take the picture was derived from Nasmyth and Carpenter's work on the moon.

Our only criticism of the picture refers to the color of the earth and of the true earthshine. We doubt whether the earth is quite red enough, especially at the edges, and we doubt again whether, with the earth as ruddy as it is, the color of the lunar landscape itself should not be rather more in harmony with it, as it is the true light source.

The picture is an admirable performance, and the science of it is so true that, as we hinted before, those of our artists who care to have a natural basis for their depiction of natural phenomena will learn much from this attempt to deal with a new order of phenomena.—*Nature*.

VARLEY'S MAGNETO-ELECTRIC MACHINE.

THE principle and chief features of novelty in this machine mainly consist in maintaining actual or nearly actual contact between the armatures and poles of the inducing magnets. The magnets themselves, together with the intermediate cores, are surrounded by helices, and form complete magnetic circuits, so that the magnetic poles of the permanent or electro-inducing magnets have their respective north and south poles continuously, or nearly continuously, closed, notwithstanding the movement of the armature or armatures, but which armature or armatures, when rotated or moved to or fro along the iron ring or link included in or forming part of the continuous magnetic circuit, alters the direction of the magnetic conduction through the inducing cores surrounded by electric conductors; the effect of which alteration is to generate electricity in the conductors forming the helices. The armatures being in actual or nearly actual

each rotation, and the armature carries a coil C^2 , so that electricity will be generated in the circuit of which this coil forms part. An ordinary rotating commutator may be included in the circuit and the electricity can then be employed to excite the magnets M, M' , when electro-magnets are employed.

THE CHAINS OF EGYPT.

THE ride to Kasr el Shama takes the sightseer through a labyrinth of small streets to the southern gate of Cairo, named after the lady Zeynab, a granddaughter of the Prophet, and thence over immense heaps of rubbish, the ashes of Fostat, burnt in 1168, until the open country is reached. The heaps extend for miles in this direction, and may mark the site of cities older by far than the tabernacles which Amer pitched on the spot in 638, and which supply a meaning for the Arabic name. This was Babylon, not indeed Babylon the great, but the town which Cambyses is said to have founded, and whence, according to some, the Epistle of St. Peter was written. Whether Strabo, when he speaks of a Babylonian colony here, refers to the extradition of a number of families by the Persian King, or whether, as his words seem to imply, a much older settlement is described, cannot now be decided. It is curious, however, to note that other authors have spoken of the colony in very similar terms, and that it is sometimes ascribed to "Sesostris," or Rameses II., who is here said to have placed his captives from Babylon, and sometimes to Semiramis. The most recent writer who has touched on the subject is Mr. Roland Michell, and in his volume on the Egyptian Calendar a conjecture is mentioned which would account for the modern name of the Roman fortress at least. Kasr el Shama—or, as

There are gates with narrow walls and signs of drawbridges. There is a covered way down to the water's edge. We might be exploring a castle on the Thames or the Dee, except for the material of which it is built. The walls, some fourteen feet thick at least, and still in places not less than forty in height, are all formed of great blocks of sun-dried mud, very like the sods of peat one sees in Scotland or Ireland. Here and there the impress of the maker's hand may be found, and you may lay your fingers into the very marks left by a man of flesh and blood, of nerves and muscles, of skin with a thousand delicate lines such as you see in your own palm, yet who lived and labored and died more than three thousand years ago. Some of the marks are small, and must be those of a woman's hand; for female labor, by which to-day the new streets of Cairo are built, was, no doubt, the rule in Egypt under Hatasoo as it is under Ismael. Of the history of the fortress opposite Dakkeh, of its very name, we know nothing. Centuries before Joseph or Moses, centuries before the siege of Troy, tens of centuries before William the Norman, monarchs had castles built for them, and employed the labor of their subjects to forge and strengthen their own chains.—*Saturday Review*.

ROYAL ASTRONOMICAL SOCIETY.

LORD LINDSAY, M.P., President, in the chair, April 12.

Captain Abney read a paper "On the Photography of the Red End of the Spectrum." He said that about two years ago he had read a preliminary note upon the subject, in which he stated that he had succeeded in obtaining photographs of parts of the spectrum as far below A as A is below D. He had not then shown any of his photographs, and had promised a further paper on the subject, and he thought it right now to redeem his promise by giving some further information on the subject. He had, by the use of gums and a method which he did not explain, succeeded in obtaining emulsions which were sensitive to the red end of the spectrum. His theory was, that by this means he had obtained a larger and more complicated molecule which was sensitive to longer wave-lengths than the ordinary iodide of silver molecule. Some of the photographs which he had obtained were thrown upon the screen by means of the electric light. It appeared that the plates, as prepared by him, though sensitive to the red and ultra red parts of the spectrum, were not sensitive to the yellow rays; there was consequently a gap extending from a little below E to C. In the photographs which were taken with a diffraction spectrum, the lines were beautifully sharp. He had submitted them to Professor Piazzi Smyth, who said that the photographs reminded him of the red region of the spectrum as seen under the best conditions in the clear atmosphere of Spain.

Mr. De La Rue complimented Captain Abney on the important discovery which he had made, and asked whether he had made any progress in the direction of producing colored photographs similar to those which had been taken by M. Becquerel some years ago.

Captain Abney said that, in a paper which he had read before the Royal Society, he had stated that he believed he had discovered the explanation of these colored photographs. The coloring depended upon the different oxidizing powers of the different wave lengths of the spectrum.

Lord Lindsay asked Captain Abney how he had managed to focus for the ultra-red parts of the spectrum. He had noticed that the lines on his photographs were very sharply defined; but he concluded that the focusing must have been obtained by a tentative process.

Captain Abney said that he had not come to the society to be pumped. He had, however, obtained the focus by a tentative process. It would be seen that there were lines upon the photographs, which could not be seen with the eye, and there were groups of lines distinctly defined upon the photographs, which could only be seen with the greatest difficulty in observing the spectrum.

Lord Lindsay said that he felt sure that the society would join with him in returning a most cordial vote of thanks to Captain Abney for his interesting communication. He would only add that when a paper of such interest was brought before the society the fellow making such communication must not mind a little cross-examination, and should remember the pleasure and information he was affording to the other fellows of the society.

Mr. Jenkins read a paper on the "Luminous Spot on Mercury in Transit." After referring to the records of the observations of transits of Mercury made during the last 170 years; he came to the conclusion: (1) that in the May transits, when Mercury is near aphelion, the luminous spot is in advance of the center of the planet, whereas, in the November transits, when the planet is near perihelion, it appears that the luminous spot follows the center; (2) the luminous spot has never been seen at the center, but always a little south of it, and it cannot be due to diffraction; (3) in some of the transits two spots have been seen close together where shortly before only one was observed; (4) in the May transit the rings round the planet are dark and nebulous, while in the November transits they are bright. In the two transits most accurately observed—namely, those of May, 1832, and November, 1868—the contrast was found to be very great and typical. In the 1832 transit there was a diffused spot preceding the center with dark rings round the planet, while in the 1868 transit there was a sharply-defined spot following the center, with bright rings surrounding the planet. Mr. Jenkins therefore concluded that on the 6th of May next, when Mercury will be near aphelion, the luminous spot will not be a point of light with no sensible diameter, but a diffused spot rather to the south of the center, and the planet will be surrounded by dark nebulous rings, and not by light ones.

Mr. Green showed some drawings of the planet Mars, made by Mr. Schiaparelli, of Milan. They showed very remarkable chain-like or mottled structure about the equatorial regions of the planet, and Signor Schiaparelli was of opinion that important changes had been going on upon the surface of the planet since the time it was in opposition. Mr. Green and other gentlemen who took part in the discussion were, however, of opinion that, considering the small apparent diameter of the planet at the time that the observations were made, and the smallness of the instrument with which the planet was observed, the evidence of the changes must be received with very great caution.

CHINESE PROVERBS.—Human nature is very much the same throughout the world, and there is a touch of the homely and practical in the great mass of Chinese proverbs, as well as an originality of diction. "Brothers in the morning, enemies at night." "A man known well is a treasure." "Every man loves his own skin and flesh." "If you honor your own parents at home, why go afar to burn incense?" "Out of the broken kiln come very good tiles." "A prodigal, when he repents, becomes a priceless treasure."

FIG. 1.

contact with the inducing magnets insure a more perfect magnetic conduction through the intermediate cores with which the inducing magnets form an unbroken magnetic circuit, so that a very large percentage of work done in giving motion to the machine is converted into electric energy.

A machine on this principle, in its simplest form, consists of two horse-shoe magnets placed opposite one another, and with two soft iron cores, on which coils of covered wire are wound, placed between their poles. The two north poles of the magnets are in contact with the two ends of one of the cores, and the two south poles are similarly placed in relation to the other core. Together with these, which are fixed parts of the apparatus, there is an armature to which a reciprocating motion is communicated, which places it first in contact or nearly so with the two poles of one magnet, and then transfers it to a corresponding position in respect to the

FIG. 2.

other magnet. To increase the area of the surfaces in contact or close proximity, the faces of the magnets and of the armature may be grooved. The armature may also be made double, so that the poles of the magnets may be received between its two parts. The attraction of the magnet for the two parts of the armature will then balance each other, and by a screw adjustment the surfaces of the armature may be brought very close to the surfaces of the magnets without giving rise to friction. In place of a reciprocating armature a rotating armature may be employed, so formed as to connect the north pole of one magnet with the south pole of the other, and as it rotates to couple the poles alternately.

In Fig. 1, M and M' are horse-shoe magnets; permanent magnets are represented, but electro-magnets are also available. Between the magnets and in with them are two cores of soft iron wound with coils of insulated wire, C, C'; they

FIG. 3.

form part of the circuit or circuits in which the electricity generated by the apparatus is transmitted. N, S, and N', S', mark the poles of the magnets M and M'. O, O, are guides made of gun metal in which the rod D is free to slide to and fro; it has upon it the armature of soft iron marked A. A reciprocating movement may be communicated to the armature between the guides, O, by connecting the rod D directly or indirectly with a steam engine or other motor. It will be observed that in this arrangement no reversal of the magnetism in the armature A takes place.

Fig. 2 is an end view of the armature A showing how it is grooved into the horns of the permanent magnets M, M'. Fig. 3 shows the rotating armature arrangement. The armature is mounted upon a rotating axis D, and as it revolves it alternately closes the pole N with S' and N' with S. In this arrangement the magnetism in the armature A is reversed in

it is pronounced, "esh Shemmah"—is in English the Castle of the Flame or Light, and may mark the site of a temple of fire-worshippers. Be this as it may—and no more plausible derivation has been suggested—there are no Persian remains now to be seen at Babloun, and the unobservant traveler might very easily pass by the Roman walls half buried in gray mounds, though they would well repay, what they have never yet received, a careful survey.

The western face now consists of a long wall of large stone blocks, under which a low entrance has been burrowed, leading into a very rabbit warren of miserable dwellings, Coptic churches, Moslem mosques, monasteries, synagogues, and bazaars, uniform only in dirt and vermin. To the ecclesiastical antiquary there is much worth seeing among the strange piles of mud and brick. But passing by the entrance and continuing along the outer wall, two well-defined semi-circular bastions, once pierced with arched windows, or embrasures, recall similar buildings at York, in London, at Trèves—anywhere, in fact, where the military engineers of old Rome built their fortresses. There is no mistake about the banded masonry, the thin bricks, the hard mortar, or any other of many marks by which Roman work may be identified; though high up, with the wall for a foundation, a tall whitewashed dwelling looks over, and seems tottering to a fall. This western front is perhaps two hundred yards long, and ends with another semicircular tower facing south. This tower is very perfect to a height of perhaps twenty feet, and is the first of a series of three, each some fifty feet in width, which range along the same side—the side, that is, which looked toward Memphis. If we climb the mound in front, the wide green plain with its palm groves across the river stretches for miles over the site of the vast city, and the tombs of the inhabitants still cluster round the pyramids on the hill beyond. From the gate between two of the bastions, now sunk in ashes to the top of its pedimented archway, the soldiers of Caesar watched the Nile and held the chief link in the chain which bound Egypt and Memphis to Rome. A few years ago there was still a trace of an eagle carved beside the arch, and everything is in a style wholly foreign and different from the native Egyptian work. To the English archaeologist this Roman castle is peculiarly interesting. Just as our Royal Engineers build a barrack at Agra and one at Armagh on the same lines and in the same style, so the Romans had but one general pattern for their pretorium, whether it was situated at Colchester or Paris, on the Danube or on the Nile. Just such a fortress as this formed the kernel of old London. Its foundations, with the banded masonry and the semicircular bastions, were discovered when the soil of Cannon Street was upturned for the new station. Long before the wall was drawn round the outer ring of suburbs, before the British London had become the Roman Augusta, a fortress which must have closely resembled this at the Egyptian Babylon crowned the hill on the eastern bank of the Walbrook, and commanded the little port at Dowgate below.

Very different in every way is the fort at Dakkeh in Nubia, yet strangely like another type of military architecture with which we are familiar in England. The voyager who ascends beyond the First Cataract finds himself in a narrow valley shut in by granite hills, and only sees here and there a space wide enough for cultivation. There are buildings of all ages and kinds, chiefly temples; and at intervals, where the sandstone ridges approach the Nile, he finds vast grottoes carved in the face of the cliff, the greatest of all being the furthest—namely, the Temple of the Sun at Aboshek, better known as Ipsamboul. Amid this wealth of architectural remains, the best of them on the western bank, the castle opposite Dakkeh, on the eastern bank, is very often passed by unvisited. Yet it well repays a visit, though the visitor wishes in vain for some one competent to describe the defenses as Mr. Clark would describe a Norman Keep in England. For, though it is built of crude brick—that is to say, of mud—and though it is seven hundred miles from the sea, and though it is one of the oldest buildings in the world, having been erected 2,500 years at least before the White Tower, yet to the eyes of an English traveler it resembles nothing in the world so much as the Keep of Rochester or of Guildford. There is the ditch, with scarp and counter-scarp. There are square towers overlapping the corners. There are flat buttresses not reaching the top of the wall.

SCIENTIFIC AMERICAN CHESS RECORD.

[All contributions intended for this department may be addressed to SAMUEL LOYD, Elizabeth, N. J.]

PROBLEM No. 82.

BY SAMUEL LOYD.

Prize in *Frank Leslie's* Problem Tournament, 1855.

Black.

White.

White to play and mate in three moves.

SAMUEL ROSENTHAL, OF PARIS.

White to play and mate in 2 moves.
By EUGENE B. COOK.

to as the Parisian champion. We differ upon this point, however, for having played many games with Mr. Rosenthal, and seen much of his play, we can only liken his play to that of the late Mr. Cochrane—dashing in the extreme, but utterly futile against the solid play of Kolisch, or the French champion, De Reviere.

Perhaps few players win more off-hand games than Mr. Rosenthal—a fact of considerable importance to one who depends upon chess for a livelihood—yet, as a match or tournament player, we know of few who have been less successful.

Mr. Rosenthal is a Pole, exiled from his country on account of political proclivities, and attracted to Paris by the sympathy of the late French Emperor, who allowed a small annual pension to all Polish refugees residing within his realm.

Mr. Rosenthal is a clever solver, and is well versed in the problematical tricks of the day, and is not often caught napping as in the Paris Tournament of '68, when we sprang a little three-move trap on him. [See SUPPLEMENT No. 103; the game is given in the last edition of the *Handbuch*.]

He has lately made his debut as a blindfold player, and has most successfully rivaled the famous performances of Paulsen, Blackburne, and Zuckertort, and in this respect is unquestionably one of the most skillful players of modern times. We select one of his blindfold games which will be found to be a marvel of accurate and finished play.

FRANK LESLIE'S PROBLEM TOURNAMENT OF '55.

We are somewhat in doubt in regard to the correct record of this Problem Tournament, inaugurated by Mr. W. J. A. Fuller, the first chess editor of *Frank Leslie's Illustrated Newspaper*. But having been a competitor, and desiring to give a record of the same, we are compelled to draw upon our memory for the following facts:

Three prizes were offered for the best problems in three, four, and five moves, the first of which was awarded to our Problem No. 82, the second to the following four-move position, which is remarkable only for its "old style:"

ENIGMA No. 48.—BY SAMUEL LOYD.

White.—K on K Kt sq, Rs K 4 and Q B 2, Bs K Kt 7 and K R 5.

Black.—K Q 6, Q Q R 3, Rs Q Kt 5 and K R 2, Kt Q 5.

White to play and mate in four moves.

The third prize was considered to be doubtful, and the honors were evenly divided, therefore, between T. M. Brown and Isaac S. Loyd, a brother of the editor, who has entirely withdrawn from chess for over a score of years. The position we give as No. 83, but are somewhat in doubt as to the five-move problem by Mr. Brown, but believe it to be as follows:

ENIGMA No. 49.—BY T. M. BROWN.

White.—K on Q R 3, Q K Kt sq, R K Kt 8, Kts Q Kt 5 and Q 3, Ps Q Kt 2 and Q R 2.

Black.—K Q B 5, Q K R 5, Bs Q sq and K R 2, Kt K B 6, Ps Q R 4, Q 3, K 5 and 7.

White to play and mate in five moves.

THE following is one of eight blindfold games played simultaneously by Mr. Rosenthal, at a *séance* given at Paris a short time since:

(Evans Gambit.)

M. ROSENTHAL.

M. FEISTHAMEL.

WHITE.

BLACK.

1. P to K 4
2. Kt to K B 3
3. B to B 4
4. P to Q Kt 4
5. P to Q B 3
6. P to Q 4
7. Castles.
8. P x P
9. Kt to Q B 3
10. B to K Kt 5

1. P to K 4
2. Kt to Q B 3
3. B to B 4
4. B x P
5. B to B 4
6. P x P
7. P to Q 3
8. B to Kt 3
9. Kt to Q R 4

This is a strong attack in the Evans Gambit, but not so much in favor as the retreat of the B to Q 3, followed by P to Q 5, which leads up to a common form of this opening by a transposition of moves.

10. P to K B 3

Black is now virtually deprived of the privilege of castling on the K side. The best defense is Q to Q 2, followed next, on the adverse B retiring to Q 3, by P to K R 3, thus gaining, without loss of time, an outlet for his K after castling on the K side, which makes all the difference from playing P to K R 3 spontaneously. Then he may either proceed by Kt to K 2, or else play P to Q B 3 preliminary to bringing out the Kt with a safe game.

11. B to R 4

11. P to Q B 3

It was of no use taking the B, for white would recover the piece by Q to R 4 ch.

12. B x Kt
13. R to K sq

12. R x B
13. K to Q 2

SAMUEL ROSENTHAL, OF PARIS.

The K had to make his escape against the threatened P to K 5, and K to B sq only subjected him to a different sort of attack, which, however, was not less intense.

14. P to K 5
15. B to Kt 3

14. P to K Kt 4
15. B to B 2

P to K B 3, with the intention of pushing his P on to B 5, would have been worse than useless; for white would have answered simply P x P, threatening to win the Q by Kt to K 5 ch, followed accordingly by Kt to B 7 ch, or else by Kt x B P dis ch.

16. P x B P
17. Kt to K 4
18. Kt to Q B 5 ch

16. Q x P
17. Q to Kt 3

The offer of this sacrifice is very fine, and highly creditable to the performer, who manifestly holds the position tight in his memory.

19. P to Q 5
20. Q x P
21. Q R to Q sq
22. Kt x P ch
23. Q x B
24. B x P

18. K to Q sq
19. P x P
20. Kt to Q B 3
21. Kt to K 2
22. B x Kt
23. R to B sq

The end is executed with great accuracy, and is well adapted as a finale to a game conducted by the blindfold player throughout with well-trained judgment.

25. B x Kt ch
26. Q x R ch
27. Q to B 8 mate.

24. R to Kt 2
25. K to K sq
26. K to B 2

THE PARIS CHESS CONGRESS.

DURING the past week we have received an invitation from the committee of arrangement of the forthcoming International Chess Congress to take part in the grand tournament which is to commence on the 17th of June; furthermore, a liberal patron of the game has made us an offer of an excursion ticket including necessary expenses to Paris. We took part in the Paris Tournament of '67, and owing to a press of duties felt that we did not do ourselves credit, and would gladly seize this opportunity of again measuring lances with the European magnates. But in a case like this it assumes almost a national character, and whoever goes to do battle for our country's honor should be selected and recognized as the American champion.

It is now nearly a year since the American Chess and Prob-

PROBLEM No. 83.

BY ISAAC S. LOYD.

Prize in *Frank Leslie's* Problem Tournament, 1855.

Black.

White.

White to play and mate in five moves.

lem Association was organized and an executive committee formed for the express purpose of arranging a programme for a tournament to select a fitting champion to send to Paris. The committee have been shamefully negligent of their duties, and have shown an utter incapacity for the duties that were imposed upon them, and common decency demands that they resign, and the original motion that was made at the meeting of the Association be adopted, viz., that "an executive committee be formed consisting of all of the chess editors throughout the United States."

We say this with no personal feelings or interests; we are in favor of prompt action of some sort; we headed a list with a contribution of twenty-five dollars to send Mr. Mason as our recognized champion, and will do the same for Mr. Mackenzie, or will give a hundred if it is to be decided by a tournament as originally proposed.

In speaking of the programme of the Paris Tournament Mr. Steinitz says: "The full programme is published in the French journal, *L'Exposition*, which contains a chess column contributed by M. Rosenthal. The principal conditions are the same as given in our issue of the 30th ult. It is now confirmed that the French Government will contribute both the two chief prizes, which will consist of valuable works of art. The regulations of the contest are a great improvement on those of previous Continental tournaments. The *modus* of the Paris Congress of 1867, where only the won games counted, while the drawn games were made equal with the lost games in each competitor's score, as well as the complicated and unsatisfactory match system of the Vienna Tournament, have been justly abandoned. The increase of the time limit to fifteen moves per hour will also meet with the approbation of the large majority of competitors, while the provision that only four games have to be played during one week guards the players against overwork. Altogether, the programme is a most liberal one, and drawn up with the utmost regard for fairness."

The conditions of the Problem Tournament have already been given, and our composers must bear in mind that their entries must be received prior to Aug. 1, 1878. Address M. Camille Morel, 38 Rue De la Borde, Paris.

SOLUTIONS TO PROBLEMS.

No. 76.—BY SAMUEL LOYD.

WHITE.

BLACK.

1. K to Q 2
2. K or Kt x Q
3. P queens, mating.

1. Q checks
2. Moves

2. B to Kt 4 ch
3. R to R 5 mate.

1. P to Q 4
2. Kt x B

No. 77.—BY SAMUEL LOYD.

WHITE.

BLACK.

1. B to Kt 3 ch
2. B to Kt 4
3. Q to Kt 7 mate.

1. K to B 3
2. K to Kt 4

2. Q to K B 2
3. Q to B 3 mate.

1. K to K 5
2. K to Q 6

2. Q to Kt 6 ch
3. B to K 6 mate.

1. K to Q 3
2. K to Q 2

LETTER "T."—BY J. MUNOZ.

WHITE.

BLACK.

1. Kt to K B 4 ch
2. Q to K R 3
3. Q to Q 3 mate.

1. K to Q 4 or x P
2. Any move

ENIGMA No. 45.—BY G. H. MACKENZIE.

WHITE.

BLACK.

1. P to Q 5
2. Kt to Kt 6
3. Kt x P ch
4. Mates.

1. P x Q P
2. P to Q 3
3. K moves

To better show what pleasure may be derived from solving problems, we give an extract from a letter we have received from one of the finest chess players in this country. He says:

"I do not know why, but I had formerly a prejudice against problems, and never would look at them, and now I find many good players with the same feelings; but I have found unexpected amusement and enjoyment in them, and, instead of sitting down with some local player, I now feel as if I had a new and invisible world of chess players to encounter."