strong solution of nitrate of silver in one dish and nitrate of copper. Mix the two together and plunge the brass into it. Now heat the brass evenly until the required degree of dead blackness is obtained. This is the method used by French instrument makers to produce the beautiful dead black color so much admired in optical instruments.

PHOTOGRAPHS OF THE BRITISH NORTH POLE EXPEDITION.—A series of the views has been published under the supervision of Sir George Nares. One photograph demonstrates the discovery of coal in the arctic regions, a solid mass of this valuable material, more than twenty-five feet broad, being depicted. Other pictures show very plainly the nature of the ice masses of which the frozen sea consists, and prove more than all the descriptions in the world how difficult it must be for sledges to make way over this sea of troubles.

TO MAKE SOFT SOLDER DROPS.—Melt the solder and pour it in a steady stream of about one eighth of an inch in diameter, from a height of two or three inches, into cold water. Take care that the solder, at the time of pouring, is no hotter than is just necessary for fluidity.

DIORREXINE.—This explosive, largely manufactured and used in Germany, has been analyzed by M. Fels, and found to consist of picric acid, wood charcoal, beech sawdust, nitrates of potash and soda, sulphur, and water.

A GOOD dryer for paints is made by grinding or dissolving a small quantity of sugar of lead in linseed oil.