THE "FORTIS" ELECTRIC EXERCISER.

For the purpose of combining with the benefits to be derived from an exerciser the hygienic effect of electricity, the Badger Brass Company, of Kenosha, Wisconsin, have recently introduced the apparatus pictured in our illustration.

In appearance the machine resembles the ordinary exerciser with elastic cords passing over pulleys; but the cords here serve as conductors, and the handles as electrodes. Somewhat below the middle portion of the board a cell is held in a recess and wired to an induction-coil, secured to the upper part of the board, so that the current strength can be increased. The induced current is conducted through the elastic cords to the handle and back again. In order to interrupt the battery current and incite a secondary current in the coil, one of the pulleys is provided with an interrupter, which, in turning with the pulley, automatically makes and breaks the circuit as it passes a contact secured on the pulley-block and wired to the secondary coil. The pulley is suspended from a hook forming part of a movable plate which constitutes a circuit-controller. When the cord is pulled, the hook-plate is drawn forward against a stop to complete the circuit. When the handle is released, the hook-plate is automatically retracted to break the circuit.

A metallic foot-plate furnished with the apparatus can be placed in the circuit, so that the current can be passed through the body. By means of a conveniently located switch, the current can be directed from either hand through the body to the other hand, or by means of the foot-plate through the body to the feet, or vice-versa. By drawing out the slide of the induction coil, the current can be regulated in strength to meet the requirements of all persons.

The stimulating effect of electricity has long been recognized by medical men. The physical development resulting from the use of exercisers has earned for the elastic cord machine a wide popularity. The benefits to be derived from an electric exerciser in which muscular exercise is combined with electrical stimulus are, therefore, so obvious that further comment is hardly necessary.

ELECTRIC EXERCISER.

A PHOSPHATE TRANSPORTER AT SFAX.

The mining of phosphates comprises one of the staple industries of Tunisia, and at Gafsa are situated the extensive mines and plant owned by the Compagnie des Phosphates et du Chemin du Fer de Gafsa. The daily output at Gafsa by this company runs into several hundred tons, and large storehouses have been erected for the temporary storing of the product, until it can be dispatched to the coast. Unfortunately, the mines are situated 156 miles from Sfax, the port of shipment; consequently the question of freightage is a very important one. As a rule the company dispatch by rail about 700 tons of phosphates from Gafsa to Sfax every day. On its arrival the product is either transferred direct from the freightage cars into the hold of the ship or transferred to storehouses to await the arrival of the vessels. They have one immense storehouse 262 feet in length by 65 feet wide and 46 feet high, constructed of armored cement, which is capable of holding 15,000 tons.

Such a tremendous output every day necessitates the employment of extensive mechanical plant, to insure the phosphates being transferred with all possible speed from the cars to the ship or store, and the loading of the vessels. The company recognized the importance of this rapid handling of the material, and consequently determined to install a transporting plant that should coincide with their requirements. In the selection of such an appliance however they were hampered by two difficulties. In the first place, the authorities controlling the quay would not permit the erection of any structure, either movable or fixed, within less than 24½ feet from the water's edge, and neither would they allow any excavations to be made below a depth of 4½ feet. Then again the company desired a plant that would be able to hold their own wagons, so that extra expenditure in this direction might be obviated. Then again it was imperative that the transporting arrangements should be done in such a manner that the phosphates should be protected from the weather, and that at least 3,000 tons of material should be transported daily.

This transporting plant has recently been constructed by the Temperley Transporter Company, of London, who have supplied two of their traveling towers, a photograph of one of which we reproduce herewith, in order to comprehensively illustrate the principles embodied in the apparatus. Each tower is 75 feet in height, and the transporter beams which carry the skips are each 111 feet in length, with an incline of 1 in 4. Two skips are provided on either transporting beams with a capacity of 35 hundredweight each. It will thus be seen that 7 tons of material can be in movement at one and the same time; and as the round trip of a single skip only occupies one minute, 420 tons can be transported in one hour, which easily enables the contracted minimum amount of 3,000 tons per diem to be accomplished.

Each tower is mounted on twelve wheels, two of which on either side act as driving wheels, running upon a railway of 28 feet gage. The tower is equipped with three platforms, the upper of which contains the portable boiler for supplying steam to four sets of engines, three of which are placed on this same platform, and one on the platform immediately beneath it. The two principal engines on this upper platform serve as the winding engines for the transporter, and are capable of lifting the loaded skips at a speed of 300 feet per minute. The remaining engine supplies the power for propelling the entire structure along the railway, and for driving capstans, etc.

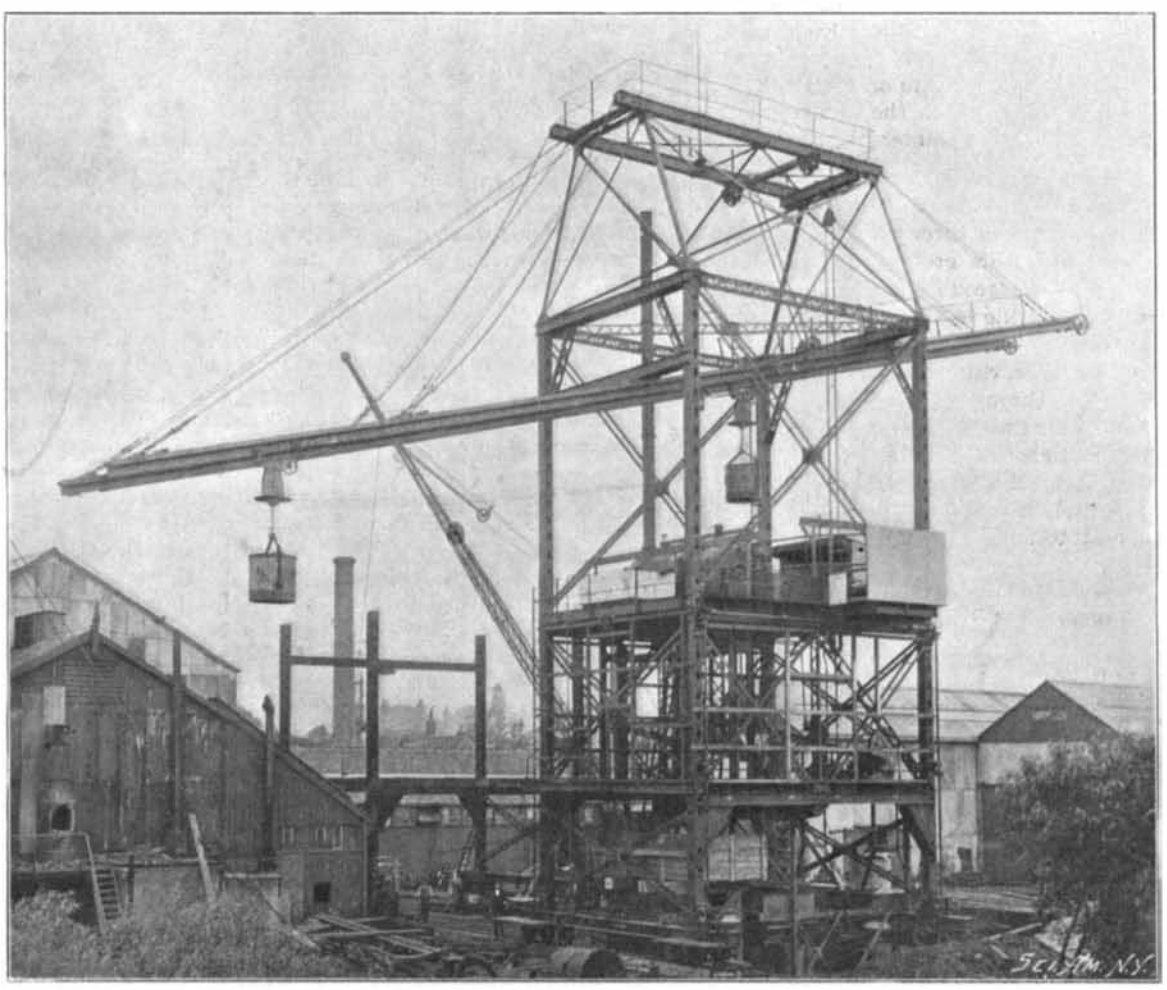
The wagons, laden with phosphates, run along the railway underneath the tower. These wagons are fitted with side doors so that the contents cannot be dumped out, but have to be removed by the aid of shovels. To accomplish this operation with celerity, the makers devised a large mechanical shovel, consisting of a large plate suspended by hinges at its upper edge, and which oscillates by means of a pair of cranks and connecting rods. The hinges are mounted on nuts, carried by long vertical screws, which are driven by gearing and so feed the shovel to its work. The shovel itself is almost the same length as the interior dimensions of the truck to be emptied, and at the limit of its downward motion its bottom edge clears the floor of a new wagon, when empty, by about 1½ inches. This mechanism is driven by the single cylinder vertical engine placed on the second platform, and upon this also stands the operator, supervising the emptying of the wagons below, who is thus enabled to obtain a full view of the work in progress. The shovels make two complete oscillations per minute.

The contents of these wagons are deposited by means of these shovels into two hoppers below, and these latter are discharged into the skips traveling on the transporting beam, which are lowered by the transporters on to a roller bed at the base of the tower. The skips are then detached, run underneath the hoppers, and thus filled. They are then hauled back, once more attached to the traveler, and carried to the destination at which it is desired to deposit the contents. The company stipulated that the phosphates should be protected from the weather, and to insure this the tower is covered at several places with corrugated iron, while an "umbrella" covers the skips while traveling along the transporter.

Although this transporter performs a series of operations, the whole of them are controlled by a single rope, and the engineer has but one lever to which to attend. Throughout the whole length of the transporting beam, at intervals of 5 feet, are arranged stops, and the engineer can, if necessary, lock the traveler for lowering or hoisting at any one of these stops. Beyond that, once he has pulled the lever setting the machine in motion, he cannot interfere in any way with the cycle of movements through which the transporter has to go on each occasion. Then the locking of the traveler at any of the stops is easily accomplished. When the traveler has passed the desired stop, it is simply pulled up and allowed to run back, when it locks itself automatically at the stop.

The series of movements through which the transporter passes, once the lever has been pulled over by the engineer, are as follows: The skip which has been filled and is attached to the suspended chain is raised by the engineer hauling in the single rope which governs the whole operations until it comes into contact with the traveler, when it strikes a lock, which secures it rigidly to the traveler, and now both the traveler and skip move together. By now paying out the rope the traveler and skip run down the beam, and on reaching the end the contact automatically releases the lock securing the skip to the traveler, so that the skip descends to the desired point. Should, however, the engineer haul on the rope while the skip is in midair, it will automatically tip, and continued hauling in will cause the skip to rise once more, until it is again locked to the traveler, when both move along the beam as before, until the desired stop is reached, when contact once more releases the skip from the traveler, and it immediately descends, to be loaded once more.

The most salient characteristic of this transporter is the self-tipping device. The majority of such appliances require the bucket to come into contact with some heap or



PHOSPHATE TRANSPORTER AT SFAX, CARRYING THE PHOSPHATE FROM STORES AND WAGONS TO VESSELS.