Tibetan blankets, musk-pods, goats, ponies, clarified butter, and yâk-tails. The chief grain grown is maize or Indian-corn. The domestic animals comprise buffaloes, yâks, zobus (cross-breed between yâk and cow), goats, and sheep of the long-horned species, largely used in Tibet for transport purposes. The yâk and female zobu afford a plentiful supply of milk. Among the wild fauna are musk deer and Tibetan antelopes, while flocks of wild pigeons and ravens and pheasants are common.

"The Daibung was away when the explorer reached Dingri, and did not return till Oct. 21. Great trouble was experienced in getting him to accord permission for the party to proceed westwards. The Daibung declared that this route was absolutely closed to all but officials; but in consideration of the explorer's companion, who was a man of influence in these parts, and in consideration of his promise to be answerable for their good behavior, the required permission was granted, but with a proviso that from village to village a guide should escort the party and send back regular reports of the progress made.

"The general direction of the explorer's route then trended to the west, past the Palgucho Lake, about nine miles by four in extent, the waters of which are clear and sweet to the taste, though it has no outlet. The Tibetan fort of Jonkhajong, the farthest point to the north-west reached, is a substantial stronghold, about four hundred paces square, protected by a mud and stone wall. Two officials, called Jongpons (Tib. = 'governor of a district') reside here, and exercise civil and judicial authority short of capital punishment. The surrounding country appeared well cultivated, and the inhabitants were reaping their harvest at the time. The Jongpons gave permission for the party to travel to Nubri in accordance with the terms of the passport, but, as the route was reported to be closed by heavy falls of snow, it was only by more presents that a pass allowing M — H to proceed as far as Kirong was obtained. Beyond Kirong the route nears the river, and for about one hundred paces is carried over a gallery about six feet wide, run along the perpendicular face of the rock at a height of from fifteen to twenty feet above the water's edge. The gallery rests on thick iron bolts driven into the rock at intervals, over which planking is loosely laid: the outer edge is fenced by a rudely made rope passed round wooden posts fixed to the bolts. At Naiakot the route turned westwards, and, crossing the watershed of the Tirsuli River, descended into the valley of the Buri Gunduk, one of the chief rivers of Nepaul, which M — H ascended as far as Nubri, along a route nearly parallel with the line of his southward journey. Thence he retraced his steps along the Buri Gunduk to Arughat, a Nepaulese village, where the party were detained three days pending the result of inquiries as to whence they had come and for what purpose. The explorer professed to have gone all the way to Nubri in search of one of his dependants, who, he alleged, had run away from M — H's home in Jumla with a large sum of money some time before, but whom he had not succeeded in finding. He said that, having failed in his object, he was anxious to return home *viâ* Tirbeni, where he intended going through the customary religious observances. He was then allowed to proceed, but warned, that, owing to the disturbed state of the country consequent on the recent insurrection in Khatmandu, he was liable to detention in several places. His further route to Tirbenighat, on the British frontier, lay in a south-westerly direction."

ELECTRICAL SCIENCE.

Alternating Current Electro-Motors.[1]

THE alternating system of electrical distribution possesses many advantages for distributing electrical energy over extended areas; it has, however, certain disadvantages, among others that of not at present allowing the use of electric motors for the distribution of power.

In any central station supplying electric lights the full capacity of the plant is utilized but a short time during the twenty-four hours, and, taking the whole day, we will find that we have sold an amount of energy equal to a half or a third — perhaps even less — of the amount we could supply supposing we worked always at full capacity.

If we draw a curve representing the energy used at different hours of the day for lighting, it will be something like *O D E H F G X* in Fig. 1. The total amount we could have sold is *A O X B*. If we can use motors on the circuit, we can sell an additional amount of power such that the power used for lighting and by the motors never exceeds the maximum capacity of the station. For instance, if the motors work until 6 P.M., we can use for them a horse-power equal to *H I*, and the total energy we can sell for the motors is *H I K L*. The solid part of our diagram is all of the energy that a purely alternating system can expect to utilize: a continuous current system, by employing storage-batteries, could fill the whole of the area *A O X B*.

In the alternating system the current and electro-motive force may be represented by the curves I and II, Fig. 2, the maximum

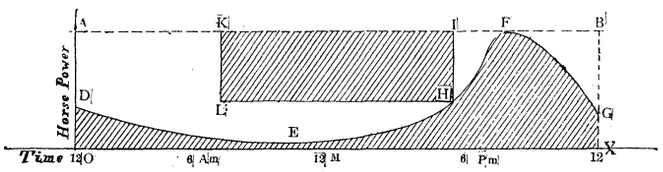

FIG. 1.

value of the current lagging behind the maximum of the electro-motive force. In the main circuit a high electro-motive force of constant maximum value is used, and this is reduced at points of consumption to the low potential necessary for safety, and for use with incandescent lamps, by 'transformers;' that is, by 'induction-coils' working backward. The value of the system lies in this: by using high potentials in the main or primary circuit, we can transmit a great deal of energy with comparatively little current, and therefore with little loss in the lines. This enables us to use small conductors, and avoid the large investment in copper necessary in distributing energy by the direct system.

If we can use motors in this system, we can almost double our receipts with comparatively little increase in our expenses. The plant remains the same; the salaries, interest on investment, and depreciation, are only slightly increased; our main additional expense is for the fuel.

The forms of motors that can be run by alternating currents are (1) an ordinary series-wound motor; (2) a motor built like an alternating current dynamo, the field-magnets being excited by the

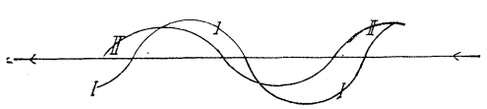

FIG. 2.

alternating current, which is first commutated so that its direction is always the same; (3) the same arrangement as the last, except that the field-magnets are excited by a continuous current from some external source; (4) the form proposed by Prof. E. Thomson, in which the armature currents are not supplied from any external source, but are induced in them by the alternations of the field-current.

Of these forms, (3) appears the most promising. Its advantages are, that when it is once started it will perfectly govern itself, revolving at such a speed that its own reversals of electro-motive force occur with the same rapidity as those of the dynamo driving it; it is cheap to construct, and durable; and it should be efficient, and give a greater output than corresponding machines of the other types. Its disadvantages are, that it must be first driven to its proper number of revolutions before the alternating currents will run it; there must be some external source of continuous current to excite the field-magnets; and if a load possessing any considerable inertia be suddenly applied, the motor will stop.

It is proposed to avoid these difficulties in the following way:

[1] Abstract of a paper read before the American Institute of Electrical Engineers, by Dr. Louis Duncan, Johns Hopkins University.

with the main circuits there should be run an auxiliary continuous current circuit from the central station, of a capacity of, say, ten per cent of the power to be supplied. This continuous current would have two uses: in the first place, it would excite the field-magnets; and, in the second, it would start the motor. This last could be accomplished by having a commutator on the motor-shaft that would reverse the current through the armature every time an armature coil passed a pole. Now, by a simple switch, we could first turn on the continuous current, which would start the motor, and then, when the armature had reached its proper number of revolutions, we could turn the handle a little further, and make the alternating circuit through the armature, at the same time breaking the continuous circuit.

To prevent the stopping of the motor on the sudden application of a load, there should be some form of friction-pulley on the shaft that would turn just before the motor had passed its maximum possible work.

The easiest way to decide which of the possible forms of motor is best, is to experiment on them all. It is not necessary to experiment on a number of motors of each form; but if we make suitable observations, and know how to draw deductions from our results, we can tell very closely, from experiments on one motor, what are the capabilities of the type.

GAS-ENGINES AND WIND-MILLS FOR ELECTRIC LIGHTING.—Up to the present there have been few private houses supplied with electric lights. The central stations have been placed in the more crowded business portions of the towns, and lights have not been distributed at great distances from them. There are other reasons why incandescent lights have not been more rapidly introduced: the general public has not had sufficiently brought before it the advantages of electric lighting over gas from an artistic and hygienic point of vlew; it has been considered mainly from the standpoint of cost as compared with gas. In many cities gas is supplied over extended areas, embracing sometimes the suburbs for miles around. For the more wealthy suburban inhabitants it would be easy to light their houses by electricity, using a gas-engine for power, and employing a storage-battery in connection with the dynamo. Some figures obtained at the late electrical exhibition in New York will be of interest. We find, if we consider a five-foot gas-burner as giving a light of 16-candle power, that 130 feet of gas supplied to a gas-engine will give as many incandescent lamps, these being fed directly from the dynamo, as would 150 feet of gas burned directly. If we use a storage-battery, and allow it 70 per cent efficiency, we have 30 incandescent lamps using 186 feet of gas, to 150 feet for the gas-burners. To the expense of the electric light, moreover, we must add the interest on the plant, depreciation, breakage of lamps, etc. These items will perhaps double the expense of the electric light. The cost could, however, be reduced if two or three people living close together would use the same plant: it could be still further reduced if cheap fuel-gas could be supplied for the engine. As far as cost goes, then, the electric lights supplied in this way would be more expensive than gas; but for people of means, the greater beauty of the light, and its healthfulness, together with the many smaller offices the electricity could be made to perform, would repay the increase in cost. Where there is no gas, it has been proposed to use wind-mills. Mr. A. R. Wolff states that a properly constructed wind-mill will govern itself for all velocities of wind exceeding six miles per hour; further, that on the average, for at least eight hours out of twenty-four, the wind exceeds this velocity. "Total calms in excess of two days' duration are practically unknown in the United States." If these figures are correct, it is evident that we can use wind-mills in connection with storage-batteries for supplying light to country houses. It should be borne in mind, however, that isolated plants of this kind must have a capacity very much greater than the mean power required; and in this case, where we may have calms of two or perhaps three days' duration, the capacity must be sufficient to last over this time. Counting the interest and depreciation, and the breakage of lamps, it will probably be found that the cost will be greater than that of oil; but there is no comparison as regards convenience and beauty, and it is probable that the wind-mill will be used as a source of power for lighting the houses of rich country people.

ETHNOLOGY.

Christmas Customs in Newfoundland.

THE Rev. Moses Harvey of St. John, Newfoundland, describes in the *Montreal Gazette* an interesting Christmas custom observed in Newfoundland. Formerly, he says, at this season, 'mumming' was carried on to a large extent; but the practice at last became an intolerable nuisance in the streets, and was put down by law. Firing salutes on Christmas Day, once a general custom, has also been prohibited, to the greater comfort of every one. A curious custom prevailed here on St. Stephen's Day (Dec. 26). It was called 'The Burying of the Wren.' Bands of boys and youths, with some rude musical instruments, went about the streets on that day carrying a green bough, to which were fastened ornaments of colored paper and either a dead bird or the figure of one. They called at the doors as they made their rounds, and sang a rude doggerel, of which the following was the burden: —

"The wren, the wren,
The king of all birds,
On St. Stephen's Day
Was caught in the furze.
Though he is little,
His honor is great,
So rise up, kind lady,
And give us a treat.
Up with the kettle
And down with the pan, —
A penny or 'tuppence'
To bury the 'wran.'"

The contributions thus levied by the youngsters were spent in the purchase of cakes and sweetmeats.

The custom is now almost extinct, but some faint and forlorn attempts are still made by a few boys to keep it up, and in a few years it will probably pass into oblivion. It is curious to find that a similar ceremony was once practised in the Isle of Man. In Waldron's works, published in 1711, in describing the Isle of Man, the author says, "Here, on the 24th of December, towards evening, all the servants have a holiday. They go not to bed all night, but ramble about till the bells ring in all the churches, which is at twelve o'clock. Prayers being over, they go to hunt the wren, and, having found one of these poor birds, they kill her and lay her on a bier with the utmost solemnity, bringing her to the parish church, and burying her with a whimsical kind of solemnity, singing dirges over her in the monks' language, which they call her knell, after which Christmas begins." It is evidently the same ceremony, in an altered form, that is practised here. What is its origin, how it came here, or whether it is kept up elsewhere on this side of the Atlantic, is not known.

BOOK-REVIEWS.

Harvard Reminiscences. By ANDREW P. PEABODY. Boston, Ticknor. 12°. $1.25.

THIS work, by the venerable professor of Christian morals at Harvard College, will be of much interest to graduates of the college, both younger and older, and by no means devoid of interest to the general reader. The author's reminiscences relate to the time when he was undergraduate, theological student, and tutor, but do not cover the period of his professorship, which he has now held for so many years. The state of things at Harvard in those olden times was so different from the present, that we can hardly repress a smile as we read of it. Thus, Dr. Peabody tells us that a student's room was usually destitute of all the means of comfort, and even of the tokens of civilization; that carpets were almost unknown, and friction matches entirely so; and that the entire furniture of the room, except the feather-bed, would not have sold for more than ten dollars. The relations between professors and students is described as one of mutual hostility; the students, in particular, considering the faculty as their natural enemies. As regards study, Dr. Peabody thinks that the best scholars did more work, and the poorer ones less, than they do now. The administration of the college affairs is described as loose and unbusinesslike until the elevation of Josiah Quincy to the presidency, when a thorough reform was carried out under that distinguished leader, whose pre-