bold and many-sided developments as that of electricity during the century that has just kissed us its good-bye and gone, like HANS BREITMANN'S 'barty,' 'afay in the *Ewigkeit*.' To Catholic brains and hands modern electric science owes its beginning and much of its later development. To GALVANI we owe dynamical electricity; to VOLTA the first battery; to COULOMB the torsion-balance, which, says STANLEY JEVONS, gives 'a delicate measure of electric forces, and is indispensable in the thermo-electric pile'; to NOBILI and MELLONI the galvanometer, the thermo-electric multiplier and many other important instruments which are deemed indispensable in modern laboratories. AMPERE, a devout French Catholic, raised dynamo-electricity to the rank of a science, and, says Dr. ZAHM, 'nearly all the apparatus now used for the illustration of the laws of electro-magnetism were devised by this distinguished savant.' In compliment to his genius, his name (ampère) has been given to the unit by which the electric current is measured. In the same way the unit which expresses difference of potential has been named 'volt' in honor of the great Italian Catholic electrician, ALESSANDRO VOLTA, whose discoveries have given to the world such scientific terms as 'voltaic,' 'voltaic pile,' 'voltagraphy,' etc.; just as GALVANI'S fame has enriched our tongue with 'galvanic,' 'galvanise,' 'galvanism,' and a number of other words that are familiar to many of our readers.

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The power of the electric current to establish communication at a distance was known to students of the science as far back as the middle of the eighteenth century. But the knowledge remained comparatively barren till the early years of the nineteenth century. The first working telegraph line (with GAUSS and WEBER'S instruments) actually constructed and used was set up at Göttingen in 1833. Four years later the first English line was ticking out its messages—railway signals only—on the Blackwall Railway. Some pushing business men were ablaze with thirst to use the new invention for commercial purposes. As a result, the Blackwall line was thrown open to the public, for a consideration. Thereafter the extension of telegraph lines went on at a merry pace. Dublin was connected with London in 1850; Dover with Calais in the following year; and the first successful transatlantic cable was laid in 1866. In 1896—four years before the century closed—there were, according to MULHALL, '1480 submarine cables, in all 168,000 miles long.' The telegraphs of the world in the same year had 933,000 miles of line, and the forty-seven countries controlled by the Central Bureau at Berne reported the number of messages passed over their wires at almost 400,000,000 a year. In his efforts to improve the electric telegraph, Professor BELL, in 1874, stumbled across the telephone—somewhat after the manner in which, according to MARK TWAIN, COLUMBUS discovered America. A few years later EDISON'S carbon loud-speaking telephone and its later developments soon brought the new invention into general use in office, shop, factory, and dwelling. In 1888 people were conversing by wire from Paris to Marseilles; two years later they were exchanging ideas by word of mouth between London and Paris. Long distance telephony has achieved one of its greatest successes over the wide span of a thousand miles that separates New York from Chicago. The idea of 'laying on' concerts and operas by telephone to private dwellings has been realised only in a partial and scrappy and tentative way. But if we may credit a statement made by ALFRED RUSSEL WALLACE in one of his recent books, a 'telephonic newspaper' is one of the startling and successful facts of daily life in Buda-Pesth. Other important applications of electrical science during the vanished century are electric railways, the first of which was constructed in Berlin in 1882, the second from Portrush to the Giant's Causeway in Ireland in the following year; electric tramways; Marconi's and other systems of wireless telegraphy; electric light; electric fire and burglar alarms; the electric fan; the electric furnace and stove; the electric cautery; the application of magneto-electricity to electroplating; and the various dynamo-electric machines. The first electric lamp was invented by a Catholic scientist, LEON FAUCAULT, in 1848. To another French Catholic, M. CARRE, we owe the carbons used for electric lights. 'The first storage battery,' says Dr. ZAHM, 'than which nothing seems to promise greater or more important results in the near future, is due to GASTON PLANTE, a member of the Catholic Scientific Society of Brussels.' 'In 1860,' says the same authority, 'Dr. ANTONIO PACINOTTI, a professor in Florence, devised an electro-magnetic machine which embodied in principle all that we find in the more improved dynamos of to-day. PACINOTTI'S great invention was the armature he employed, of which all the armatures now in use are only modifications.' M. GRAMME, a Belgian, and, like PACINOTTI, a Catholic, produced, in 1871, the first modern type of commercial dynamo. He was also, says Dr. ZAHM, 'the inventor of the electro-motor, as he was the first to discover the reversibility of the armature of a dynamo on the passage through of an electric current. This was justly pronounced by the eminent English physicist, Professor CLERKE MAXWELL, the greatest discovery of the latter half of the nineteenth century.'

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Assorted Sciences.

Prophecy, according to MARK TWAIN, gives the highest dividend for the smallest investment of fact. But it is not always a safe form of speculation. As late as 1842 the French mathematician-philosopher COMTE took down his harp and prophesied that all study of the fixed stars would turn out a mere woful waste of precious time. But the solution, by KIRCHHOFF, in 1860, of the problem of the solar spectrum (first observed by Dr. WOLLASTON in England in 1802) has enormously increased our knowledge of the worlds that whirl about in the depths of space. By the aid of spectrum analysis 'we are able to ascertain the relative heat and chemical constitution of the stars, and to ascertain the existence, and measure the rate of motion, of stellar bodies which are entirely invisible.' The telescope, which enables the astronomer to peer so far into the star-depths, was, like the microscope, the invention of a devout Catholic. The first observatories in Europe, America, the Philippine Islands, India, and China, were founded by Catholics, and chiefly by Catholic ecclesiastics. A prominent place in the astronomical investigations of the past century is occupied by URBAIN LEVERRIER, Fathers GUY, SECCHI, DENZA, and PERRY. Two French Catholic scientists, FIZEAU and FAUCAULT, were the first to determine the velocity of light. And FAUCAULT, with his wonderful pendulum experiment in the Pantheon (Paris), and his curious and ingenius gyroscope—the joy of many a schoolboy's heart—was the first to give a practical scientific demonstration of the rotation of the earth on its axis. He was likewise the inventor of those wonders of mechanical ingenuity, the heliostat, the siderostat, the automatic electric arc lamp, and many other appliances that are now deemed indispensable in the study of astronomy and physics. Among the other sciences, modern music owes its origin to the Italian monk GUIDO, and most of its highest triumphs to men of his faith and country. The sciences of mechanics, hydrostatics, hydraulics, and hydro-dynamics were created by DA VINCI and GALILEO and his school, three of the most prominent of whom were ecclesiastics. Italian and Danish Catholic ecclesiastics laid the foundations of the modern science of geology. And botany, zoölogy, optics, medicine, and others were greatly furthered by the labors and researches of Catholic scientists and investigators.

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Steam.

In travel, industry, and the social and domestic habits of the people, the steam-engine has probable produced a greater revolution than all the other combined agencies of science and invention. The first invention of an actual, working steam-engine was by that universal genius, the Marquis of Worcester, who suffered so much for his fidelity to the Catholic faith and to his hapless sovereign in the days of the Puritan régime in England. He received a patent from Parliament for his invention in 1663—just 109 years before WATT took out his first patent for a similar method of generating energy. The invention that lay so long dormant has in latter days touched modern life at almost every point. As the Turkish Vizir said to KINGLAKE in *Eothen*, it is now 'Whirr! whirr! all by wheels! Whizz! whizz! all by steam!' No carriages were known in England till 1568; no stage-coaches till 1659. Within the memory of many persons still living—to use the words of ALFRED RUSSEL WALLACE—'the wagon for the poor, the stage-