of the axles. Some trials were made to determine the tractive force of this locomotive. It was coupled directly to one of the ordinary steam-locomotives of the Birmingham Tramway Company, and set to haul the latter. The brakes on the steam-locomotive were then gradually tightened until it was brought to rest, when the spring balance indicated a pull of a ton and a half; the current through the motor at that time being 200 ampères. Previous trials on the line had shown that the maximum pull was required on a six-per-cent grade, where it amounted to 1,800 pounds: so the electric locomotive has a margin of over 50 per cent of tractive power above that actually required in the ordinary working of the line. While it is to be hoped that the experiments in Birmingham will succeed, yet storage-batteries have hardly reached that state of perfection that they can compete, as far as expense goes, with steam-engines. While it is still a very doubtful question whether they are more economical than horses for street-car work, it would seem a mistake to bring them in direct competition with steam.

THE DIMENSIONS OF ELECTRICAL UNITS. — Professor Fitzgerald, in a note communicated to the Physical Society of London, calls attention to the fact that the dimensions of the electric and magnetic inductive capacities are the same, being the inverse of a velocity, the one differing from the other only by a numerical coefficient. This, Professor Fritzgerald thinks, is very suggestive, and seems to have been hitherto overlooked. He thinks that the two quantities must be proportional to the reciprocal of the square root of the mean kinetic energy of the ether.

A NEW DYNAMO. — Messrs. Fritsche and Pischon of Berlin have brought out a new wheel-armature dynamo which gives some remarkable results. The armature is built without a core, without cotton insulation, without copper, and without a special commutator construction. It is built up of a lattice-work of iron rods, which are separated by air-spaces, and the rods are prolonged as segments of the commutator. The dynamo is multipolar. The smallest of them gives 50 16-candle-power lamps, at a speed of 240 revolutions: the largest supplies 3,500 lamps at 70 revolutions. They are said to be very efficient, which fact, together with their extreme simplicity, will probably cause their extended adoption.

NOTES AND NEWS.

THE Ericsson Coast Defence Company was incorporated at Albany on Friday, March 22, by George H. Robinson, William Williams, Ericsson F. Bushnell, Cornelius S. Bushnell, and Edward S. Innet. The main idea of the company is to manufacture implements for the defence of the American coasts, and to enlist the interest and assistance of the United States Government in the results of the studies and experiments of the late Capt. John Ericsson, who devoted many years and much labor to the subject of our coast defences. The most notable of his inventions in this line is the "Destroyer," a boat built for the destruction of the monitor gunboats. The company claims that the boat has been satisfactorily tested, and believes that it will receive recognition from the present administration. With all the other inventions left by Capt. Ericsson, the Ericsson Coast Defence Company will have nothing to do; that is, with inventions which have nothing to do with the subject of coast defence. There are several of the latter inventions, notably a perfect caloric engine and the sun-motor, which the executors will proceed to patent at once, or at least as soon as they can act in the matter according to law. Owing to the legal advertising made necessary by the conditions of the will, that document cannot be probated before May. Every thing has to be turned into cash, and the necessary delay in communicating with the legatees in Sweden and other parts of Europe will prevent for the present the patenting proposed by the executors. This delay, however, does not affect the operations of the Ericsson Coast Defence Company, which is wholly independent of the will and the legatees.

— The collection of American precious stones, both in the form of crystals and cut stones, which are to be exhibited at the Paris Exposition, Messrs. Tiffany & Co. have decided to place on exhibition on Friday, Saturday, Monday, and Tuesday, March 29 and 30 and April 1 and 2. This collection is one of the finest that has ever been gotten together, and will be in charge of Mr. George F. Kunz, who has devoted considerable time to its preparation.

— In *Nature* of March 7, J. Starkie Gardner writes as follows on the origin of coral islands: "Mr. Murray's concise explanation of the formation of coral reefs and islands presents advantages in more than one respect. It demands no *a priori* assumptions, but begins and ends with that which can be observed, while Darwin's theory requires the preliminary concession of subsidence, which never has been and never perhaps can be observed. It must appear ungracious to question a theory that accords so completely with the natural history of coral islands; but even this theory requires a geological concession, and that is stability. Coral islands, it may be supposed, after all, only differ from other oceanic islands in being crusted over with coral, so that we cannot see their original state; and the question is, whether we can grant such long periods of stability to them, from our experience of other oceanic islands, which are free from coral, and can therefore be observed. Nearly all oceanic islands are volcanic, and it is probable that their elevation coincides more or less with the period of volcanic activity somewhere along their line. It is obvious that coral islands are not formed during this phase, because no theory would then hold good; the peaks would grow through and carry up the coral, which might leave only such small traces of its existence as we find in a single spot in Madeira. It would not be unreasonable to suppose, that, if the expansive and elevating force were withdrawn, the peaks would slowly subside; and that, if there are some lines of elevation, there must be others of subsidence, unless the earth is as a whole growing in bulk. Darwin claims the existence of areas of subsidence, and that these are eminently favorable to coral-growth; and it is quite apparent that if the Island of Madeira were to sink, as it has undoubtedly risen, its last appearance in a coral sea would be as an atoll. We shall never see the interior structure of a stationary or subsiding coral island, and can only look for a re-elevated example with a crust that has been protected from solution whilst dead and submerged, and yet not sufficiently so to mask the core. In submitting geological considerations, I am not questioning any of Mr. Murray's observations, which are in every way admirable, though it does appear to me doubtful whether atolls could increase outwards in deep water on their own talus, in face of the dissolution of dead coral that is claimed to take place in the interior of the lagoons, and yet more so in deeper water."

— We note with pleasure the advancement to the grade of commander in the navy of Commander R. B. Bradford, who for the past few years has had complete control of the various electric-light instalments in our men-of-war and at the different naval stations. The unvarying success that these numerous plants have met with are well-deserved tributes to the abilities of the naval inspector of electric-lighting.

— Marcus M. Hartog, in *Nature*, writing of the inheritance of acquired characters, says, "A very strong *a priori* objection to the line on which most experiments on the inheritance of acquired characters are carried on is the following. These experiments involve mutilation; and a tendency to transmit characters so produced would, considering that every accident or fight produces some slight mutilation, involve the animals in a process of degeneration: hence the tendency to transmit the characters acquired by mutilation would be constantly bred out by natural selection. But a tendency to transmit characters acquired by habit in youth rests on quite another basis, and would tend to the conservation of the race. I do not know if observations have been made on the physique of the offspring of persons engaged in trades where apprenticeship begins before puberty: they would be most valuable. But the following case seems to me to be thoroughly to the point. A. B. is moderately myopic and very astigmatic in the left eye; extremely myopic in the right. As the left eye gave such bad images for near objects, he was compelled in childhood to mask it, and acquired the habit of leaning his head on his left arm for writing, so as to blind that eye; or of resting the left temple and eye on the hand, with the elbow on the table. At the age of fifteen the eyes were equalized by the use of suitable spectacles, and he soon lost the habit completely

and permanently. He is now the father of two children — a boy and a girl — whose vision (tested repeatedly and fully) is emmetropic in both eyes, so that they have not inherited the congenital optical defect of their father. All the same, they both have inherited his early acquired habit, and need constant watchfulness to prevent their hiding the left eye, when writing, by resting the head on the left fore-arm or hand. Imitation is here quite out of the question. Considering that every habit involves changes in the proportional development of the muscular and osseous systems, and hence probably of the nervous system also, the importance of inherited habits, natural or acquired, cannot be overlooked in the general theory of inheritance. I am fully aware that I shall be accused of flat Lamarckism ; but a nickname is not an argument."

— At a meeting of the Physiological Society, Berlin, Feb. 1, Professor Moebius spoke on the movements of the flying-fish through the air. He first described, from personal observation, the way in which the fish shoot out of the water from both bows of the ship, and then propel themselves horizontally for a distance of several ship's-lengths with their pectoral and abdominal fins stretched out flat, skimming along without moving their fins, always in the direction of the wind, but either with or against the same. When they meet the crest of a wave, they raise themselves slightly in the air, falling again to the same extent in the succeeding trough of the sea. Occasionally a slight buzzing of the fins may be observed, similar to that of the movements of the wings in many insects. At night they frequently fall on the deck of the ship. As the result of a detailed investigation, the speaker had proved that these fish do not fly, since the anatomical arrangements of their fins and muscles are not adapted to this purpose. What really occurs is, that, when frightened by the approach of a ship or any enemy, they shoot out of the water, as do so many other fish, and are then carried along by the wind, which strikes on the under surface of their outstretched and evenly balanced fins. Notwithstanding the general acceptance which was accorded to the above investigation, it was urged by many that the buzzing of the fins, the rising over the crest of a wave, and the falling overboard after having landed on the deck of a ship, were evidences that this fish really executes movements which result in flight. In reply to this, Professor Moebius pointed out that the buzzing of the fins takes place when a strong current of air is directed against the outspread fins of a dead flying-fish by means of a bellows, and, further, that the rising over the crest of a wave or the bulwarks of a ship may be explained by the ascending currents of air which are always produced whenever a strong horizontal wind strikes against any elevated object such as a wave or part of a ship. Thus, finally, with the exception of the movements involved in its oblique sudden exit from the sea, all the motions of a flying-fish when in the air are really passive.

— It was claimed awhile ago for an elevator in the Wilder Building, Rochester, N.Y., that it had broken the record, and was the fastest in the country, having made the run from bottom to top, 126 feet, in 6½ seconds, or at the rate of 1,163 feet per minute. The best previous record was said to have been that of an elevator in the Tribune Building, New York City, 110 feet in 8 seconds, or 825 feet per minute. Mere speed alone, however, does not afford sufficient data for a fair comparison, and gives little evidence of how fast an elevator can travel in actual use. The load is a most important item, and should always be stated, as in the following instances cited by *The Engineering and Building Record*, which will be found of interest in this connection. All are in New York City unless otherwise stated. The elevators in the Potter Building have travelled at the rate of 500 feet per minute with a load of 1,000 pounds in the car ; those in Aldrich Court will travel about 600 feet per minute with the same load ; and those in the Standard Oil Company's Building have made trips at an average speed of 720 feet per minute with 500 pounds in the car, and including the time of starting and stopping. The rise is 133 feet, and the time 11 seconds. What these elevators can do with an empty car, or with a light operator and no passenger, have never been determined. The fastest elevator probably now in existence is the "Water Balance" in the Western Union Building. This machine can attain a speed of certainly 1,000 feet, and probably 1,200 feet, per minute. Similar ones in Chicago, not now in use, are reported to have reached 1,500 feet. This style of elevator is no longer made, not being as safe as the more modern types. The elevators which combine the greatest power and speed in New York City are probably those in the Produce Exchange, and their counterparts in the Cotton Exchange. These were contracted to lift 2,500 pounds in the car at a rate of 300 feet per minute, and did considerably better at the official trial.

— A substitute for granite blocks for paving purposes is a steel paving block claimed to have superior durability, and whose cost is said to be somewhat less than the stone. It is thus described in *The Engineering & Building Record:* The block is made of steel strips, some two inches and a half wide by one thick, with a rolled channel on the side exposed to traffic, and containing notches about half a foot apart. The weight of these strips is eleven pounds to the yard. They are laid across the street, a distance about five inches between centres ; and, as their length is sufficient only to extend to the middle of the street, the proper slope from the centre to the gutters is easily secured. To insure their not slipping sidewise, they are bolted together, and fastened to wooden sills. The support for the new pavement is composed of a firmly constructed bed of gravel, while between the steel strips a compound of pitch and cement is poured, filling the interstices to a level with the tops of the strips, and rendering the surface comparatively smooth.

— *The American Field* is authority for the statement that wild boars have become very numerous in the deep recesses of the Shawangunk Mountains, that border Orange and Sullivan Counties, N.Y. They are the genuine Black Forest wild boars of Europe, the descendants of nine formidable and ferocious boars and sows imported by Mr. Otto Plock of New York, some few years ago, for the purpose of annihilating the snakes and vermin which infested his estate near the Shawangunk Mountains. After the boars had eaten up all the rattlers and vermin in the enclosure, they longed for more, and dug under the wire fencing and escaped to the mountains, where they have since bred and multiplied, and are so ferocious that the most daring hunter hesitates ere he "goes in for game." They have immense heads, huge tusks and shoulders, and lank hind-parts. They attack with a savage rush ; and woe betide the hapless hunter who stumbles before one. Wild-boar hunting is greatly indulged in in Europe, and the accidental escape of these nine boars may furnish American Nimrods with sport on "big game" for many years, in the East. Buffalo hunting is not as dangerous as wild-boar hunting, and, as the element of danger is the spice of hunting to many, the Shawangunk Mountains will undoubtedly supply the East with sport the equal of any in the West.

— The shad fishermen of the Atlantic coast are all happy, and very busy preparing their nets and traps for the expected arrival of the vast schools of shad now steering for the coast from different parts of the Atlantic Ocean, this being the season of the year when they seek fresh water. This passion is well known by all shad fishermen ; and, according to *The American Field*, thousands of feet of drift nets are being got in readiness on Staten Island, Long Island, along the Delaware, and all along the coast where rivers empty into the ocean. The New York fishermen lay for the shad as they attempt to pass through the Narrows, and are rewarded with tons of the delicious sea-food. The tides are such, however, that they can only work two hours out of six ; and this in daytime only, for at night the boats of the fishermen are in constant danger of being run into by tugs and other steam-craft.

— At the meeting of the mineralogical section of the Brooklyn Institute, March 20, Mr. H. Hensoldt, in referring to his experiences as a naturalist in Ceylon, mentioned the fact that he had observed one of the stones carried in the mouth of the cobra-de-capello. This stone is phosphorescent, and the cobra has even been observed with its mouth open, the phosphorescent stone within it, for the purpose, it is believed, of alluring the mate of the firefly *Lampyris noctiluca*. This substance, Mr. George F. Kunz suggested, was evidently chlorophane, a variety of fluorite which emits a green phosphorescence on being heated. He stated that he had observed that the fluorite found at Amelia Court-house,

Va., would be caused to fluoresce by the heat of the hand, and that a similar variety had been described as occurring from Penandræa, Cornwall, England. He had cut a small stone of this substance, and had passed it around the rooms of the Academy of Sciences, the stone emitting a phosphorescence during the entire time. Mr. Kunz exhibited a copy of Sir Francis Reed's "Experimentala Naturæa" (Amsterdam, 1685), which contained a plate showing eight of these so-called cobra-de-capello stones, to which were attributed the power of curing the bites of serpents and other venomous bites. Mr. Kunz also exhibited specimens of tabasheer, the variety of opal found in the joints of the bamboo, which strikingly resembled in its appearance, and also in its power of absorbing an equal weight of water, the variety of hydrophane described by him from a Colorado cavity, stating at the same time that the *oculus mundi* of the gem-writers of the sixteenth to the eighteenth century was evidently this tabasheer, which is powdered by the natives, and used as a medicine.

— C. O. Boutelle, H. L. Whiting, and B. A. Colonna, a committee of the assistants of the United States Coast and Geodetic Survey, announce, on behalf of themselves and their associates, that they intend to ask the President of the United States to appoint Dr. Benjamin Apthorp Gould of Cambridge, Mass., as superintendent of the Coast and Geodetic Survey. Dr. Gould is no stranger to the Coast Survey. From 1851 to 1868 he was attached to the work, and for nearly fourteen years was in general charge of all its telegraphic longitude parties. Between 1853 and 1867 eleven printed reports bear his name. The first telegraphic determination of the difference of longitude between Greenwich, England, and Cambridge, in New England, was under his general charge, and he personally superintended the observations at the eastern end of the cable, near Foilhollerum, in Ireland. Soon after this last great work of 1866–67, he left the country to found an astronomical observatory, and educate native astronomers at Cordova, in the Argentine Republic. What he has done for astronomy in the southern hemisphere during the thirteen years of his stay there, has been well set forth in the "Proceedings of the National Academy of Sciences," at its session in April, 1888, in Washington, when the Watson gold medal was awarded to him for his distinguished and successful labors.

— At the Academy of Sciences, Paris, March 4, remarks accompanying the presentation of a work entitled "Introduction à l'étude de la Chimie des anciens et du moyen age," were made by M. Berthelot. This work forms a sequel to the author's "Origines de l'Alchimie" and "Collection des anciens Alchimistes grecs," thus completing a series of historical researches which fully establish the true character of the old philosophic doctrines, methods, and practices, which were hitherto supposed to be mainly absurd and fanciful, but which must henceforth enter into the scheme of historical evolution of the positive sciences. Here M. Berthelot gives a full description and translation of the Leyden papyrus of Egyptian origin, the oldest extant treatise on chemistry. The signs, notations, and appliances of the ancient alchemists are also described and reproduced by the photogravure process.

— Capt. Moore, of H.M.S. "Rambler," has lately described in a paper read before the China Branch of the Royal Asiatic Society, and summarized in *Nature*, the appearance and effects of the remarkable "bore" which often occurs in Hangchow Bay. This dangerous visitor is the result of the struggle between the advancing tide in the great estuary and the current of the river. Capt. Moore and his officers on several occasions observed the progress of the wave, and their investigations may be summarized as follows: The rate at which the bore travels varies from ten to about thirteen miles per hour. The height of the bore rarely exceeds 12 or 14 feet; and broken water, in which no small boat could live, follows it for some distance. With the passing of the wave the tide rises many feet in a few seconds; in one instance, observed by Capt. Moore, it rose from 9 feet 4 inches below, to 4 feet 7 inches above, mean level. The rush of the bore was so strong that the force of the waves breaking against the broadside of the "Rambler" sent the water into the mizzen chains, and the spray on to the poop. The junks in that region are protected by platforms with narrow steps cut in the sides. To the north of the estuary is a great sea-wall, built to protect the surrounding country from being flooded by these great tidal waves. It is thirty-five miles long, and it is strengthened, where the bore strikes most strongly, by an elliptical stone buttress, 253 feet long by 63 feet wide. Behind this the junks are drawn up for shelter.

— A test-piece of Mullens silicated iron, has stood a compression of 120,000 pounds per square inch. It finally broke in the same manner as specimens of stone do. It contained a very large proportion of silica.

— The latest news from the Sudan encourages the hope that Emin Pacha has successfully resisted the Mahdi, and makes it probable that Osman Digma's report of his surrender was solely a trick to prevent the English from action at Suakim. A despatch dated from Cairo, March 23, says that Mahommed Beraivi, who has arrived here from Omdurman, reports that Sheik Senoussi's forces occupied Darfur and Kordofan, and expelled the dervishes. In July last, Mahommed Beraivi accompanied an expedition of six thousand Mahdists which proceeded in steamers and barges against Emin Pacha. He states that Emin defeated the dervishes near Bor, killing most of them, and capturing their steamers and much ammunition. A despatch of the following day adds that Emin was reported to be in good health, and that all his people and some European travellers were with him in Bahr-el-Gazal.

BOOK-REVIEWS.

Profit Sharing between Employer and Employee. By NICHOLAS P. GILMAN. Boston and New York, Houghton, Mifflin, & Co. 12°. $1.75.

THIS is an elaborate history of profit-sharing, beginning with the initiation of the system in France by Leclaire, and tracing its development in Europe and America to the present time. The author shows a deep interest in his subject, and gives evidence of painstaking industry in the study of the facts. His work is well written and well arranged, and presents as exhaustive an account of the subject as any reader will be likely to want. Though Mr. Gilman s a firm and even enthusiastic believer in profit-sharing as a cure for the industrial evils of the age, he does not fail to recount those experiments with the system that have failed, as well as those that have succeeded. He does not confine himself however, to the mere history of the system, but discusses its value and its relations to the present wages system on the one hand, and to that of co-operation on the other. Co-operation, he thinks, is not destined to succeed, except under specially favorable circumstances, because the laborers are not willing to pay a sufficient salary to their manager to secure the best talent. Profit-sharing, on the other hand, leaves the management where it is now, while it furnishes the means, as Mr. Gilman thinks, to reconcile the laborers to their position. How far these views are correct, time alone can tell; but we would point out that the *Maison Leclaire*, which the author chiefly relies on as an example of profit-sharing and its benefits, is really a co-operative society, somewhat different from the ordinary type, but none the less really co-operative. The workmen, or a certain portion of them, own one-half the capital, the two managing partners owning the remainder; and when one of the managing partners dies, or retires from the firm, the workmen who are shareholders choose his successor. Part of the profits are divided among all the workmen, whether they own capital or not; but this is only one of the distinguishing features of the *Maison*, that of co-operation being quite as prominent. We shall be glad to hear that Mr. Gilman's work meets with a ready sale.

Deductive Logic. BY ST. GEORGE STOCK. London and New York, Longmans, Green, & Co. 16°. $1.25.

THIS is an ordinary treatise on formal logic, with no considerable deviations from the usual type. The author says that before publishing the work he submitted it to the criticism of a friend, who advised him to strike out some new matter which the manuscript contained, and that he did so, retaining only a few novelties. Those