

him so far, but his leg is hurt. She pulled him down out of range. A noble girl, and worth her weight in gold!" said Charley.

"And he said she didn't care for him! Oh, Charley—isn't she splendid? She risked her life for his, as she believed."

"Yes, we all thought he would be shot; but this will teach him and the others a lesson. The soldiers behaved splendidly, too."

"Well, I am glad they did not shoot anyone. I felt dreadful, Charley, when I fancied the people were killed. But find out about John."

Charley went and made inquiries at the hospital. John Cummings' leg was broken, and Mary Somerville

had received several bruises; but the leg would mend, and Mary would be out in a couple of days, they said. It was more than a couple of days, though, for she had fever, and many weeks elapsed before she came round.

At length one day she and John came to our cottage, looking well and happy. They thanked us heartily, and John was more particularly gracious to me.

"Mrs. Farmer," said he, "I humbly beg your pardon, as I have Mary's here. She is a precious jewel, ma'am, and I have learned to value her, I hope. She's one in a thousand. She's pointed out to me my errors, and if ever I get on in life it'll be her doing. She's an angel!"

THE GATHERER:

AN ILLUSTRATED RECORD OF INVENTION, DISCOVERY, LITERATURE, AND SCIENCE.

Correspondents are requested, when applying to the Editor for the names and addresses of the persons from whom further particulars respecting the articles in the GATHERER may be obtained, to forward a stamped and addressed envelope for reply, and in the case of inventors submitting specimens for notice, to prepay the carriage. The Editor cannot in any case guarantee absolute certainty of information, nor can he pledge himself to notice every article or work submitted.

A Portable Electric Bell.

The portable bell which we illustrate occupies a space of $3\frac{1}{2}$ inches square and contains a dry battery, so that it can be packed in a portmanteau.



It can be used as a table call-bell, an invalid's bed-bell, or a burglar and fire alarm. To adapt it as an intrusion alarm, the bottom part which

holds the battery is detached, and a flexible conductor connecting it to the rest of the apparatus uncoiled. The press-button of the bell is then placed against the door or window to be protected, so that when the latter is opened the circuit will be closed and the bell will ring. A fire alarm under the gong is so made that it can be adjusted to ring the bell at a predetermined temperature, thus giving notice of a fire. The other uses of the bell require no explanation.

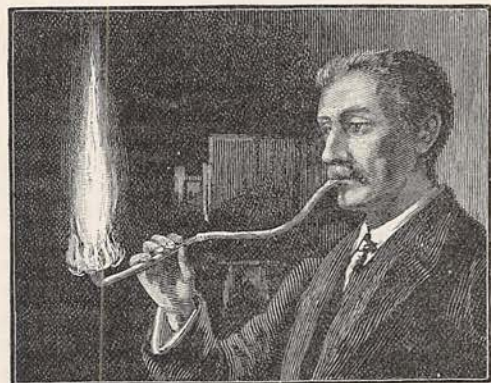
Natural Soap.

"Wyoming Soap" is a mineral occurring in the Blue Ridge, about 35 miles west of Soudance, in Wyoming Territory, United States, at an elevation of 5,000 feet. A wet variety is found in sink-holes and in the neighbourhood of springs. It is a pasty mass resembling moist soap, and of a yellowish-grey colour. It has a clayey odour and a saline taste. A dry variety is found in veins of the earth, like coal, and when wetted

becomes similar to the other. The ranchers and cow-boys of the vicinity employ it as soap for removing grease and making "hard" water. Its chemical constitution is very complex, including as it does seven oxides, namely, of silicon, iron, aluminium, manganese, calcium, magnesium, and sodium, with water and sulphuric acid.

A Simple Flash-Lamp.

An American photographer gives the following simple method of making a flash-lamp to photograph by (see the figure). Take an ordinary clay pipe and



wrap a wad of absorbent cotton round the bowl, tying it with a piece of string. Draw a piece of bulb rubber tubing over the stem so that you can place the tube in your mouth and blow through the pipe. Then weigh out the quantity of magnesium required for the flash, and place it in the bowl of the pipe. Take some alcohol and saturate the cotton with it. When the subject is focussed, and the light wanted, ignite

the alcohol. The flame will rise six inches over the bowl of the pipe. Blow through the pipe-stem, and the magnesium will rise with a flash.

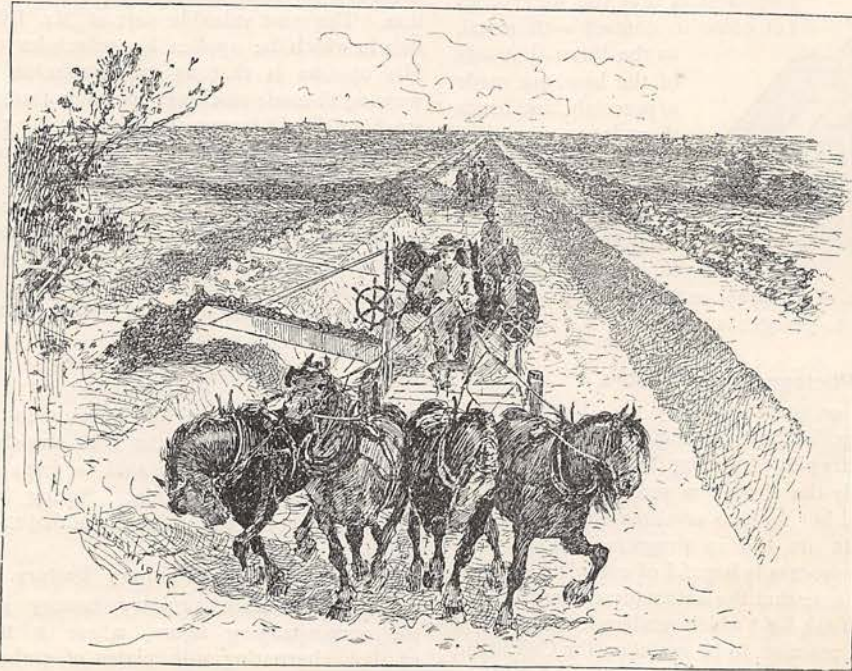
Kolatina.

The Kola nut is used by the natives of the West Coast of Africa as a stay during long journeys, like the *cuca* or *maté* chewed by the Indians of South America. It is a stimulant, like tea or coffee, but is almost free of the tannin which is an ingredient of tea, especially that from India. According to Professor Haekel, it contains caffeine and also a principle called kolaine, which prevents rapid waste of the tissues during

six teams of horses and three men is capable not only of excavating, but of embanking from 1,000 to 1,500 cubic yards of earth, or of loading from 600 to 800 waggons with it, in ten hours.

A Home-made Filter.

Professor P. T. Austen, F.C.S., gives the following plan for making a simple and serviceable filter. A little alum in water containing carbonate of lime forms a flocculent precipitate which entangles germs and suspended matter, though these will pass through an ordinary filter. Professor Austen, therefore, takes a long, narrow-necked bottle, such as a Florence oil



A NEW GRADER.

fatiguing exertion, whilst the caffeine stimulates the muscles. The German War Office has ordered thirty tons of kola for the use of the army; and it is reported that Major du Rocher, a French officer, and his orderly, walked forty-eight miles in fourteen hours, and resumed their military duties, without having slept, under the support of kola. It is, therefore, worthy of mention that kola has been prepared as a beverage by a London firm, in the shape of kolatina, and kola chocolate, both of which are said to be more nutritious than tea, coffee, or cocoa, and also more digestible.

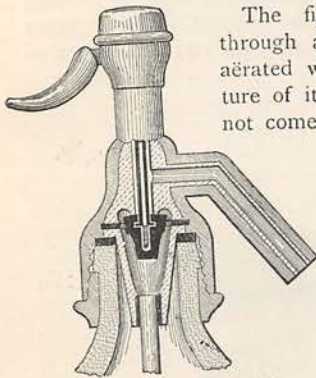
A New Grader.

The Austin Manufacturing Company of Chicago have introduced a track-cutter, or grader, for making canals, roads, or railways, which we herewith illustrate. The machine consists of a series of ploughs, or diggers, which loosen the earth and deliver it from a shoot seen on the left of the figure. It will work in any soil where a plough can be used, and with

flask, and cuts off the thick end. This can be done by tying a string soaked in kerosene round the bottom, at the place where the severance is to be made. The string is then set on fire, while the bottle is held bottom up, and when it is burnt out, the bottle is plunged into cold water. The sudden contraction of the heated glass causes the end to break off; and asperities can be removed by filing the edges of the break. The bottle is then thoroughly cleaned, and put neck downward in a support—say a hole bored in a shelf. A handful of cotton-wool, properly soaked in water, is dropped in shreds into the bottle, until a layer two inches deep rests evenly on the shoulders of the glass. A cup or two of clean water is next poured in, and the bottle tapped, to consolidate the filter-bed. Alum, to the extent of two grains to the gallon, is added to the water to be filtered. It is best to add it in the form of a strong solution, say one grain of alum to a teaspoonful of water. This solution is easily made by dissolving 128 grains of alum in 16 oz. of

distilled water. After mixing the alum with the water in a clean basin, it should be allowed to stand for ten minutes, then poured by a clean dipper into the filter. The first half-pint of water which runs through ought to be rejected. Such a filter-bed will last a day; but a fresh one should then be substituted. Of course, this preliminary alum treatment can be applied with advantage to any of the filters now in use. The filtered water should be kept in corked or stoppered bottles.

A Porcelain Siphon-Head.



The figure shows a section through a new siphon-head for aerated water bottles. One feature of it is that the water does not come in contact with metal, as the internal fittings of the head are made of porcelain, and hence there is no corrosion. The porcelain is protected on the outside by an armour of metal. The piston is sheathed in ebonite, and the

valve is made of a rubber material. The device is also applicable to gasogenes.

Photographing Colours.

It is stated on good authority that Herr Verescz, of Klausenberg, in Transylvania, has partially succeeded in directly photographing the colours of nature. At present only the shades of red and orange have been fixed, and but for two or three days; however, the experiments are still in progress, and the discoverer of the process is hopeful of complete success. We may add here that the automatic camera, by the addition of a flash-light which renders it independent of the weather, promises to be useful on the Continent, where season ticket holders by the railway sometimes have their portrait on the ticket. With one of these instruments in the booking-office, a traveller's likeness can be obtained while the ticket is being written out.

The Human Foot.

A valuable work on this subject has been written by Mr. Thos. S. Ellis, surgeon, and published by Messrs. J. and A. Churchill. The author points out that both feet when brought together form one pedestal supporting the body, and each foot by itself is only a half of this complete support. In some ancient statues the second toe is longer than the great toe, and Mr. Ellis says that while this feature occurs in nature it is not the rule, for in general the great toe is longest. This phenomenon, like the difference in length between the ring and the index finger, is therefore a "variation." As regards walking, he thinks the mode which keeps the inner borders of the great toes almost parallel to each other, is that best

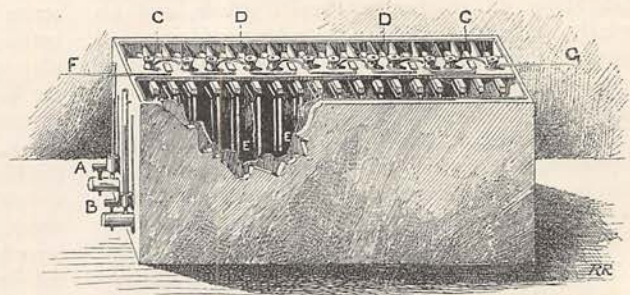
adapted for steady progression, since it allows the joints and muscles of the foot to rest in the intervals between the steps. He condemns the military position, with the toes turned outwards, as much more fatiguing, by keeping the joints and muscles in continual strain. What is called "flat-foot" is a defect which tends to disappear by the spring from heel to tip-toe in straight toe-and-heel walking, and by the act of dancing. In this connection we may point out that the North American Indians walk with a straight forward foot, or with the toes turned slightly inwards, instead of outwards, whereas the white man tends to turn his toes outwards. Since the red man has lived by the chase, it would seem that the white man's habit is a physical shortcoming produced by civilisation. The most valuable part of Mr. Ellis's book is that in which he applies his principles to foot-gear. His opinion is that as much mischief is done by wearing ill-made stockings as badly fitting shoes. A stocking should have a separate stall for the great toe, and a straight inside line. In order to make a fitting shoe or boot, not only the length and girth of the foot should be measured, but it is desirable to obtain contour-lines of the foot. For this purpose the author has devised a foot-stand and pedistat which are illustrated in his work. From these measurements a last can be made which represents the foot as it stands on a level surface.

A New Tea.

Germany has found a new industry in the collection of the young leaves of the wild strawberry, which, when carefully dried, are said to form an excellent substitute for Chinese tea. Young bramble and woodruff leaves are occasionally added to improve the flavour.

A New Primary Battery.

The Weyersch primary battery is shown in the accompanying figure, where E E are plates of zinc, alternating with plates of carbon, D D; the whole being connected up by a line of wires and terminals, F G. Two fluids are used to excite the current, and the carbon plates are each contained in porous cells. The liquid for the zincs is merely acidulated water, and that for the carbons is kept

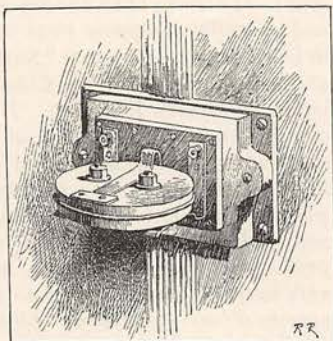


a secret. The fresh solutions are supplied to the battery by charging pipes from elevated reservoirs (not shown), and the spent solutions are drawn off by the taps, A B. A six-cell battery of this type yields

15 ampères at a pressure of 7·8 volts for eighteen hours at a stretch. For this a charge of $1\frac{1}{2}$ gallons of the secret solution is required, at a cost of 1s. The consumption of zinc is stated to be about ten per cent. above the theoretical consumption. The internal resistance of the battery is 0·05 ohm per cell. In feeding glow lamps, the cost of the battery is estimated at 0·4d. for a light of ten candle-power during an hour, and for arc lamps one-sixth of that. For small or temporary installations such a battery may prove serviceable.

An Earthing Device.

There is a risk of "transformers," or "converters," which alter the current from a dynamo into the condition fit for the supply of electric lamps in houses, breaking down, and the high "pressure" current from the generator thereby finding its way to the lamps and destroying them, or causing fire, or even endangering life. Hence the "earthing" device of



Major Cardew, R.E., which we illustrate herewith. It is essentially a means of connecting the secondary circuit of the transformer to earth, whenever the electric "pressure" in it reaches a certain intensity, say 400 volts. This is effected by attaching a metal disc to the secondary circuit, and another to the ground, with a foil of aluminium between them, so placed that while it makes contact with the latter disc, it is not in connection with the other until attracted to it when its pressure reaches 400 volts. Then the metallic path between the secondary circuit and the ground is established and the current in the secondary escapes to earth, leaving the lamps and installation uninjured. The apparatus is automatic, and is said to act very well. It is also intended for protecting the eye from dangerous currents. Another appliance of the kind is that of Mr. Killingworth Hedges, which, however, is a variety of the well-known vacuum lightning guard introduced by Varley

The Green Ray.

The flash of blue-green or emerald light shot forth by the sun's upper limb, on sinking in the sea or behind a mountain, has also been observed when the luminary sank behind a cloud, and Professor Schonke considers it an effect of refraction, the vanishing light refracted by the atmosphere showing the blue or more refrangible rays uppermost. Professor Michie Smith, however, dissents from this view, and regards the phenomenon as an effect of absorption by the atmosphere, and akin to the green sun occasionally seen—for instance, in Southern India, September, 1883. A

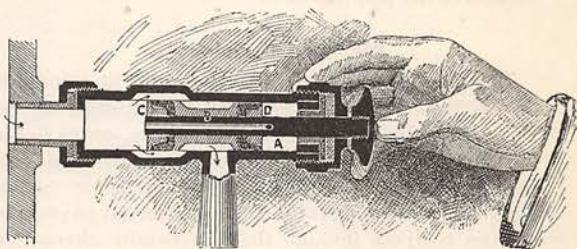
moist atmosphere, with dust particles in it, is sufficient to cause the appearance; the green sun of 1883 being, it was thought, an effect of the volcanic dust disseminated by the eruption of Krakatoa. Perhaps, however, the green flash and the green disc are different phenomena, one being due to refraction, and the other to absorption. There is room for further observation on the matter.

New Fire-Pails.

It is customary in America to keep a number of pails ready filled with water in case of fire. They are made of galvanised iron of extra thickness to resist the tendency to collapse, and evaporation is prevented by covering the mouth with tin-foil or waterproofing easily broken. Solutions of low freezing-point are also used instead of water, in glass-lined pails. Sometimes the pails are hung on hooks fitted with a spring, by which when the pail lightens through loss of the fluid an alarm bell is rung; and there are ingenious ways of keeping the buckets always full.

A Study of Dreams.

Dr. Julius Melson, of New York, has made an interesting study of his dreams, having registered and criticised no less than 4,000 of them. He finds that the evening and nightly dreams were more or less connected with the events of the day, those of the night being the more alarming or terrifying. The morning dreams were the pleasantest and most vivid, perhaps because the phantasy has then rested and is more composed. His dreams appear to fluctuate regularly in a period of twenty-eight days, and to vary with the seasons: those at the end of the year, in December, being the most vivid, and those of March and April the dullest. Not long ago a German investigator found that sleeping on the left side was apt to cause bad dreams.



A Self-closing Tap.

An automatic tap for water at ordinary pressures is shown in section by the figure. The tap is opened by pressing on the knob with the thumb, but as soon as this pressure is withdrawn the double piston, B, follows the hand, the knob moves outwards, and the valve is closed. The area of C, the inner piston-head, is greater than that of D, so that the water drives it outward until it closes the escape. The arrows indicate the stream of the water; and A is a cataract chamber, which, when the piston recedes, discharges its water back into the supply pipe.

Testing Polluted Wells.

The following method of testing the water of wells suspected of pollution from infiltration has been successfully employed by Professor Blake, of Kansas University, U.S. Dissolve an ounce of chloride or carbonate of lithium in a quart of water, and pour it into the suspected source of pollution. After a week draw a quart of water from the well and boil it down to half an ounce, then dip a platinum wire into it, and hold the wire in the flame of a Bunsen burner. Examine the flame with a spectroscope, and if lithium is present in the water, that is to say, if the suspected source filters into the well, the bright red band of colour, characteristic of lithium, will be visible towards the red end of the spectrum.

A* Tablet-Holder.

Artists, authors, and all who write on "pads" or tablets will be interested in the tablet-holder of Mr. A. W. Tuer, which is illustrated in the woodcut. It



is simply a board or square of wood on which the tablet is placed, and having on the left, at side and bottom, an edge or frame which may be level with the surface of the pad if desired.

Standard Resistances.

The use of German silver as the wire in standards of electrical resistance has been discontinued at the Physico-Technical Institute of Germany, owing to the liability of such wires to increase in resistance with time or use. It has recently been proved that copper conductors become brittle by the continued passage of electric currents through them, especially alternating currents, and some such secular change may take place in the German silver. An alloy of nickel and copper has been adopted in its stead for the standards of comparison. The alloy has also the advantage of varying very slightly in resistance with change of temperature. Alloys of copper and manganese, especially those having under 30 per cent. of manganese, are also adapted for resistance coils.

The Health of the Skin.

The skin has long been regarded, and rightly, as a species of popular health-barometer. And it is fair to suppose that if the skin be out of order, there is some

weak spot in the system which requires attention. How to care for the skin is the subject of Dr. E. B. Shulldham's little booklet, "The Health of the Skin, and its Nervous Affinities," just published by Messrs. Cassell. The book is written for the perusal and the guidance of lay or non-medical readers, and it is one which we commend to every paterfamilias.

What we Teach now.

Nothing is more marked than the improvement that has taken place during recent years in the books intended both for the recreation and instruction of the young. Take, for instance, the school-books of twenty, or even ten, years ago, and compare them with those in vogue to-day, and what a wonderful change is to be seen! The books of to-day are aimed at more directly and specially equipping their scholars for their walk in life. Before us is a new "Smaller Commercial Geography," by Mr. George S. Chisholm, M.A., B.Sc., just issued by Messrs. Longman. How different from the old dry-as-dust geographies of a score of years ago, that, indeed, surveyed mankind from China to Peru, but in such an arbitrary, spiritless fashion that a tyro was wont to get lost among the endless capes, seas, and gulfs, and apt to wander in darkness as to the products of the various lands, and to come away with very hazy notions indeed as to the lands from which specific objects are drawn. All this is changed in Mr. Chisholm's book, and even schoolboys, who (*pace* Lord Macaulay) have generally a good deal to learn—in this respect, at any rate—may soon be expected to know where our merchants are most likely to find competition in any particular direction, and whence fresh supplies of raw material may most naturally be expected. As in geography, so in other branches of learning. Messrs. Cassell have just issued, for the use of the Young People's section of the National Home Reading Union, a little text-book of the "Science of Every-day Life," in which Mr. John A. Bower, F.C.S., explains the common laws of mechanics, the properties of air and water, &c., while in a companion volume, intended primarily for the reading of artisans in connection with the same Union, "Science as applied to Work" is expounded, with equal thoroughness and simplicity. In the very collections of poetry for young readers there is a change, too, as witness the third edition of "The Illustrated Poetry Book for Young Readers," just issued by Mr. Fisher Unwin—a book as far above the old wishy-washy collections as is a mountain above a mole-hill. It is representative, indeed, of the poetry of our day in its highest aspect.

New Music.

Songs for school concerts that are at once good and attractive are certainly much required. We are glad, then, to welcome "Lollipop Dick," a most amusing and attractive miniature cantata, suitable for school concerts, children's gatherings, &c., published by the composer, Dr. C. J. Frost. In the same connection it is interesting to note Mr. Myles Birket Foster's "A Daring Adventure," and "A Pastoral," just published by Messrs. Weekes & Co., and in which both words

and music are far above the average. A good and original song from the same publishers is a setting by our contributor, Mr. R. Ernest Bryson, of Mr. R. Meyrick's words, "A Song of Long Ago." Messrs. Weekes also send us a new and not unworthy setting of Lord Tennyson's "Break, Break, Break," by Mr. Arthur Ray; a "Japanese March" for the piano, by C. A. Ehrenfechter; and "The Quaint Gavotte," by Oliver Cramer, for the piano; besides "Six Album Leaves," for violin and piano, by C. E. Lowe, and a new edition of Emilie Norman's "Tarentella." All these works are easy and original, and well suited to the capacities of young performers. Messrs. Paterson & Sons, of Edinburgh, send us No. 2 of their "Waverley Collection of Vocal Trios," which is "Bonny Kilmeny," by Hamish MacCunn, well printed and cheap. Another work, by the same composer, which has already made its mark, is the ballad "The Cameronian's Dream," which Messrs. Paterson send us. It is very clever, although essentially Scottish in character. Three more songs from the same publishers call for something more than passing notice. The first is a setting, by Louisa H. Grant, of Mr. Begbie's words, entitled "Light and Shade," to which the composer has given us a pretty popular melody, with an attractive rhythm. "Easter Eve" is, as its title implies, a sacred song, the music by Charles Gounod, and the words by C. Armstrong; the devotional effect of this really beautiful song is greatly enhanced by the addition of organ and violin accompaniments. The third and last is "Singing a Lullaby," a taking song, of which both words and music are by R. W. K. Edwards.

Four Kindred Games.

The latest volume of the Badminton Library (Longmans) is devoted to what may well be called the four kindred games of Tennis, Lawn Tennis, Rackets, and Fives. As one of the authors says of the game of Tennis, it is notoriously difficult to make the game intelligible to a looker-on who has never played it. To some extent this is true of all the four games which are the subject of this volume. All of them are remarkable for the enthusiasm they arouse among their votaries, and probably the publication of this volume will lead to no little discussion between adherents of the four games as to which is best. Each game is dealt with, not only historically, but critically; and remarks and suggestions are made which are admirably calculated to aid the player in the course of actual playing. The illustrations are very helpful and suggestive. No lover of any one of these games should be without this complete and comprehensive *vade mecum*.

A Book about Russia.

The Russian Empire takes no small share, not only of the map of the world, but of the attention and interest of the world's newspaper-readers, and yet how little the average reader knows about Russia! Not long ago Sir Mackenzie Wallace gave us his account of Russia as it is, and an admirable account it was; but of the history of Russia we have hitherto been left

to a great extent ignorant. Mr. Fisher Unwin has just added a volume on Russia, by W. R. Morfill, M.A., to the "Story of the Nations" series, in which it is very wonderful to notice how comparatively recent are the steps which have placed Russia among the foremost of European Powers. Almost to the end of the last century the Russian Court and people were practically Oriental in constitution, customs, and even dress. We are bound to say that Mr. Morfill often seems to take for granted a wider acquaintance with the elements of Russian character and history than we are prepared to find in the public mind, and we regret this all the more because we feel the need there is of a book like his, which shall be at once attractive and instructive. It is a strange story that he has to tell, and one that is obviously a very difficult one to tell adequately for the general public. Considering the close commercial relationship that has so long existed between the two countries, Englishmen ought to know more than they do of the history of Russia, that they may rightly appreciate the aims and endeavours of her people. We have in Mr. Morfill's book the means of gaining, at any rate, some idea of the growth of this mighty empire.

More New Music.

Mr. Alphonse Carey has just issued three more books—Nos. 7, 8, 9—in his admirable series of Voluntaries for organ and harmonium. The collection consists of useful and well-written pieces, and includes some really charming items. He sends us at the same time, under the title of "Treasures of Melody," a series of moderately difficult pianoforte pieces for young players, one of which, the "Doll's March," is a quaint and attractive little composition. We are glad to see that in "The Young Violinist," by E. Polonaski, issued by the same publisher, there are some useful exercises and melodies arranged for two violins. Messrs. Duff & Stewart have sent us a very good song, "Two Dreams," in which the words are by H. L. D'Arcy Jaxone, and the music is by Mr. Henri Logé. In Mr. J. Hoffmann's setting of Mr. Oxenford's "Silver Bridge," small choral societies will find a good and easy cantata, that ought to prove very useful. It is published by Messrs. Hutchings & Co., who also send us a new setting, by A. Scott Gatty, of Kingsley's "Soft, Soft Wind," with a violin obligato, the whole evidently being the work of an accomplished hand. From the same publishers we have also received "Wavelets," an effective transcription for the violin, with pianoforte accompaniment, by Tivadar Nachéz. From Messrs. Swan & Co. comes "Far from Thee," a setting quite of average merit of words by S. J. Adair Fitz-Gerald, from the hand of Miss Scalé, whose pianoforte piece, "On the Village Green," our readers must remember. Messrs. J. Curwen & Sons send us, in two books, "The Violin Player," by S. D. Gray, arranged on an excellent method, giving full and clear instructions on every point and detail connected with the art of violin playing. At the same time they send us an effective song for contralto or bass, by Adam Geihel, under the title of "The Watcher."