

elers agree as to the freedom from molestation which they have experienced while traversing its immeasurable steppes; and it is therefore but fair to conclude, that though the attempt at moral reformation may be unsuccessful in many instances, in general convict colonization has here borne good fruits. That great severity in the chastisement of new transgressions has been found necessary, is on the other side proved by the penal laws bearing exclusively on Siberia. According to these laws, drunkenness, fighting, idleness, theft of articles of small value, unallowed absence from the place of detention, are considered venial offenses, and are punished with from ten to forty lashes with the cat-o'-nine-tails; while desertion among the colonists is punished, the first time with simple flogging, the second and third time with the cat-o'-nine-tails. If the offense be persisted in after this, sentence is to be pronounced by the local tribunals, and often consists in temporary removal to some distant and thinly-populated district, or incorporation in one of the penal labor companies. Convicts condemned to hard labor who attempt to escape are punished with the knout, and are branded on the forehead, in case this mark of ignominy have not previously been inflicted on them. Repeated thefts, robberies, and other like offenses are punished in the same way as desertion; but in these cases the value of the object stolen is not so much taken into consideration as the motives by which the criminals are actuated, and the number of times the offense has been repeated. A fourth repetition by an exile of a crime previously punished renders him liable to forty lashes with the knout, and to being placed in the category of the convicts condemned to forced labor. Murder, highway robbery, and incendiarism are, if the offender be a simple exile, punished with from thirty-five to fifty lashes with the knout, in addition to branding on the forehead, and forced labor in irons for a period of not less than three years—the term beyond this being left to the judgment of the local tribunals. The convict condemned to forced labor who renders himself guilty of similar crimes receives fifty-five lashes of the knout, is branded on the forehead, and is chained to the wall of a prison for five years, after which period he is allowed to move about, but must continue to wear fetters during his life. Criminals of this class are never to be employed beyond the prison walls, and are not even in illness to be taken into the open air beyond the prison-yard, or to be relieved from their chains, except by especial permission of the superior authorities, which can only be granted in consequence of a medical certificate.

The river Irtysh is the Styx of the Siberian Hades: from the moment they cross the ferry in the neighborhood of the city of Tobolsk, the Russian *employés* appointed to offices in Siberia are placed in the enjoyment of the higher grade of rank which they so much covet; and from the moment they cross this same ferry commences the extinction of the political life of the exiles. Here they exchange the name by which, until

then, they have been known in the world, for one bestowed upon them by the authorities, and any change of the latter is punished with five years' compulsory labor over and above the original sentence. At Tobolsk sits the board which decides the final destination of each culprit or each martyr. It consists of a president and assessors, having under them a chancellerie divided into two sections, and has offices of dispatch in several of the towns of Siberia. Before their arrival at Tobolsk the convicts are, however, liable to be detained by the authorities of Kasan or Perm, for the public works in their respective governments.

It is as the land of political exile that Siberia is generally known, and that it has gained so unenviable a reputation among the liberty-loving nations of Europe, whose imagination pictures it to them as a vast unredeemable desert, whose icy atmosphere chills the breath of life, and petrifies the soul. Yet the truly benevolent should rejoice in circumstances which have led a government that punishes a dissentient word as severely as the direst crime, to select exile as the extreme penalty of the law. Siberia is, it is true, the great prison-house of Russia; but it is a prison-house through which the blessed light of the sun shines, through which the free air of plain and mountain plays, and in which the prisoner, though he may not labor in a self-elected field, may still devote his faculties to the benefit of his fellow-creatures, and continue the great task of moral and intellectual progress. How different his lot from that of the Austrian prisoner of state, doomed to drag on long years of a miserable existence in the dungeons of Spielberg, or some other fortress, severed from all intercourse with the world beyond his prison-walls, deprived even of the light of day, and left in solitude and forced idleness to brood over his dark and despairing thoughts.

APPLICATION OF ELECTRO-MAGNETIC POWER TO RAILWAY TRANSIT.

ONE of the most wonderful characteristics of scientific discovery is the singular way in which every advance connects itself with past phases of progress. Each new victory over the stubborn properties of matter not only gives man increase of power on its own account, but also reacts on older conquests, and makes them more productive. Thirty years ago, Davy and Arago observed that iron-filings became magnetic when lying near a wire that was carrying a current of galvanic electricity. Since then powerful temporary magnets have been made for various purposes by surrounding bars of soft iron by coils of copper-wire, and transmitting electric currents through these. In fact, it has been ascertained that iron always becomes a magnet when electricity is passed round it. The alarm-bells of the electric telegraphs are set ringing by a simple application of this principle. A conducting wire is made to run for hundreds of miles, and then coils itself round an iron bar. Electric currents are sent at will through the hundreds of miles of wire, and the inert iron becomes an act-

ive magnet. Observe the clerk in the Telegraph Office at London. When he jerks the handle that is before him, he turns on a stream of electricity that runs to Liverpool or Edinburgh, as the case may be. In either of those places a piece of iron that is twisted round with the extremity of the wire becomes a magnet for an instant, and attracts to itself a steel armature that is connected with a train of wheel-work. The motion of the armature, as it is drawn up to the magnet, sets free a spring that was before kept quiet; and this gives token of its freedom by making an alarm-bell to ring. The clerk in London awakens the attention of the clerk in Edinburgh by turning a piece of soft iron placed near to the latter into a magnet for a few seconds. He is able to do this because currents of electricity induce magnetism in iron. This, and this alone, is the secret principle to which he is indebted for the wonderful power that enables him to annihilate space when he instantaneously attracts the attention of an ear hundreds of miles away.

It has recently been announced that this electro-magnetic induction has been made a means for the instantaneous registration of astronomical observations. We have already to draw attention to another practical application of the principle. M. Niklès has just invented an arrangement of apparatus that enables him to make the wheels of locomotives bite the rails with any degree of force without increasing the weight that has to be carried to the extent of a single grain. Our readers are aware that in wet weather the driving-wheels of locomotives often slip round upon the rail without acquiring the power of moving the weight that is attached behind them. Whenever they are asked to ascend inclined planes with a weight that is beyond the adhesive powers of their wheels this result invariably follows; and the only practical escape from the difficulty hitherto has been the adoption of one of two expedients—either to increase their own intrinsic weight, so that the earth's attraction might bind the wheels down more firmly, or to let the railway be level and the load to be dragged proportionally light. In either of these cases a waste of power is experienced. Power is either expended in moving a superfluous load, or the same amount of power drags less weight even upon a level rail than it otherwise could upon an ascending one, that would have required less outlay in its construction. It therefore becomes a great desideratum to find some means of making the locomotive wheels bite more tenaciously without increasing the load they have to carry. The important problem of how to do this it is that M. Niklès has solved.

If our readers will take a common horse-shoe magnet, and slide the connecting slip of steel that rests upon its ends backward and forward, they will feel that the slip sticks to the magnet with a certain degree of force. M. Niklès' plan is to convert the wheel of the locomotive into a magnet, and make it stick to the iron rail by a like adhesion. This he does by placing a gal-

vanic battery under the body of the engine. A wire coming from the poles of this battery is then coiled horizontally round the lower part of the wheel, close to the rail, but in such a way that the wheel turns round freely within it, fresh portions of its circumference coming continually into relation with the coil. The part of the wheel in immediate contact with the rail is thus made magnetic, and therefore has a strong adhesion for the surface along which it moves—and the amount of the adhesion may be increased or diminished at any time, by merely augmenting or reducing the intensity of the galvanic current that circulates through the surrounding coil. By means of a handle the electricity may be turned on or off, and an effectual break be thus brought into activity that can make the iron rail smooth or adhesive according to the requirements of the instant, and this without in any way interfering with the free rotation of the wheels as the friction-breaks of necessity do. Increased adhesion is effected by augmented pressure, but the pressure results from an attraction that is altogether independent of weight. The lower portion of the wheel for the time being is in exactly the same condition as a bar of soft iron placed within a coil of wire circulating electricity. But as it rises up out of the coil during the rotation of the wheel, it grows less and less magnetic, the descending portions of the opposite side of the circumference acquiring increased magnetic power in the like degree.

M. Niklès' experiments have been made with large locomotives in full operation; and he states as the result, that the velocity of the wheel's motion does not in any way affect the development of the magnetic force. He finds the condition of the rail, as regards wetness or dryness, to be quite unimportant to the success of his apparatus, and he has already managed by its aid to achieve an ascent as rapid as one in five.

THE STOLEN ROSE.

GERALDINE DELISLE was the year previous to the late Revolution, which in one day shattered one of the great monarchies of the earth, the reigning belle in her circle. Lovely in form and face, she wanted but to correct some trifling defects of character to be perfect. But if she had large black eyes and massive brow, and beautiful hair and white teeth—if she had a lily-white hand and tiny feet, she knew it too well, and knew the power of her charms over man. She loved admiration, and never was so happy as when in a ball-room all the men were almost disputing for the honor of her hand. But Geraldine had no declared suitor; she never gave the slightest encouragement to any one. Many offered themselves, but they were invariably rejected, until at twenty her parents began to be alarmed at the prospect of her never marrying. M. and M^{me} Delisle had found so much genuine happiness in marriage—the only natural state for adult human beings—that they had promoted the early marriage of two sons and an older daughter; and now that Geraldine alone