game is played in a lodge or wigwam. Six moccasons are buried with their tops even with the ground, in two rows several feet apart, and filled to their edges with sand.

The Indians divide into two parties, and draw lots for the first move. The winners of the move take a small black stone, and, raising a blanket between themselves and their opponents to conceal their operations, hide the stone in one of the moccasons, burying it in the sand so that it is entirely out of sight. The others then try to find the stone by striking with a stick the moccason supposed to contain it. If they find it, they take the stone in turn and hide it, the others guessing; but if they fail, their opponents hold it until it is found, each time hanging up the blanket, and changing, or pretending to change, its location. The game is counted by means of a hundred and two long slender sticks on each side, which change hands as the sides win or lose. The system of counting is very intricate, the count depending upon the location of the ball. Four, six, or ten counters change hands at each hiding. The chances are almost all in favor of the holders of the ball; and frequently one side will lose all of their counters before the ball is found, when the game comes to an end. Two of the counters on each side are notched, and are called 'grandmothers.' When there has been a long run of bad luck, the 'grandmothers' are stuck up in the ground and told to go and seek their grandchildren, meaning to bring back the luck and the lost counters. It is supposed to be lucky to hold the 'grandmothers' until the last: so they are not laid out until the others are all gone.

The myth on which the kesichay is founded is based, like most other Indian traditions, upon the sayings and doings of animals in those ages when the world was supposed to be peopled entirely with beasts. There were some animals, the tradition runs, that saw better, hunted better, and were happier, in the light, and others that liked the dark. As it was thought wise that the existing alternation of night and day should be changed so as to suit one or the other of these classes, it was determined to call a council of the animals to determine in whose favor the change should be made. When all were together, they decided to play the kesichay to settle the controversy. The council was held at night, and the game progressed with varying success for many hours. During the play the animals of either side began to sing songs illustrative of their luck or their feelings, sometimes taunting each other with their ill success. Every animal present sang of his own characteristics, and so the foundation of the present animal songs of the kesichay was laid. When the blanket is put up, the holders of the ball sing a chant to the effect that "the old screen hangs in front, the old screen hangs in front," repeated many times. The bear, the dog, the owl, every bird and animal known to the Navajo, has some appropriate song that is sung in the game.

The game between the nocturnal and the diurnal animals developed into a round of taunting songs, flung from one side to another, until some one called on the raven. He sang a song of the morning, and cried that the dawn had come, when the eastern sky began to be filled with light; and with a mingled cry of disappointment the nocturnal animals fled to their homes, scattering the articles used in the game, which was thus brought to an undecided end. For this reason the alternation of night and day has never been changed.

The moccasons used belonged to the bear, who, in his hurry, put them on wrong, thus giving his feet their peculiar shape. The sun shone on him before he reached his den, and turned his black coat to a reddish brown, which is its color now.

A Navajo Indian will not kill a snake, but, if one is encountered, will put a stick beneath it and toss it away: so, if a snake come into the tent where the kesichay is being played, it is tossed from one side to the other by the opponents, in the hope that it will bring bad luck to those with whom it stays.

ELECTRICAL NEWS.

The Use of Condensers in distributing Electricity.

TWO patents have been lately issued in which condensers are employed to reduce from a high to a low potential, in place of transformers or storage-batteries. One of these plans has been already described in this journal, and an objection to it was pointed out. Briefly, it consisted in charging a condenser of comparatively small capacity to a high potential, discharging it into a much larger condenser, thereby decreasing the potential, and finally discharging the latter through the lamp-circuit. This operation was continuously and rapidly performed. One objection that was pointed out lay in the great capacity that would be required for the large condenser. Another objection lies in the great waste of energy. The energy of the smaller condenser before it is connected with the larger is

$$\tfrac{1}{2}\frac{m^2}{c},$$

where m is the quantity of electricity on it, and c is its capacity. After it is discharged into the larger condenser, the energy of the two is

$$\tfrac{1}{2}\frac{m^2}{c+c_1},$$

where c_1 is the capacity of the latter. If we wish to reduce our potential from 2,000 volts to 100, c_1 must be $19\,c$, and the energy in the last case is only one-twentieth of that in the first, the difference having appeared as heat in the conductor connecting the two condensers. We have, in fact, an efficiency of only five per cent.

Another condenser apparatus for reducing from a high to a low potential has been patented by W. J. McElroy. The groups of sheets of which the condenser is made are of two sizes, the smaller size being connected with the main line, while the larger are connected through the lamp-circuit with the earth. The main line is supplied by an alternating current. The inventor describes the result as follows: "The electro-motive force available for the consumption circuit is easily regulated or set by the relative sizes of the sheets in the respective sides of the condenser, — the larger the difference, the lower the induced electro-motive force, — and the number of sheets will depend on the current strength needed for the particular circuit supplied. . . . For example: if it be desired to carry on the main line a current of 1,000 volts, and to supply a current on the consumption lines of 100 volts, then the size of the sheets on the one side must bear the proper proportion to those at the other side."

If we consider for a moment what the potential of the sheets on the consumption side will be, we see, in the first place, that, if they are not connected in any way with the earth, their potential will be that of the high-potential plates. If they are directly connected with the earth, their potential will be always zero, and, according as they are connected to the earth through a high or low resistance, their potential will be high or low. As for the increased size of the sheets connected with the lamp-circuit, it has nothing at all to do with the phenomenon, and the effect would be approximately the same if they were reduced to the size of the small sheets. It would not be difficult to calculate whether the system would regulate itself, but it is hardly in place here. Some of the objections to it, outside of the question of regulation, lie in the size of the condensers required, and in the fact, that, if only a few lamps are in use, it would be almost as dangerous to touch the lamp-circuit as the dynamo-circuit.

THE ACTION OF ELECTRICITY ON THE VESICLES OF CONDENSED STEAM. — M. J. L. Soret describes the following interesting experiment in the *Archives des Sciences:* In a dark room a platinum cup containing water is placed on a metal support, which is connected with one pole of a Topler machine. Above this cup a metal point is placed, which is connected with the other pole of the machine. A Bunsen burner boils the water in the cup, which is powerfully illuminated by the projection of a large pencil of the electric light. As long as the Topler machine is at rest, the vapor vesicles ascend in the ordinary way; but, as soon as the machine is at work, the action of electricity on the vapor is manifested in a most striking manner. For a certain distance from the point to the surface of the water the clouds collect, and whirl along the edge of the cup; under the influence of the electric light, they look to a certain extent like flames. If the point is brought a little nearer the water, the vapor disappears completely, although the water continues to boil briskly.

COMMELIN, DESMAZURES, AND BAILHACHE STORAGE-BATTERY. — M. Reymer, in his recent work, 'L'accumulateur Vol-

taique,' describes this novel and promising battery. The positive electrodes are porous plates made by submitting finely divided copper to a pressure of 600 kilograms per square centimetre. The negative electrodes are tinned iron plates, which are amalgamated, the object of the tin being to hold the mercury, which does not adhere to iron. The receptacle is made of tinned sheet steel. The negative electrode rests on the bottom of the box, with which it is in contact. The following table shows the composition of the electrolyte: —

Water	1,000.00
Zinc	144.67
Potash in solution	209.82
Potash, free	313.72

The positive electrodes are enveloped in parchment paper, and are insulated from the negatives by glass rods. Without the parchment, the action is irregular, the oxidation of the positive is not complete, and deposits of zinc are mixed with the copper: hence want of adherence, and local action or short circuits through the formation of 'trees,' as in other batteries where metallic deposition takes place. The following data are the results of tests made in the laboratory of the inventors: —

Weight of cell in working order	22.05 pounds.
" " 5 positive plates	4.25 "
" " 6 negative "	2.32 "
Height of positive plate	11.02 inches.
Width " " "	4.92 "
Height of negative plate	11.81 "
Width " " "	4.92 "
Surface of positive	54.22 sq. m.
" " negative	58.10 "
Length of receptacle	5.90 inches.
Width " "	3.35 "
Height " "	15.75 "
Weight " "	2.20 pounds.
Electrolyte (specific gravity, 1.55) weight	13.224 "
Useful electro-motive force	.75 volt.
Current, charging	15 ampères.
" discharging	48 "
Time of charging	30 hours.
" " discharging	9.5 "
Useful capacity	413 ampère hours. / .42 H.P. hours.
Capacity per pound of cell	18.72 ampère hours. / 14.12 watt hours.
Weight per horse-power hour	52.47 pounds.

According to a note of M. Krebs, however, the total weight of battery for a horse-power hour was found to be 87.55 pounds.

The Edison Electric-Lighting System in Berlin. — According to *Industries*, the work of the Edison Company in Berlin has been so successful that the public and the municipal authorities have perfect confidence in their ability to extend their central-station work still further, and a concession has been given for the establishment of two new stations. Both stations must be ready within two years, and each must be able to supply current for 6,000 glow-lamps burning simultaneously. The capacities of the two stations are to be eventually increased to 24,000 and 12,000 lamps. The network of cables to be laid down in connection with these stations is very complete, and practically comprises all the streets of the respective districts, some small side-streets alone excepted. In view of this extension of their business, the Edison Company propose to increase their share capital at present by $750,000, and later on by $1,500,000. The supply of current within the districts to be lighted will be compulsory, provided the customer is willing to take the light for at least one year.

The Eickemeyer Dynamo. — The *Electrical Review* contains a description of a dynamo which has just been built by Mr. Eickemeyer, to be used in 'forming' the plates of storage-batteries. The novelty of this machine lies in the fact that both the armature and magnet coils are surrounded by a heavy casing of cast iron. The advantage of the type lies in the fact that there is no chance for lines of force to take any other path than through the armature, so that all magnetic leakage is avoided. The dynamo is to give 40 ampères at 1,000 volts. Its weight is 6,000 pounds, the principal part of which is in the cast-iron casing. The armature is of the drum type, 18 inches in diameter by 15 inches long. There are 240 turns of No. 11 wire, making a single layer on the armature. The machine is shunt-wound, and the following data are given as to its performance: —

Armature	240 turns, 1,560 feet No. 11 wire.
" resistance	0.57 ohms.
Field	14,880 turns, No. 21 wire.
" resistance	1,600 ohms.
Speed	850 revolutions.
Electro-motive force at terminals	1,000 volts.
" " " per foot of wire	1.28 "
Current in external circuit	40 ampères.
" " field	.625 "
" " armature	40.625 "
Energy absorbed in field	612 watts.
" " armature	912 "
" " friction, etc	600 "
Net commercial efficiency	94.5 per cent.

The machine is said to run beautifully, with no sparking at full load. Its efficiency is more than good; and the dynamo is simple in construction, and cheap.

Trial of an Electric Locomotive at Birmingham, England. — The following description of a trial of an electric locomotive is given in *Industries*: "The trial trip of an electric locomotive for drawing the tram-cars of the Birmingham Central Tramways Company took place in the presence of a large number of representatives of the press, the corporation, and of the various tramway companies. The engine itself, weighing eight tons and a half, has been constructed upon the Julien system by Messrs. Elwell-Parker. In the trial the electric locomotive successfully replaced the steam-tram engine now in use upon the Birmingham tramways. The gradients in many places are steep, rising to 1 in 17; but the electric locomotive successfully mounted this steep and long ascent with a load of sixty passengers, at a speed of about five miles an hour. On the level and down hill the speed could be increased to ten miles an hour without difficulty; and the locomotive was started, stopped, and backed with ease. The engine itself is a very neat and compact arrangement, compared with the ordinary tram-engines. Two rows of accumulators occupy each side, between which is the alley for the driver, where is fixed the switch, the reversing-switch, the engine-brake, and the car-brake. The switch connects the cells in five sets, all parallel, and two, three, or four in series. The cells number 104, having 39 plates, each 9 inches by 6 inches. The motor is placed low down, and is connected to the axles by helical gearing, — geared 1 to 8½. The engine is capable of exerting 40-horse power, and will run sixty or seventy miles. A contract has been entered into by the engineers to run this car for three months at twelve cents per car-mile, the present cost of steam being nearly sixteen cents.

Electric-Lighting. — The establishment of central stations for the distribution of incandescent electric-lighting has received a noticeable impetus through the successful introduction of the alternating current and transformer method of distribution. The saving in the cost of conductors effected by this method, due to the employment of relatively high potential currents in the mains, has rendered it commercially practicable to distribute over much larger areas than formerly, but over areas of relatively sparse consumption. Thus many small towns are enabled to maintain successfully electric-lighting stations. The Westinghouse Electric Company of Pittsburgh, Penn., introduced the alternating-current system here, after careful and thorough investigation and experiment, about two years ago, installing the first commercial station at Buffalo, N.Y., and putting it in operation Thanksgiving Day, 1886. The number of central-station plants since supplied or contracted for by the Westinghouse Company has reached no fewer than one hundred and twenty-four. They have recently received a contract for a station in the heart of London, to include an outfit for twenty-five thousand lamps. This contract is with the Metropolitan Electrical Supply Company, Limited, the organization of which in London was noticed in electrical journals some months since.

An Electric Surface Road in New York. — The Bentley-Knight Electric Railway Company will soon resume operations on the Fulton Street cross-town railway in this city, and expect to have it in operation before the end of this month. They began work on the road over a year ago, but, owing to the opposition of a

street-railway whose track extended over a part of the route, they were unable to proceed far with the work at that time. In the Bentley-Knight system the electric current is taken from conductors contained in and protected by sub-surface conduits, — a system admirably adapted to the crowded thoroughfares of a busy city.

COMMERCIAL GEOGRAPHY.

The Obi Railroad.

THE question of opening the interior of Siberia becomes more and more important. While hitherto the canals between the large rivers, and projects of navigating the dangerous Kara Sea, were foremost among the plans that seemed likely to be realized, the project of a railroad from the lower Obi to the coast west of Nova Zembla has at present assumed definite shape. The Russian newspapers give the following reports of the project: The Obi Railroad, the most northern road ever planned, will be of the greatest economic importance to Siberia. It deserves special attention, as the projectors do not demand any subsidy or government guaranties. The river Malaia-Obi, near Obdorsk, is the starting-point of the projected line, which will take a direction towards the foot-hills of the Ural Mountains. The latter will be crossed in one of the transversal valleys, which are not over one hundred feet above sea-level. It will cross the river Ussa near its source, and reach the ocean through the tundra of Bolchesemelsk. Its terminus will be in the Bay of Shainoudir, near Belcoff Nosse. The total length of the line will be 260 miles. The price of construction, including rolling stock, is estimated at forty thousand dollars, or ten million dollars the whole line. The establishment of a port on the Arctic Ocean in the locality mentioned above, with all modern improvements for loading and unloading vessels, is estimated at one and a half million dollars. To this must be added the cost of establishing a line of river-boats on the Obi and Irtish, which is estimated at two and a half million dollars. Thus the whole plan requires the expenditure of fifteen million dollars in works of construction.

It is believed that the line can be worked for six months of the year. The products of the remotest parts of the Obi basin will be carried to the shipping port on the ocean in twelve days, while twelve days more will be sufficient to carry them to London. The price per hundredweight is estimated at $1.30; while on the present route, *via* Barnaul, Perm, St. Petersburg, London, it is $2.25, the time necessary to accomplish this distance being 130 days.

The railroad, which has been projected by Mr. Golovacheff, is intended as a means for making the transactions of a Siberian commercial company, which has been founded recently, profitable. According to the concession granted by the Russian Government, this road will not be open to the public, but will only be used by the grantee, who proposes to export the grain and stock from southern Siberia, and hopes to be able to furnish the London market with north Siberian fish. On the other hand, the company will import principally machinery, which so far has hardly found its way to Siberia, and other articles which are at present imported by Moscow merchants.

NOTES AND NEWS.

SCREENED from the world by a high fence, and not far from the Edison Laboratory at Orange, N.J., there have gone up two large factory-buildings. In these buildings there are now in operation a hundred thousand dollars' worth of such fine machinery as can be supplied by E. E. Garvin & Sons of New York, Pratt & Whitney and Dwight Slater of Hartford, and Brown & Sharpe of Providence, in the manufacture of the parts of the improved phonograph. The assembling of these will begin at an early date, so that by Jan. 1 one hundred phonographs should be leaving the works each day. Lieut. F. W. Toppan, U.S.N., is the manager.

— Lieut. D.Bruun of the Danish army, says *Nature*, having had a moss dug out in Finderup, in Jutland, has made some discoveries. In the moss were found trunks of oak, beech, and fir trees from 6 to 30 inches in diameter. The branches had in some cases been cut off, but the bark remained. By the side of one of the oak trunks two earthen vessels were discovered, and near another a third, shaped like an urn. In the latter lay a sandal cut from a piece of leather, with flaps, and leather straps for tying to the ankle the length of the sandal being 7 inches. It seemed as if the trunks of trees had been placed in a certain position for some purpose or other. About 20 feet farther to the south, and at the same depth, viz., 6 feet, a yoke of oak was found, $5\frac{1}{8}$ feet long and 3 inches thick, being fairly cylindrically cut out in the centre. At each end, were holes, in one of which remained a strap of leather. Other implements of oak were also found, evidently used for carrying. Some of them seemed part of a wheel. Close to the yoke another earthen urn was discovered, which, like the three referred to, was surrounded with sprigs of heather and bramble. Formerly some horns of bullocks and the skeleton of a man in a fur coating were found in the moss. The various objects are now in the Copenhagen Museum, and are said to date from the early iron age.

— Mr. J. W. Osborne of Washington, the well-known inventor of photo-lithography, has presented to the United States National Museum and to the Art Museum in Boston his large and exceedingly valuable collection of proofs and specimens illustrative of the development of photo-mechanical printing. All the important and typical processes are fully represented in each by specimens collected by Mr. Osborne in all the art centres of Europe and America, and include the works of all who have in any measure achieved success in the graphic arts. As soon as it can be properly classified, the collection intended for the National Museum will be placed on exhibition in the section of graphic arts. Mr. Osborne's contribution, the museum authorities assert, has laid a substantial foundation for an exhaustive collection of kindred productions under government auspices at Washington.

— The Philosophical Society of Washington will hold a meeting on Saturday evening, Dec. 8, at which an address will be delivered by the retiring president of the society, Col. Garrick Mallery, on 'Philosophy and Specialties.'

— According to news received in Denmark, Dr. F. Nansen has succeeded in crossing Greenland, but unfortunately was too late to catch the last steamer. It will be remembered that on July 15 Dr. Nansen, accompanied by Lieutenant Sverdrup, two other Scandinavians, and two Lapps, left the whaler 'Jason' in latitude 65° north, in sight of the east coast of Greenland. After twelve days of difficult march across the pack-ice, the coast was reached, but about sixty miles farther south than Dr. Nansen expected to land, the current having carried the ice southward. On Aug. 15 the party began the march across the inland ice, taking a north-westerly direction towards Christianshaab. When a height of about 7,000 feet was attained, the travellers were overtaken by a northerly snow-storm, which compelled them to take a westerly course toward Godhaab. The greatest altitude attained was about 9,500 feet. Finally, after forty-six days of travel, the party arrived at the head of Ameralik Fiord, which is situated a little south of Godhaab, and, by means of an improvised float, Godhaab was reached on Oct. 4. Dr. Nansen despatched immediately two kayaks with letters to Ivigtut, from which place the steamer 'Fox' was to leave about this time. The kayaks reached this place when the steamer was about to leave, and as the captain did not feel justified in delaying his departure, on account of the advanced season, the party will have to winter in Greenland.

— At the meeting of the Royal Meteorological Society held on Nov. 21, Mr. G. J. Symons read a paper entitled 'Results of an Investigation of the Phenomena of English Thunder-storms during the Years 1857–59.' This paper was written nearly thirty years ago. It has now been communicated to the society at the request of the thunder-storm committee. The paper contains a summary, chiefly in statistical form, of some of the results of an investigation into English thunder-storms, and the accidents produced by lightning during the years 1857–59. The author found that in sheet lightning the most prevalent color is white, then yellow, blue, and red; in forked lightning the order is nearly reversed, blue being more than twice as frequent as any other color, then red, white, and most rarely yellow. Sheet lightning was seen about twice as often as forked. Dr. A. Riggenbach exhibited some photographs of cirrus and other fine clouds, which had been obtained by using the surface of a lake as a polarizing mirror.