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NEW YORK, SATURDAY, APRIL 1, 1905.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

CASUALTIES—MILITARY AND CIVIL.

And now it would seem that the steam railroad has a close rival in the art of killing and wounding; for the latest statistics of the Census Bureau show that during a single year 1,218 persons were killed and 47,429 injured by street railway lines in this country. To those of us who happen to live in New York, where just now the daily collision on our elevated and subway lines, with its list of casualties, is an item that we should miss from our morning paper, these figures may not prove so startling as to the citizen who travels under more normal conditions; but in all conscience they are big enough to be positively shocking, particularly when we remember that a great number of street car accidents are never reported. Added to the statistics of steam railroad accidents, they show that people are being killed at the rate of 5,300 and wounded at the rate of 100,000 a year! And it all happens to persons who are engaged in the "peaceful pursuits" of "the most highly-developed civilization" of modern times.

Add together two or three years of such statistics, and you get a total casualty list equaling that of the Russo-Japanese war.

Odd, is it not, that we should blench with horror, as we read in one column of the wholesale killing and wounding on Manchurian battlefields of men whose profession it is to kill and be killed, and yet read in the next column with easy composure of the day-by-day killing and wounding of our neighbors or associates, under circumstances for which in nine cases out of ten there is no excuse whatever to be offered.

"CONSIGNED TO THE SCRAP HEAP."

The New York Evening Post has delivered itself of the following: "What the big-navy men cannot deny is that a single new invention or development in marine engineering may consign our enormously costly fleet to the scrap heap without a moment's warning." Strange, is it not, that our staid contemporary should commit itself in its most approved *ex cathedra* manner to what is surely one of the most foolish fallacies of the day. And still more strange that it should do so at a time when the naval experts are telling us all that, if the naval operations of the present war teach one truth more than any other, it is that the battleship is the supreme engine of naval warfare—more secure to-day than ever against the many cheap and short-cut devices that were designed to bring about its "annihilation." It was but a few days ago that the captain of one of the sunken ships at Port Arthur assured the writer that the battleship had more than vindicated its construction, and the principles and theories upon which it had been designed. His own ship, struck time and again by mines, battered by direct shell fire from Togo's battleships, and by the plunging shells from Nogi's batteries, the target for at least a score of torpedoes, some of which found the mark, was sent to the bottom only when he himself opened the sea valves to prevent her from becoming the prize of the enemy. In all the rough handling, above water and below, that the Russian fleet has received in the past twelve months, it was the battleship alone that time and again proved able to survive the blow of the torpedo or the floating mine. For a cruiser to be struck by one of these deadly weapons has meant, with a single exception, immediate and total destruction. Not a battleship was sunk by gun fire; whereas cruisers, and all smaller craft, were by this means sunk or so badly damaged as to be put out of action. It is the battleship that has decided the issue of the naval campaign. In the coming fight, down in the Indian Ocean, between Rojestvensky and Togo, the fate of the victorious Manchurian armies of Japan will depend upon what number of battleships survive on either side. If the unexpected should happen, and Togo should lose three or four of his battleships, not all the armored cruisers, protected cruisers, gunboats, and torpedo boats of Japan could wrest from Russia the command of the sea, or stave off the ultimate capitulation of Oyama's armies.

The history of modern naval development shows that it has moved steadily in the direction of big units, each representing a vast concentration of fighting power, whether for attack or defense. Our 16,000-ton "Connecticuts" and "Louisianas" are the result of a law of evolution, which is as inexorable in a warship as it is in the processes of natural life. At the same time, naval history shows that inventors have been quick to appreciate what they conceived to be the weak feature in this policy of concentrating the fighting strength in a few large units, rather than in many smaller ones. Periodically, the small, cheap "kill-all" device bursts upon an awestruck world, and forthwith the wiseacres shake their heads and predict a complete "revolution" in naval construction. Our contemporary is not by any means the first that has consigned "our enormously costly fleet to the scrap heap without a moment's warning."

The naval revolutionist is ever in our midst; and not even the contemplation of the large and ever-growing list of naval engines of destruction that fail to destroy, deters each new annihilator from being duly heralded as sounding the death knell of every battleship afloat.

There was the torpedo boat, "a single new invention" which caused all the naval powers to set afloat whole squadrons of these now discredited craft. For the torpedo boat was met first by the rapid-fire gun and the torpedo net, and then by the destroyer, a larger edition of itself, swift enough to catch, powerful enough to sink the torpedo boat. The predicted revolution never took place; and the battleship continued to grow steadily in size, power, and price. Then came the submarine ram, which was to usher in another revolution. Great Britain built her "Polyphemus," and the United States her "Katahdin;" but the former was stricken long ago from the lists, and the latter has already found a post of interest, if not of honor, in our museum of naval curiosities. It was a fascinating idea, this of a turtle-backed, submergible ram, hard to see, impossible to hit, running amuck through a fleet of these "big-navy men" battleships, and sinking them with pitiless deliberation. Nevertheless, the Spanish war came and went, while the "Katahdin" lay rusting at her moorings.

The next annihilator was the awe-inspiring "dynamite gun." Here, surely, was that "single, new invention or development," that was to prove a veritable demon of destruction—worth just as many battleships as happened to come within range of its shells. Why spend so many years in building a 16,000-ton "Connecticut," when in one-fifth of the time one could set afloat a dozen "dynamite cruisers," bearing the awesome name "Vesuvius," and each capable of sinking a battleship a minute by the very simple expedient of tossing a quarter of a ton or so of dynamite aboard from her pneumatic guns? We shall not soon forget that queer little midnight comedy, when the "Vesuvius" drew stealthily within range of Santiago harbor, and proceeded to scatter "earthquakes" among the rocky bluffs of the Cuban coast.

Just now the "single new invention or development" which is to "consign our enormously costly fleet to the scrap heap," appears to be the submarine torpedo boat. We are willing to admit that the submarine has proved terribly destructive, and in every case "without a moment's warning;" but unfortunately, in place of consigning our own or any other "enormously costly fleet to the scrap heap," its chief exploit seems to have been that of consigning its unfortunate crew to untimely and most hideous death. It is probable that there is no "single new invention or development" which, in this respect, has so unique a record. It is a gun which kills at the wrong end of the barrel, and until this latest "annihilator" shall have given over slaying its friends, we shall be forced to the conclusion that not to the submarine is to fall the honor of consigning our fleets to the scrap heap.

As it has been, so it will be. There has been much evolution, but no revolution, in the growth of the fighting ship to its present bulk and power. To the country that can concentrate in greatest numbers the big battleship, with its combination of a steady platform, long-range heavy guns, a large reserve of buoyancy, and good speed (to say nothing of its trained personnel) will the victory of the future and the ultimate blessings of permanent peace belong.

ELECTRIC RAILWAYS AND POPULATION.

Some interesting illustrations of the extent to which the outer areas of cities have increased through the development of the street railway are to be found in the recent report of the Census Office on American Street and Electric Railways. For instance, the population of Manhattan borough of New York city increased from 1,441,216 in 1890 to 1,850,093 in 1900, or 408,877. Of this increase, 231,556, or considerably more than one-half, took place in that part of the island lying north of Eighty-sixth Street, the population in this section having practically doubled during the decade. This district is situated about seven miles from the southern extremity of the city, and the great majority of its breadwinners do business downtown and make daily use of the street railways. In the Bronx borough the population increased from 88,908 to 200,507, the increase being mainly along the street and elevated railway lines. In Brooklyn and Queens boroughs the increase in population was 39 and 76 per cent, respectively, and in each case the advance was mainly in the outlying wards.

Another conspicuous illustration of this influence is furnished by the city of Boston. Of the seven wards lying nearest to the business center of Boston, five showed a decrease in population, while in the outlying wards there was an increase of 93,395 inhabitants, or nearly five-sixths of the total increase of Boston. Moreover, the population of the immediately adjacent cities of Cambridge, Somerville, Chelsea, and Brookline increased much more rapidly than that of the older parts of Boston. A very considerable proportion of the breadwinners, both of the outlying wards and of the adjacent cities, are employed in the business district of Boston and depend upon the electric railways for their transportation.

The change in the distribution of the population of Philadelphia since 1890 has been remarkable. Almost all of the wards in the heart of the city show a decrease in population, while several of the large outlying wards to the west and north of the business center have added greatly to the number of their inhabitants. Moreover, the electric railway has given a powerful impetus to suburban life, not only for residence but also for manufacturing purposes. The effect of this influence is shown in the increased population of the suburbs of Boston and Philadelphia, two cities whose suburban residents are served largely by electric railways. Other cities showing this influence in a marked degree are St. Louis, Milwaukee, and Cleveland.

The presence of a rapid and cheap means of passenger transportation permits manufacturing and commercial establishments to be located conveniently and economically and allows the concentration of retail and wholesale trade and office business in specialized centers. The change thus noted has had a marked influence upon the value of land, and upon rentals and building operations, for every extension of an electric railway line into new territory increases the selling and rental values of the real estate in the vicinity. Thus the clearly marked effect upon the community of the increase of electric railway facilities is to prevent overcrowding and to promote equalization of values.

The effect of street railways in concentrating business is evident, although there are no satisfactory statistics regarding the degree to which the business of cities has become concentrated in narrow areas. It has been estimated, however, that the daily movement of people into the central section of Chicago by means of the surface street railway alone is about 225,000, while a still larger proportion of the traffic of the elevated railways is to and from the same business center, which has an area of scarcely more than a square mile. It has also been estimated that the day population of Manhattan Island below Canal Street is about half a million greater than the night population. Practically all of this enormous number of persons is carried to and from this section by the electric railway.

THE GEORGE WASHINGTON UNIVERSITY.

BY N. MONROE HOPKINS, PH.D.

Active steps are now being taken to expand the George Washington, formerly Columbian, University, and to make of it an institution of national character. These plans provide for a great post-graduate university, with every advantage for advanced study and higher research. It is also proposed to have numerous affiliated colleges, like the system which prevails at Cambridge and Oxford in England. George Washington, in his last will and testament, expressed a desire to have in the capital city of the country just such an institution as this university is about to become, and his ideal will doubtless be realized.

The George Washington University was organized by an act of Congress on February 9, 1821, under the name of the Columbian University, and its name has recently been changed. It may be of interest to sketch briefly the causes which led to this change of name. The change was made on June 8, 1904, by unanimous vote of the Board of Trustees, and on June 22, 1904, the Secretary of the Interior and the United States Commissioner of Education approved the change, the action having been taken under Congressional sanction given on January 23 of the same year.

For a long time Columbian University had been confounded with Columbia University of New York, and there had long been a wish on the part of those interested to secure a name more national in character. It happened that in May, 1897, a large body of patriotic women from all sections of the United States held a meeting in Washington and organized the George Washington Memorial Association. Its objects, as stated in its articles of incorporation, were "To advance and secure in the city of Washington a uni-

versity for the purpose and with the object substantially set forth in and by the will of George Washington, the first President of the United States, and to increase the opportunities for the higher education of the youth of the United States."

There was an immediate response to the appeal of the association for money for a permanent building fund, to be held in trust by the association for the erection of a George Washington memorial building in the city of Washington. This fund, amounting to half a million dollars, is to be devoted to the building of the central administration building of the university. This structure will be the center of the proposed group, and will be surrounded by the other buildings, all of equal architectural worth.

Upon the day that the name of the university was changed, Columbian College was organized, as the first of the affiliated colleges of the university. The old name of the institution is, in this way, preserved. Columbian College has charge of the undergraduate students, under the direction of the Board of Trustees. There will also be departments of Arts and Sciences, covering Engineering, Chemistry, Biology, Physics, Astronomy, Geology, Mathematics, Languages, etc., and departments of Politics and Diplomacy, Law, Medicine, Public Health, Bibliography, and Library Science, etc.

The site upon which the new university buildings are to be erected is one of the most desirable in Washington. Fronting upon the President's Park, just south of the White House, the site faces upon the south of the new Potomac Park. The river is less than half a mile away. When George Washington outlined his plans for a national university, the site which he designated was not very far from the one which the new university has acquired. Immediately surrounding the new site are perhaps 1,000 acres of government grounds, including the Potomac Park, which, when completed in the near future, will give the George Washington University the most beautiful campus in the country.

The proposed colleges will have their own faculties and boards of trustees, like Columbian College, and, with the facilities already at hand, there will be no place in the world where the advanced research worker can obtain better facilities than at the George Washington University. The splendid Library of Congress, as well as the special libraries of the various federal institutions, are always available to the students, as well as the government laboratories. In many of the government bureaus are scientists of the very highest rank, who may be called upon for assistance, while many of the numerous types of scientific apparatus are at the disposal of the faculty and the students of the George Washington University. For many years, by act of Congress, these courtesies have been shown officers and students of the institution and, with its expansion, will doubtless be increased. The university works in harmony with the following celebrated organizations, which make the city of Washington a great university in itself: The Smithsonian Institution, the National Museum, the United States Bureau of Standards, the United States Patent Office, the Engineering Bureaus of the War and Navy Departments, the United States Navy Yard, with its model-testing tank for ship models, and where the factory which makes the guns for the navy is situated; the United States Army War College, the United States Weather Bureau, the United States Engineer and Signal Corps, the Agricultural Department, with its many laboratories; the Engineering Department of the District of Columbia, the United States Coast and Geodetic Survey, the United States Geological Survey, the Carnegie Institution, the United States Naval Observatory, etc. Many large private plants, modern in every particular, are also located in Washington, and to these the student of engineering is admitted for study and work. Probably the next of the affiliated colleges will be a College of Engineering, with an equipment second to none in the country. The university publishes regularly scientific bulletins, which may be obtained, together with any additional information desired, by communication with the Registrar of the University.

THE HEAVENS IN APRIL.

BY HENRY NORRIS RUSSELL, PH.D.

When we return to our observation of the evening sky this month, we will notice that all the constellations are farther west than they were at the same hour a month ago. For example, Orion and Taurus, which were well above the horizon at nine o'clock on a March evening, have now sunk so low that they are almost setting, and the other stars have similarly altered their apparent position.

This does not mean that the stars have really moved at all, but that the sun (from which we take our time) has moved eastward among the stars and come much nearer to these constellations than it was before. Consequently, they are not as high up at sunset or at any given hour of the evening as they were a month ago, and they set earlier—two hours earlier every month—which brings them round to the same time again at the end of a year. A description of the position of the constellations that holds good for 9 P. M. in the middle of a month is therefore valid for 8 P. M. at the end of the month or 10 P. M. at its beginning, and so on.

Having thus specified our hour of observation, let us examine the sky. Orion, Taurus, and Canis Major, which we studied last month, are now low in the west. Above them lies the Milky Way, in or near which are a number of prominent constellations.

Beginning in the extreme northwest we find Cassiopeia, marked by a zigzag line of five second-magnitude stars. There is nothing else like this group in the heavens, and as in our latitude it never sets, it forms a "landmark" in the sky second only to the Great Bear itself. Some distance farther to the left is a very bright star, Capella, in Auriga. This constellation contains several other fairly conspicuous stars which lie to the left of Capella or below it and form a large irregular pentagon easy to recognize. Between Auriga and Cassiopeia is Perseus, which contains two second-magnitude stars and numerous fainter ones.

South of Auriga and above Orion is Gemini. The two first-magnitude stars, Castor and Pollux, which are much closer together than any two other stars of equal brightness that we ever see, make this a very easy constellation to identify. Castor—the northernmost, and somewhat the fainter of the two—is a remarkable double star, consisting of two components of unequal brightness which revolve about one another in a period of several hundred years. Just how long the period is, we do not know, but the stars have not got half way round since the invention of the telescope. Spectroscopic observations have recently shown that each of these bright stars has a dark companion revolving about it in a period of a few days, so that the system is really quadruple. Finally, there is a ninth-magnitude star not far from the bright pair which shares their proper motion, and is undoubtedly a member of the system, describing its own enormous orbit about the brighter stars, though at such a distance that it probably requires 50,000 years to complete one revolution.

The two bright stars and their distant companion may be seen with any telescope of above three inches aperture. The close pairs, however, must be far beyond the power of even the greatest telescopes.

The rest of the constellation Gemini lies below Castor and Pollux toward Orion, and consists of two roughly parallel lines of stars.

South of Gemini is an isolated bright star, which is Procyon, the only conspicuous feature of Canis Minor. Like Sirius, this star is relatively very near the sun, and its light takes only about ten years to reach us.

The most prominent constellation near the meridian is Ursa Major, which is now right overhead. The familiar "Dipper" forms the hind quarters and tail of the Bear. Three of its paws are marked by pairs of stars which lie along a line some 20 deg. southeast of the Dipper, and its head is formed by several faint stars between the Pointers and Capella.

Below Ursa Major is Leo, which has one star of the first magnitude, Regulus by name. Above this is the group known as the "Sickle," which well deserves its name. (Regulus is at the end of the handle.) Two second-magnitude stars about 30 deg. to the left belong to the constellation, being in the Lion's hind quarters, while the bend of the sickle outlines his head.

Between Leo and Gemini is Cancer, the least conspicuous of the zodiacal constellations, marked only by a little hazy spot of light which a field-glass will show to be a star cluster. It has been known since ancient times by the name of Praesepe, the Bee-hive.

Below Cancer is a little group of stars which marks the head of Hydra. This is a very large constellation which extends southeastward for about 90 deg. but contains no bright stars. The quadrilateral in the southeast, which is the most prominent object in that part of the sky, represents Corvus, the Raven, which is perched on Hydra's head.

The bright star in the southeast is Spica, in Virgo, and the still brighter one farther north is Arcturus, in Boötes. These constellations, however, together with Corona and Hercules, which are now rising, can be better seen and described in later months.

From the Lick Observatory comes the news of the discovery of another satellite of Jupiter found photographically by Prof. Perrine with the Crossley reflector. It is of the sixteenth magnitude, that is, so faint that it can only be seen with instruments of the largest size. From the manner of its discovery it is clear that it must be a distant satellite with a long period similar to the recently-discovered ninth satellite of Saturn and the still more recent sixth satellite of Jupiter.

THE PLANETS.

Mercury is evening star until the 23d, when he passes between us and the sun and becomes morning star. During the first part of the month he is very well visible in the evening. On the 4th he is at his greatest elongation from the sun and sets at about 7:45 P. M. He is in Aries, a few degrees south of the brightest star of that constellation.

Venus is also evening star till the 27th, when she also becomes morning star. She is conspicuous at the beginning of the month, when she sets two hours after the sun, but disappears from view about the 20th.

Jupiter is also evening star in the same part of the sky and the three planets are quite near one another. On the evening of the 25th Mercury and Jupiter are about 5 deg. apart and at about the same altitude above the horizon. Jupiter is the southernmost of the two. Venus is directly above them, about 10 deg. higher up. The moon will be near them all on the 6th.

Mars is in Libra and is becoming brighter as he approaches opposition. He rises at about 9 P. M. on the 15th and is the most conspicuous object in the southeastern sky at midnight.

Saturn is morning star in Aquarius, rising between 3 and 4 A. M. Uranus is in Sagittarius and comes to the meridian at 4:40 A. M. on the 15th. Neptune is in Gemini and sets about midnight.

The asteroid Vesta, the brightest of these small planets, was in opposition on March 24 and is now visible. Her position is as follows:

	R. A.	Declination.
March 30...	12h. 26m. 3s.	10 deg. 49 min. N.
April 11.....	12h. 15m. 7s.	10 deg. 47 min. N.
April 23.....	12h. 7m. 4s.	12 deg. 7 min. N.

So that she is near the line joining β Leonis and γ Virginis about one-third of the way from the former toward the latter. She is about the 6½th magnitude, just visible to a keen eye. By making a diagram of the small stars visible with a field-glass in this region the asteroid may be identified by its motion.

THE MOON.

New moon occurs at 6 P. M. on the 4th, first quarter at 5 P. M. on the 12th, full moon at 9 A. M. on the 19th, and last quarter at 6 A. M. on the 26th. The moon is nearest us on the 18th and farthest off on the 4th. She is in conjunction with Saturn on the 1st, with Mercury, Venus, and Jupiter on the 6th, Mars on the 21st, and with Saturn again on the 28th. The two conjunctions with Saturn are fairly close.

Capri, Italy.

SCIENCE NOTES.

The constant effort of science to overcome natural laws as well as to apply them must be recognized. A few years ago, at a meeting in New York, a gentleman was deploring the fact that we did not allow nature's laws to have full play; that we were constantly antagonizing nature at the expense of the welfare of the human race. Mr. Abram Hewitt answered this pernicious doctrine by saying that if nature had been allowed to take its course, grass would still be growing in Broadway.

Are metals made radio-active by the influence of radium radiation? This is a question which Prof. Thomson, F.R.S., answered in a communication made to the Cambridge Philosophical Society recently. From experiments made on lead, brass, and tin, it was shown that these bodies, after exposure to radium radiation, exhibit no trace of radio-activity four minutes after the radiation has ceased to fall upon them; there was no evidence of induced activity of any kind, but the method used was not adapted for testing the existence of a very short-lived radio-activity.

Cuvier, the naturalist, while a young man incurred the enmity of certain of his colleagues, who decided to give him a severe fright by dressing one of their number in the conventional garb of Satan and making a midnight call upon him. It is presumable that being aroused from a sound sleep, Cuvier was duly impressed with the figure before him and that some of the threats made were having the desired effect. But finally, in a last effort to overwhelm him, the devil threatened to eat the young scientist. This was a fatal mistake, for Cuvier, at once reassured, eyed the grotesquely-clad figure from head to toe and exclaimed, "What, horns and hoofs and carnivorous! Never!" He then rolled over and went to sleep.

THE CURRENT SUPPLEMENT.

The current SUPPLEMENT, No. 1526, opens with an excellent and very fully illustrated article by Charles H. Dodge on a new Mexican substitute for cordage fiber. L. E. Neame writes on "Mysterious White Races." The famous chemist, Prof. Arrhenius, discusses in a very simple and instructive way the development of the theory of electrolytic dissociation. Arthur Churchill writes eloquently of Edison and his early work. Charles R. King's splendid article on the completion of the Simplon tunnel is concluded. William Scott Taggart, the author of "Cotton Spinning," presents an easily understood description of cotton gins. The strength of timber treated with preservatives is discussed. The Pintsch suction gas producer is described and illustrated. The English correspondent of the SCIENTIFIC AMERICAN writes interestingly on the Just-Hatmaker process of manufacturing powdered milk.