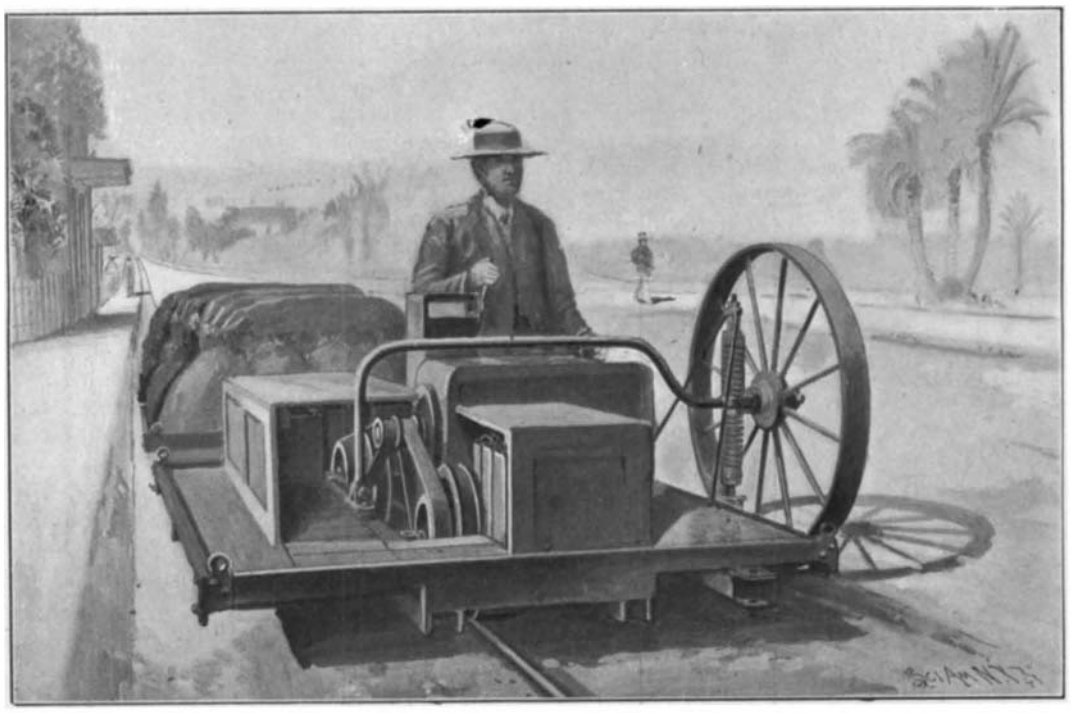
SINGLE-RAIL STORAGE-BATTERY MOTOR.

The single-rail railroad has found an extensive field for usefulness in various parts of South America, and also pretty generally in India. In both countries the system is a form of the well-known Decauville system, in which the bulk of the weight is carried on two wheels alligned in the same longitudinal plane beneath the car, while the balancing is performed by a cross beam or outrigger, to which is harnessed the horse or mule which draws the load, or, if man power is used, the boom is steadied by an attendant. This is the plan which is more generally followed in South American countries. In India it is customary to place a wheel at the end of the outrigger and so distribute the weight in loading the car that the bulk of the load is carried by the rail wheels, only a small fraction of the weight being borne by the road wheels. These trucks are, as a rule, drawn by oxen. The truck, which is herewith illustrated, is being specially constructed for service in India; and, while it is built on the general lines of the ox-drawn vehicle, it differs from it in that the motive power is derived from storage batteries carried on the platform of the car. The motor is placed between the two wheels, and carries on its spindle a double pulley which is belted directly to a pulley on to each of the axles. The storage batteries are grouped around the motor and the whole is boxed over to form a carrying platform. The truck is designed to carry a load of a quarter of a ton, and is capable also of drawing two other trucks, each carrying a ton, at a speed of eight miles per hour. The single tracks for these railways are exceedingly economical to build, and if laid near the edge of the road, encroach but little upon the driveway. We are indebted to Mavor & Coulson, Glasgow, the builders of the truck, for illustration and particulars.



Capacity, 5,000 pounds of freight at eight miles an hour.

SINGLE-RAIL STORAGE-BATTERY MOTOR.

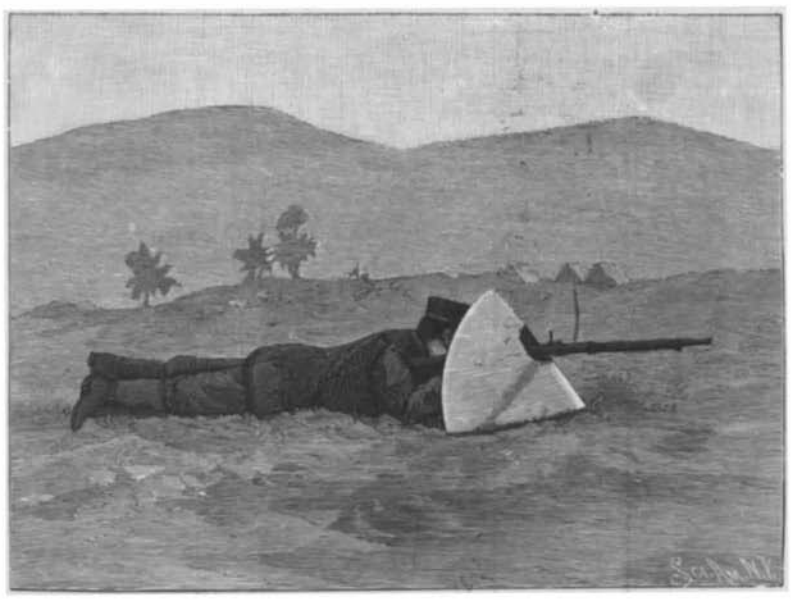
PORTABLE SHIELDS FOR INFANTRY.

A few years ago the question of equipping infantry with a cuirass to protest the most vital parts of the body against rifle fire was the subject of wide discussion. Several experiments were made with many so-called bullet-proof shields or breastplates, but in every case they were found to be penetrable at ranges at which it was desired to obtain full protection, and for the time the idea of providing infantry with armor was abandoned as impracticable.

The present struggle between the British and the Boer forces in South Africa has revived interest in the question, and several bullet-proof cuirasses or shields have been constructed and put to more or less severe tests; one or two of them with very gratifying results. When we bear in mind the high velocity and great penetrative power of the modern magazine bullet, the idea of providing infantry with a shield of reasonable impenetrability might seem to be chimerical, but if we recall the protection that has frequently been afforded by a pocketbook, bible or other object carried in the pocket of the soldier, the suggestion takes on a color of reasonableness. One of the most recent, and as tests have shown, the most practical efforts in this direction is the folding shield which forms the subject of the accompanying illustrations. It is formed in two separate parts, which are hinged together vertically, and when shut up can be carried on the back of the soldier without inconveniencing him, or hampering his movements on the march. One of the cuts shows the shield folded and strapped on the back, while the other two are front and side views which show the shield acting both as a rest for the rifle and a cover to the rifleman. The front view, in particular, suggests what excellent protection is afforded.

The shield, considering its protective power, is very light, weighing about 13 pounds and its shape when opened out and placed in position somewhat resembles the ram of a battleship. It has been proved to be impervious to Mauser and Lee-Metford rifles at a range of 700 yards, the bullet striking the sloping sides and glancing off. When painted the prevailing color of the surrounding country it is difficult to detect, since in form it bears a striking resemblance to a rock or bowlder. The man behind the shield, at least during the earlier stages of an advance in open order, can creep forward in comparative safety, and his invisibility is greatly assisted by the fact that he is using smokeless power.

While it is admitted that the device would be invaluable to sharpshooters and would greatly assist the work of "sniping," the main idea of the shield is to make it practicable to attack from the front in cases where flanking movements are impossible. The war in South Africa has brought home to the English and other nations the fact that, under ordinary conditions, the attack upon intrenched positions is a thing of the past. The game of war has been greatly modified by the introduction of the magazine rifle and the quick-firing gun, the attack being now placed at an enormous disadvantage, which is estimated by experts to range from five to one to as high as ten to one. The shield is expected to offset to a large extent the advantage of cover which is now enjoyed by the defense. The theory is that the storming party could work their way with comparative safety behind the shield to within say 400 yards of the enemy's trenches. At this range they would be able to concentrate a fire which would shake the morale of the enemy preparatory to the final charge with the bayonet.



SIDE VIEW, SHOWING SHIELD USED AS A RIFLE-REST.

IN MARCHING ORDER.

FRONT VIEW, SHOWING COMPLETE PROTECTION.

New Type of Battery.

Among the new types of batteries which have appeared in Europe may be mentioned that of Poppenberg, in which the positive electrode is a hollow cylinder or retort carbon filled with depolarizing matter and closed at the bottom of an insulating plate; the negative electrode is a cylinder of zinc. These two electrodes rest upon a false bottom consisting of a horizontal plate of porous material, constituting a diaphragm. Between the plate and the bottom of the cell is placed a thick layer of sulphate of soda, with or without the addition of common salt. When water is put into the cell, a portion of it traverses the porous diaphragm and dissolves the salt below, the solution then passing by endosmose to the water above. The strength of the electrolyte is thus rendered nearly constant. The battery keeps its strength for a long time and has an electromotive force of about two volts. The new accumulator invented by T. Michalowski utilizes the properties of sesquioxide of nickel; the positive plate is of nickel covered with a layer of sesquioxide, Ni 203, the negative electrode being a plate of zinc; an alkaline solution is used for the electrolyte. The characteristic point of this accumulator is the use of the sesquioxide of nickel as a depolarizer. Up to the present a number of cells have been devised using zinc, potash solution and metallic oxides, but the specific properties of the oxide of nickel have not as yet been taken into account, namely, that it is an endothermic body, giving off heat upon decomposition; owing to this property, the depolarizing action is considerable and the element keeps constant at a high voltage. The nickel plate is oxydized by heating it in air or oxygen, or with compound of oxygen and nitrogen under pressure.

Mounting Photographic Prints.

One of the greatest difficulties in mounting photographic prints is to prevent them from curving when dry; as this is due to the contraction of the print after having been distended by the water, a paste must be used containing as little water as possible. The following formula is recommended: Common gelatine, 2 parts; water, 4 parts; alcohol, 8 parts. The alcohol is added slowly as soon as the gelatine is well dissolved in the water, and the vessel turned continually to obtain a homogeneous mixture. The solution must be kept hot during the operation, and should be applied quickly, as it soon dries; the print must be placed exactly the first time, as it adheres at once. The solution keeps for a long time in well-corked bottles; when used it is heated on a waterbath.

SIR WILLIAM PREECE, the famous electrician of the General Post Office of Great Britain, gave an interesting lecture in London, on April 23 last, before the Institution of Civil Engineers, upon the latest developments of electricity, and Marconi's numerous experiments. Sir William Preece acknowledged that wireless telegraphy had made small progress, a circumstance which he attributed to the fact that there is no commercial business in the invention. The interest in wireless telegraphy does appear to have diminished in London, and Sir William Preece's poignant remarks will not give much further encouragement to those few who are so closely interested in Marconi's experiments. It may be remembered that Sir William Preece assisted Marconi when he first brought his primitive instruments to England.