

A BIG MAGNET.

WONDERFUL INVENTION OF AN ARMY ENGINEER.

It Will Derange a Ship's Compass at a Distance of Six Miles. Would Prove of Great Service in War.

There is a big twelve-inch gun standing on top of the ramparts at Willet's Point, N. Y. It is an innocent-looking gun, and a big coil of telegraph cable wound around the muzzle end of the piece suggests that it has become fractured and that the Government is experimenting with an economical method of repairing broken-down ordnance.

The gun, however, is the most powerful electro-magnet in the world, excepting those of nature's own construction at the imaginary points of the earth known as the magnet poles. The big magnet is the invention of Colonel W. R. King, commander of the engineer corps of the army stationed here, and some very interesting experiments have been made with it. When Colonel King conceived the idea of building an immense electro-magnet, he had no thought of its possibilities. There entered into the construction of the first magnet two huge guns, some pieces of iron, and a good many miles of heavy insulated telegraph wire. The guns stood on carriages on top of the fort. The pieces of iron were fastened across the breeches of the cannon, and were held in place by chains, forming a horseshoe. The telegraph wire was wound around the muzzle ends of the guns, making two immense spools. The current of electricity was supplied by a dynamo, and the first time the magnet was charged it developed marvelous power.

The work undertaken simply as an experiment soon became a matter of great importance. The magnet had not been long in existence when it was discovered that it would derange a vessel's compass at a distance of six miles from the fort. This discovery suggested that if in time of war an enemy's ships attempted to pass the fort under cover of darkness or during the prevalence of a heavy fog, when the pilots would have to depend solely upon the ship's compass, the commanders of the war ships would probably find their vessels ashore near Willet's Point, where they could be blown up with torpedoes or destroyed by the guns of the fort.

Many experiments have been made from time to time in testing the power of the big magnet. One of the most interesting ever attempted was made under the personal supervision of Colonel King. A number of pieces of railroad iron were placed near the muzzles of the guns, and the current of electricity turned on. Immediately the rails flew to the magnet, and were held as fast as if they had been welded to its immense core. Colonel King then had one end of a large chain fastened around the pieces of iron to ascertain the amount of power necessary to pull them away from the magnet. The other end of the chain was attached to a capstan, that was held firmly in place by long stakes driven into the ground.

When everything was in readiness for the test the capstan bars were manned by eight stalwart engineers, and they endeavored to pull the railroad iron away from the magnetized guns. After straining for some time, the stakes holding the capstan in place gave way and it toppled over. The railroad iron had not even moved on the face of the magnet. The dynamometer which had been attached to indicate the amount of strain the magnet would stand showed that it had resisted 22,500 pounds. It was found impossible to disturb the pieces of railroad iron until the electricity had been shut off.

Some time ago Colonel King caused to be made the one-gun magnet. Thirteen miles of half-inch insulated telegraph cable was used in making the coil on the gun. Tests with this magnet showed that it possessed almost as much power as the first one, where two guns were used for the core. A number of exhibitions of the working of this electro-magnet were given before members of the American Society for the Advancement of Science. One of the exhibitions attracted a great deal of attention, as it best illustrated the power the magnet possessed.

The test consisted of four cannon balls being suspended from the muzzle of the gun. The balls weighed, on an average, 400 pounds each. The first one was placed under the muzzle of the gun, and, notwithstanding the smallness of the point of contact, made so by the shape of the suspended object, the ball was held very firmly. A second cannon ball was placed under the first one; then a third was put under the second, and when the magnetic attraction exclamations of surprise came from the spectators. The smallness of the central point of bearing made each cannon ball, and the rigid manner in which the four iron spheres were held up, was considered to be the best exhibition of the magnet's power.

During a recent series of experiments an iron tray, heaped up with old horseshoes, big iron spikes, nuts, bolts, and other articles made of iron, was given to a soldier, and he was directed to hold the tray in front of him and walk toward the magnet. When the soldier arrived at a point about fifteen feet from the gun the contents of the tray departed with a rush and lodged on and about the muzzle of the big gun. The soldier had all he could do to keep the tray from following the scrap iron.

This test has suggested the possibilities of big electro-magnets being used to defend forts and earthworks from land attacks. A row of them of sufficient power would draw the smaller arms out of the hands of the infantry while the advancing column was still some distance from the place of attack, leaving the soldiers at the mercy of the garrison of the fort.

BLOWN UP BY A BOMB.

How Sailors Rid Themselves of a Ravenous Shark.

One of the oldest sea captains who visit this port is a German who years ago left his fatherland to take service in one of the English vessels plying between London and the East Indies. In conversation a few days ago he gave an account of his "most exciting experience."

"A great shark," said he, "had followed us—our vessel was not very large—for five days, on one of my early voyages. It was impossible to satisfy his ravenous hunger, and he swallowed almost everything that we threw overboard. We tried in vain to capture the animal and almost decided to give up the attempt. Then, unhappily, my cabin-boy died, and we, of course, made preparations to bury him as sailors wish to be buried, in the depths of the sea. We watched closely for the shark on the morning of the funeral, naturally not wishing him to make a meal of the ship's little favorite. We had not seen him for an hour or more, and believed the time favorable for the burial. But we had been deceived. The body, loaded with cannon balls to carry it to the bottom of the sea, had just touched the water when the great shark opened its mighty jaws and swallowed it. The sailors who had loved the body were almost drawn overboard by the forceful pull of the shark."

"This angered the seamen beyond endurance, and they swore that they would kill the creature. They prepared a bomb, which was made to explode under the water in a certain time, inclosed it in a cowhide and threw it to the shark when he again appeared near the ship. The cowhide quickly disappeared. As a rule the shark, after getting something in its mouth, swam away from the vessel a considerable distance in order to eat the morsel. We, of course, expected it to do the same thing this time, as the ship might be endangered by the coming explosion. But, to the terror of all of us, the shark remained in close proximity to the vessel. One of the sailors suggested that the bite was not large enough to inconvenience the monster and proposed that we make a larger package for his stomach. It was done as quickly as possible.

"One of the seamen got a sack which was filled with old rags and other useless things, and threw it into the water. The jaws opened, but he could not get the stuff down his throat easily, so he swam away, to the great delight of all on board. But the time had come for the explosion, and we waited with quickening hearts for it, praying that he would keep away from the ship. We could just see the fish start below the surface, when a dull sound was heard, the waters parted and flew in the air. The shark was divided into pieces and our danger was past. I shall never forget our terror while the animal remained near us with that bomb in his inside."

Cats' Eyes.

The pupil of a cat's eye ordinarily appears as a long, narrow oval, or a straight, vertical black line. The animal seems to be looking through mere slits in the iris of its eye, especially when it faces the light. In semi darkness the pupil widens into a beautiful oval. One is accustomed to regard the narrowness of the pupil as the distinguishing peculiarity of the eyes of cats. All animals of the cat family share this peculiarity.

And yet, according to the results of a scientific investigation of cat's eyes, recently made in England by Lindsay Johnson, the natural shape of their pupils is circular.

By varying the quantity of light entering the eyes he has seen the pupils of cats and tigers change from straight lines to perfect circles, and while under the influence of atropine, which suspends for a time the muscular control of the eye, they are always circular.

The normal form of the cat's pupil is, then, the same as that of the human pupil, but when submitted to the influence of light its behavior differs. In a bright light our pupils become very small circles, while those of a cat turn into ovals or narrow slits. The general effect is the same in either case, namely, to diminish the quantity of light passing into the eye.

Curiously enough, in the larger animals of the cat tribe, such as tigers, the pupil sometimes behaves exactly like the human pupil, and when brightly illuminated contracts into a minute circle instead of becoming linear. In the case of domestic cats, the older the animal the more frequently does the pupil of the eye assume a circular form.

Victims of Wild Animals.

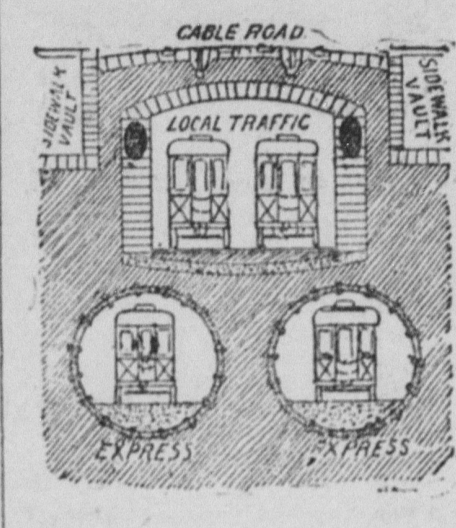
Ferocious as the rogue elephant appears to be, its record as a man-killer is far below that of other animals in India. Thus in India, in 1875, the tigers killed 823 persons and 12,423 domestic animals; wolves killed 1,061 persons; leopards, 187 persons and 16,157 domestic animals; while the elephant is charged with but 61 persons killed and 6 domestic animals. Rogue tigers, wolves and leopards are far more to be dreaded than rogue elephants.

UNDERGROUND TRAFFIC.

Proposed Underground Road for New York City.

The subject of rapid transit is again being considered by a commission consisting of Alexander E. Orr, the President; Seth Low, John Clafin, William Steinway, and John H. Inman.

The latest scheme for underground traffic is presented by Chief Engineer W. B. Parsons, who estimates the cost of building at sixty-six millions of dollars. It is proposed to traverse the entire length of New York by an underground road as soon as a feasible scheme shall be presented. Above Fourteenth street the underlying rock comes close to the surface, and tunnelling can be carried on through this with comparative cheapness



and expedition, either by opening the surface of the streets or by working entirely underground. Below Fourteenth street the rock lies deeper, and over it are beds of unstaple sands. The great buildings which line Broadway would render tunnelling through these sands at any great depth a very unsafe operation. Along a great part of this route, too, sidewalk vaults extend to the curb line, and these would have to be cut into and a part of them occupied in order to get room for a four-track road such as has been advocated and provisionally adopted. The practical impossibility of making such a subway without tearing up the whole street and stopping traffic on the cable road has been admitted.

A GREAT WORK.

Extent and Importance of the Chicago Drainage Canal.

The Chicago Drainage Canal is being the most important public work now being executed in the world.

Chicago occupies the vantage site of the largest area of resourceful land which our race can occupy. Between the great St. Lawrence Valley on the north and the greater Mississippi to the south lies one pass two hundred feet lower than any other. At the heart of this pass sits Chicago. Nature has given her claim to the title that she has taken to herself—"The City of Destiny."

There was a time when, at a higher level, the lakes poured their flood of waters down the present valley of the Illinois River into the Mississippi. To-day, standing on the low summit of the water-shed of the Illinois, one is but thirty feet above the rocky ledge of Niagara. Here lay the physical opportunity to renew the ancient southern outlet of the lakes, and to complete the circle of deep waterways by joining the Gulf of St. Lawrence with that other distant Gulf of the South.

The canal was projected primarily to insure sewerage removal. The periodical floods of the Des Plaines, which forced the city drainage to Lake Michigan, have been already diverted into a permanent channel. The sewerage of a population whose stock-yards make it equivalent to that of a city of two and a half millions will be rendered harmless by dilution and borne away. In addition new harbor conditions will be evolved for a port already first in the country; and the bridge problem, which has wasted the time of hundreds of thousands, will be solved. The demands of the exposition perfected the railway service of the city. Street transit, with its network of cable, electric, and elevated systems, has kept pace with growth, and terminal track elevation, abolishing railway grade crossings, has been inaugurated. The final housing of the great merchants in structures whose location and mechanical design will relieve the congested team traffic of its business streets will soon come. Chicago will be entrenched in commercial advantages without a possible parallel.

The large commercial use of the canal, aside from the practical extension of Lake Michigan thirty miles further west, involves the improvement of the Illinois to its junction with the Mississippi. This should admit the passing of vessels drawing fourteen feet of water. It is unfortunate that the government works in this really noble river could not have been planned with better reference to the future. Removal of the old dams will be imperative, and it is well that the Sanitary District has authority under the laws of its creation to safeguard the new flood, and in so doing to make a proper initiative toward carrying the deep waterway to the Mississippi. The Mississippi Commission—who are privileged to assist that stream in controlling itself—will have the lakes as a storage reservoir to aid their labors.

The Carrara marble quarries in Italy are practically inexhaustible. Business is increasing in Manchester (England) ship canal.

A BELGIAN MANDARIN.

The Romantic Career of a Chinese Custom Official.

While the young American bicyclists, Messrs. Allen and Sachleben, were crossing the Desert of Gobi, they heard much of a mysterious and powerful official called the Ling Darin. No one could tell who or what he was. Finally, as they emerged from the desert, starved, ill and ragged, they were met by a richly dressed mandarin, according to the story they tell in the Century. He greeted them cordially in clear but broken English, and, mounted on waiting horses, they were attended into the city of Su-chow. "It was some time before the idea flashed across our minds that this might indeed be the mysterious Ling Darin about whom we had heard so much. 'Yes,' said he, 'that is what I am called here, but my real name is Splingard.' He then went on to tell us that he was a Belgian by birth; that he had traveled extensively through China, as the companion of Baron Richthofen, and had thus become so thoroughly acquainted with the country and its people that, on his return to the coast, he had been offered by the Chinese government the position of custom mandarin at Su-chow, a position just then established for the levying of duty on the Russian goods passing in through the northwest provinces; that he had adopted the Chinese dress and mode of living, and had even married, many years ago, a Chinese girl educated at the Catholic schools in Tientsin.

"We were so absorbed in this romantic history that we scarcely noticed the crowds that lined the streets leading to the Ling Darin's palace, until the boom of a cannon recalled us to our situation. From the smile on the jolly face beside us we knew at once whom we could hold responsible for this reception. The palace gates were now thrown open by a host of servants, and in our rags and tatters we rolled at once from the hardships of the inhospitable desert into the lap of luxury.

"A surplus is not always so easily disposed of as a deficit—at least we were inclined to think so in the case of our Su-chow diet. The Ling Darin's table, which, for the exceptional occasion, was set in the foreign fashion with knives and forks, fairly teemed with abundance and variety. There was even butter, made from the milk of the Tibetan yak, and condensed milk for our coffee, the first we had tasted since leaving Turkey, more than a year before. The Ling Darin informed us that a can of this milk, which he once presented to Chinese friends, had been mistaken for a face cosmetic, and was so used by the ladies of the family. The Ling Darin's wife found an excellent and even artistic cook, while his buxom twin daughters could read and write their own language—a rare accomplishment for a Chinese woman.

"As guests of our highly respected and even venerated host, we were visited by nearly all the magistrates of the city. The Ling Darin was never before compelled to answer so many questions. In self-defense he was forced to get up a stereotyped speech to deliver on each social occasion. The people, too, besieged the palace gates, and clamored for an exhibition. Although our own clothes had been sent away to be boiled, we could not plead this as an excuse. The flowing Chinese garments which had been provided from the private wardrobe of the Ling Darin fluttered wildly in the breeze, as we rode out through the city at the appointed hour. Our Chinese shoes, also, were constantly slipping off, and as we raised the foot to readjust them, a shout went up from the crowd for what they thought was some fancy touch in the way of riding."

Fight of the Dervishes.

The Dervishes themselves were fearless to a fault, but could do nothing against riflemen. Again and again they rushed on certain death with a kind of fascination. In one instance, while a company of infantry were advancing, an Arab horseman rode out from behind a wall and charged straight into the men. Horse and rider fell dead on the bayonets of the front rank, pierced by a score of bullets. His saddle, which is preserved at Hafsa, was pierced by seven bullets. On witnessing scenes like this, one understands how formidable must have been the Arab invaders of Southern Europe and Northern Africa during the early days of Mohammedanism, when firearms were unknown. The fearlessness of the Dervishes was equalled only by their fanaticism. Toward the end of the day at Arguin, where a number of Arabs had taken refuge in a house and could not be turned out, the roof was set on fire; after a short interval an old man, reading out of an open Koran, walked quietly out of the door, followed by a dozen spearmen.

A Sofa.

"Sofa," which has come to be a common term for a sublimated lounge, or the settle of our grandmothers, is the Turkish name for a reception room for servants or the visitors of servants.

LIKE PEARLS.

She's the handsomest of girls, And her teeth are just like pearls, Which is hardly an original thing to say; Yet, like pearls, they are white, and, to her intense delight, They are often found in oysters nowaday.

NOTES AND COMMENTS.

ANOTHER "wonder doctor" has been discovered in Germany. He is a shepherd named Ast, living in the small village of Radbruch. In the last few weeks over 1,000 persons have visited him from all parts of Germany. The people stand in crowds about the man's hut, waiting for his advice. His success is said to be remarkable.

The Car of Russia promises to be one of the most popular monarchs in Europe. He has completely won the St. Petersburg populace by his lack of fear in going about the streets of the capital unattended—a great contrast to the manner of his father. The police, however, do not like his ways, and they are in constant fear that he will be killed.

ST. LOUIS, Iowa, is to try a novel experiment in selling liquor. The town council has granted a company of leading citizens the exclusive right to open saloons; which, however, are to be governed by the severe restrictions in use in Gothenberg. After deducting a fixed per cent. of interest on the investment, the company is to turn all the proceeds over to the Young Men's Christian Association.

The example set by the Russian Government in placing a contract for 12,000 tons of armor for war vessels with an American firm has been followed by the governing powers of Japan. An order for 250,000 yards of cotton duck has recently been placed with a New York house by the representatives of the Mikado. The cloth is to be used in the manufacture of army tents.

THROUGH the efforts of Dr. Sheldon Jackson, who has had charge of the Government schools in Alaska for many years, a herd of over 700 reindeer has been transported from Siberia across the Behring Straits into Alaska, and they are reported to be doing very well. More than 200 fawns were born last year. There used to be large herds of wild reindeer on the moss-covered tundra of Alaska, but they were all exterminated years ago, and the walrus, whale and seal, which have since supplanted the natives with food, clothing and fuel, are getting very scarce.

THE PARIS Rappel explains that very many Italian letters go to the Washington dead letter office through sheer meanness. The writer in Italy does not prepay the postage, and the Italian recipient in this country refuses to pay the double postage due, because he or she is quite satisfied to learn, by reading the stamp of the office from which the missive comes, and the address, or by simply recognizing the handwriting of the address that the writer is certainly still alive, and probably well. By the way, the simple trick is not new. It used to be employed in England many years ago before the advent of penny postage.

TAXES in France are the heaviest in Europe in proportion to the population, amounting to \$17.50 a man. Though the general taxes for the German Empire are only \$6.25 a head, they must be added to the taxes of the individual States; the average Prussian German, for instance, pays \$15.50. Next comes Austria with \$12.37 and Hungary with \$12.12. England's rate is \$11.50, so is Holland's; that of Belgium is \$11, of Italy \$10.50, of Greece \$10, of Spain, Denmark, and Roumania \$9, of Sweden \$5.50, and of Servia \$5.25. In Switzerland the general Government receives \$9 a head, but the individual canton tax as well. In Russia the rate is the lowest, \$4.25, as a large proportion of the revenue comes from the State's domain.

NO WONDER Japan wins her battles. There is probably no country in the world, says Professor Ladd, in Scribner, where so large a proportion of the clever young men have their ambitions fired with desire to do something worthy for their liege lord, or their country, or the particular ideal cause which their imagination has espoused. In politics, scholarship, sociology, and religion, an uncommon proportion of striplings are ready to offer themselves as reformers and reformers, as leaders and as prophets. Where this ferment of aspiration, accompanied by the sentimental view of what one man—and he young, unknown, and no other than "I myself"—can accomplish, is also joined to even a fair amount of judgment and patient willingness to undergo training and to submit to rebuffs, it produces some truly splendid results.

OVER against the opinions of the visiting English labor leaders on the condition of the poor in New York City must be placed some statistics regarding London municipal government, furnished by Home Secretary Asquith the other day. He described the overcrowding in London as terrible. There are about 400,000 persons living in homes of one room, and 800,000 "living two or more in a single room." With regard to the inspection of workshops, Mr. Asquith says that "only five out of forty-three District Boards have appointed inspectors specially for the purpose." In Lambeth, with a population of 275,000, there is not a single public bath. In St. Pancras, population 284,000, there is not a single public library. In Bethnal Green and Mile End there is neither a public bath nor a public library. When London critics talk about New York they find it convenient to forget facts like these.

"You often hear passengers ask," says a travelling man, "I wonder how fast we are going?" and it is the easiest thing in the world to ascertain with the aid of a watch. The rails on nearly all railroads are thirty feet in length, and you can easily tell when each rail joint is passed over

by the peculiar sound which the truck-wheels make. Now, if you will count the number of rail lengths the car passes over in twenty seconds, you have approximately the number of miles per hour the train is going. Another but a more complicated method of arriving at the same result is to note the number of feet a car goes in a minute, and divide the sum by 88. This is done by securing the number of rails passed over in one minute, and multiplying that by 90, the number of feet in a rail. A person of an inquiring turn of mind will find great pleasure in this simple employment, and it is one of which he will never grow tired."

MAKING SERMONS.

How Evangelist Moody Goes to Work About It.

Mr. Moody's method of sermon-making is original. In reality his sermons are never made, they are always still in the making. Suppose the subject is Paul; he takes a monstrous envelope capable of holding some hundreds of slips of paper, labels it "Paul," and slowly stocks it with original notes, cutting from papers, extracts from books, illustrations, scraps of all kinds, nearly or remotely referring to the subject. After accumulating these, it may be for years, he wades through the mass, selects a number of the most striking notes, arranges them, and, finally, makes a few jottings in a large hand, and these he carries with him to the platform. The process of looking through the whole envelope is repeated each time the sermon is preached. Partly on this account, and partly because in delivery he forgets some points, or disproportionately amplifies others, no two sermons are exactly the same.

By this method also—a matter of much more importance—the delivery is always fresh to himself. Thus, to make this clearer, suppose that after a thorough sitting one hundred eligible points remain in the envelope. Every time the sermon is preached these hundred are overhauled. But no single sermon, by a mere limitation of time, can obtain say more than seventy. Hence though the general scheme is the same, there is always novelty both in the subject matter and in the arrangements for the particular service varied with each time of delivery.

No greater mistake could be made than to imagine that Mr. Moody does not study for his sermons. On the contrary he is always studying. When in the evangelistic field, the batch of envelopes, bursting with fatness, appears the moment breakfast is over; and the stranger who enters at almost any time of the day, except at the hours of platform work, will find him with his litter of notes, either stuffing himself or his portfolio with the new "points" he has picked up through the day. His search for these "points," and especially for light upon texts, Bible ideas, or characters, is incessant, and he has an eye like an eagle for anything really good. Possessing a considerable library, he browses over it when at home; but his books are chiefly men, and no student ever reads the ever open page more diligently more intelligently, or to more immediate practical purpose.

An Epsom Salts Mine.

The State Mining Bureau has recently received a gift of pure epsomite to be added to the collection. Epsomite is pure epsom salts. The peculiarity of this specimen lies in the manner of its discovery. It came from the tunnel of an abandoned quicksilver mine on Sulphur creek in Lake County. The Abbott mine lies among the hills on the east side of Clear lake in a section heavily impregnated with minerals of all kinds, as the borax and sulphur beds and innumerable mineral springs prove. The tunnel in question has been closed for years. A short time ago the superintendent, A. Gibson, wanted to show a friend the ledge of cinnabar at the extreme end. On removing the boards from the entrance a strange sight met their eyes. The tunnel was entirely obstructed by what appeared to be an immense body of snow. On a closer examination the snow proved to be epsomite. It had been exuded from the bottom, sides and top of the tunnel in long fibrous formations similar in appearance to fine asbestos. At first it was believed to have collected only near the mouth of the tunnel, but investigation showed that it extended the entire length of the excavation several hundred feet. Mr. Gibson and his friend procured heavy clubs and beat their way through the entire distance. The stuff crumbled like spun glass, and made a beautiful carpet on the floor six inches thick.

Saw It at Last.

"One day," says an American, "I went into a book shop in the Strand and asked for Hare's 'Walks in London.' In America the book is sold in one thick volume. The clerk brought it in two. 'Oh,' I said, as I looked at them, 'you part your 'Hare' in the middle, do you?' 'I, sir?' he said, with a bewildered look. 'Oh, no, sir?' I saw he didn't see the joke, so I didn't explain, but bought the books and went away. A week later I went to the same shop. As soon as the clerk saw me he rushed from the back of the shop, laughing vociferously. 'Good!' he shouted. 'Capital! Part your 'Hare' in the middle! That's capital, sir, capital!'"

Coal gas was described and manufactured by Dr. Clayton, of England, as early as 1782.