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.

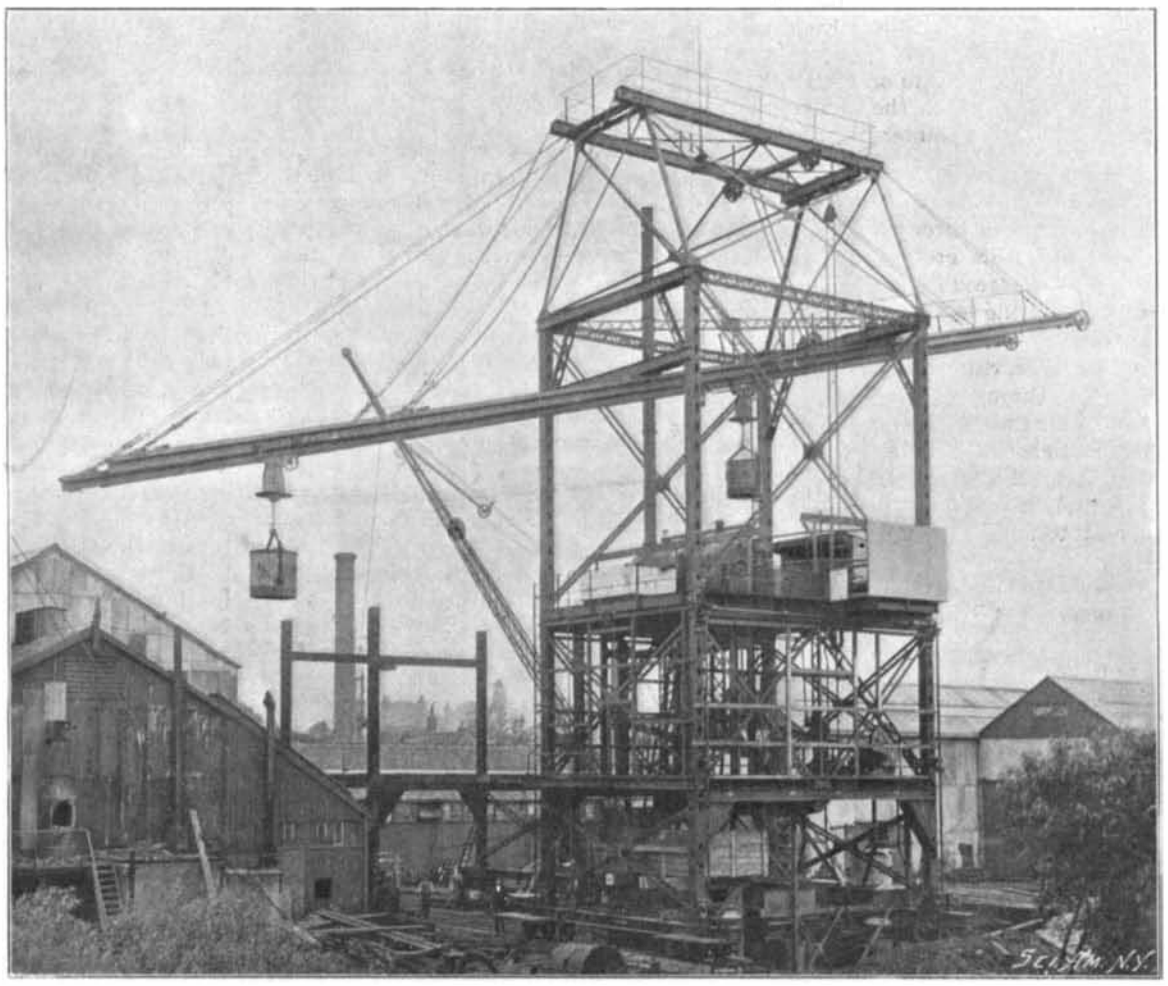
The wagons, laden with phosphates, run along the railway underneath the tower. These wagons are fitted with side doors so that the contents cannot be dumped out, but have to be removed by the aid of shovels. To accomplish this operation with celerity, the makers devised a large mechanical shovel, consisting 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.

other stop, but in this particular invention no such concussion is necessary, and the skip can be overturned at any point in the air.

In these transporters erected at Sfax, in order to prevent the transporting beam colliding with the masts and rigging of vessels the ends are hinged, so that if necessary they can be hauled up out of the way.

THE DAMAGE TO THE "OREGON."

Since the "Oregon" grounded in the Gulf of Pechili, on a submerged rock, a technical description of the injuries to the ship has been awaited with interest. In our issue of September 1 we gave an account of an eyewitness of the salvage operations, and we now publish some engravings showing the extent of the damage. A cable message from Kure dated August 29, 1900, is published verbatim below as it was received at Washington: "'Oregon,' outside plating frame fourteen to nineteen strake A port to B starboard indentation maximum depth eighteen inches plating not pierced frame eighteen to twenty-five port strake A B extending into A starboard and larboard aft indentation maximum depth twenty-four inches plating pierced over much of area up frame twenty-four and driven almost to inner bottom about twenty. Minor indentations on fore body forward frame fifty-five most serious keel frame ten to eleven twelve to fourteen three inches maximum depth strakes C D port frame twenty-four depth three one-half inches keel and larboard frame twenty-seven to thirty depth five inches strakes A B port frame twenty-seven to thirty depth four one-half inches strakes C D starboard frames forty-four to forty-five depth three one-half inches other indentations maximum depth one-half inch to two one-half inches some butts rivets started plating scored in places bilge keel starboard buckled two places inner bottom port side buckler frames eighteen to twenty-four over first longitudinal calking rivets started in places structural part longitudinals vertical keel floors frame eleven to thirty near indentations generally distorted some badly lower ends frames fifteen, sixteen, seventeen and floors and longitudinals frame eighteen to twenty-five port side to third longitudinal crushed vertical keel buckled places frames twenty-nine forward cellulose framing over minor indentations buckled varying extent lower plated bulkheads eighteen twenty-two buckled bulkheads fourteen twenty-nine and four and aft near frame thirty-two slightly buckled protective deck beams fifteen sixteen buckled at tops hold stanchions door frame slightly distorted bulkhead twenty-two pump room fire rooms fire room floor forward slightly bent six-inch branch main drain two suctions secondary drain broken certain drainage valve seats sea suction slightly distorted woodwork holds slightly damaged estimate cost permanent repairs twenty-five thousand time one hundred days home card damaged part frame fourteen nineteen and eighteen twenty-five first mentioned undergoing temporary repairs other places being calked riveted in view large cost and long time dock permanent repairs recommended completion of temporary repairs as now going on strengthening shoring weakened part structure building to ship's frame with wood covered with plating spaces to inner bottom filled cement watertight and structural work elsewhere to be carefully gone over far as practicable drain pipes doors valves overhauled."

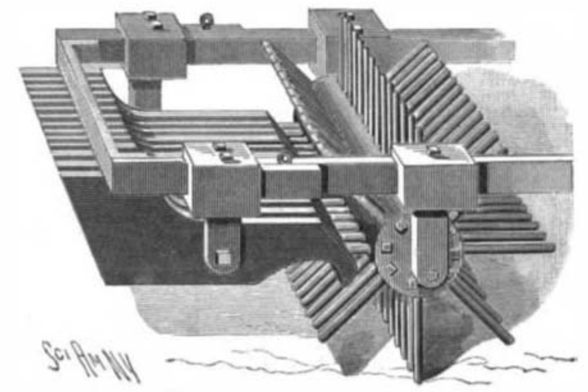
It is possible that the Navy Department will soon issue an amplification of this cable message illustrated by diagrams.

TWO logs of African mahogany from one tree have been sold in Liverpool for $7,680.

TWO NOVEL HARROWS.

Several harrows have been invented by Mr. William M. Baker, of Fortville, Ind., which are of such improved construction that we have selected for illustration from their number two which may be of some interest to our readers.

The first of our engravings represents part of a rotary harrow provided with a novel cleaning device. As a substitute for the rear roller usually found in such machines, Mr. Baker employs a series of blades, each of which has a hooked forward end intercurrent with the teeth of the preceding roller. The downward and rearward inclination of the forward edges of the blades serves to direct the trash to the rear; while the upwardly and rearwardly inclined edges of the blades cause any trash which might be carried up between adjacent hooks to pass downward. The hooks likewise serve to pulverize the soil.



BAKER ROLLER HARROW.

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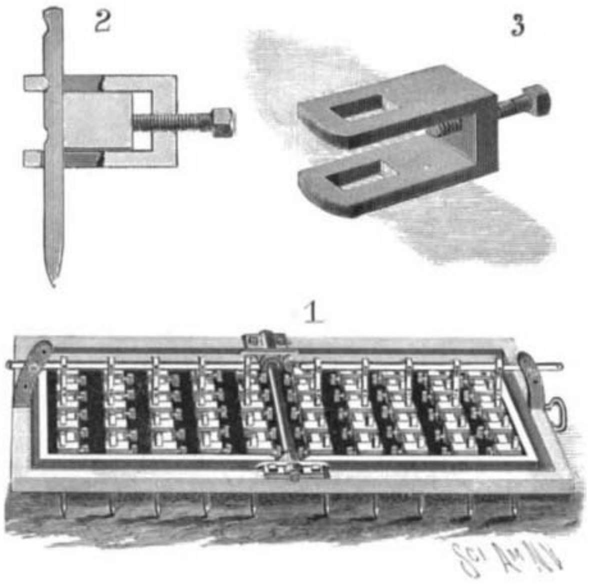

DOUBLE HARROW AND TOOTH CLAMP.

The second of our engravings represents a double harrow, the teeth of which are adjustably held in a simple clamp. The two harrow frames constituting the implement are located within a main frame, and are provided with supporting-bars journaled in the sides of the harrow-frames. The trunnions of the innermost supporting-bar of each harrow-frame enter the winged hubs of a shaft centrally mounted in the main frame. Thus a very simple method is provided for independently pivoting each harrow-frame in the main frame.

In order that the supporting-bar may not be weakened, the teeth are adjustably screwed in clamps of the form shown in Figs. 2 and 3. The shank of each tooth is notched. The upper and lower members of the clamps are formed with slots of unequal length, so that the forward wall of the upper slot will engage a notch in the tooth when the plain forward surface of the tooth is in engagement with the forward wall of the lower slot (Fig. 2). The teeth are firmly held in place by set screws.

The central teeth on the supporting-bars, as shown in Fig. 1, are provided with arms connected by a shifting-bar. Standards on the main frame receive and guide each shifting-bar, the standards being provided with apertures adapted to register with apertures in the outer ends of the shifting-bars. By means of these shifting-bars, the harrow-frames can be readily adjusted up or down, and the teeth be given any desired angle. The shifting-bars are secured in adjusted position to the standards by passing pins through registering apertures.

The World's Shipping.

Lloyd's Register, the new edition of which has just appeared, gives as usual, a vast amount of valuable statistics relating to the mercantile marine of the entire world. There are now 28,422 vessels having a tonnage of 29,043,728. Great Britain has 10,838 vessels and her tonnage is 14,261,254. From this it will be seen that the numerical proportion of British ships is not so great as is the case with some other countries, because the greater part of her ships are of larger size than those of other countries, and more of them are steam vessels. It is gratifying to note that the United States comes next to the British Empire. We have 3,135 vessels, with a tonnage of 2,750,271; Germany has 1,710 vessels having a tonnage of 2,650,033. Then comes Norway with 2,380 vessels with a tonnage of 1,640,812; then France, with 1,214 vessels having a tonnage of 1,350,562, and Italy with 1,176 vessels having a tonnage of 983,655; Sweden has a greater number of vessels than France, having 1,433, but as the vessels are smaller, the tonnage is only 637,272. Japan has 1,066 vessels, the tonnage being 574,557; Holland, 406 vessels with a tonnage of 530,277; Denmark has 802 vessels with a tonnage of 519,011; Austria-Hungary, 270 vessels with a tonnage of 416,084. Greece, Brazil, Belgium, Portugal and Chile all have a tonnage in excess of 100,000. The steam tonnage of the British merchant navy is superior to that of all other countries combined, but nearly half of the tonnage of the United States is made up of sailing vessels. Great Britain has more than 1,600 steamers of 3,000 tons and upward. Germany has 127 of the same size; the United States 120, and France 60. Great Britain now has 24 steamers with a register of 10,000 tons or more.

Bees as Poachers.

A very interesting case has originated at Warwick, N. Y., and if the decision is sustained on appeal, a most important precedent will be established. Bees owned by one person punctured the peaches of another while they were ripening, extracting the juice from the fruit, thus destroying it. The plaintiff placed his damages at $250.

Local experts gave testimony in both peach growing and bee keeping. The justice gave judgment to the plaintiff to the amount of $25 and costs. If the case is sustained, it will render the owners of the bees liable in damages for their incursion on the premises of other property holders, the same as horses, pigs, and other trespassers. A few years ago a suit was brought in Delaware County against a farmer to recover on a claim for pasturing bees. The plaintiff alleged that the bees had no right to obtain sustenance and material for making honey for the benefit of the owners from his property without compensation. The contention of the plaintiff was sustained and judgment was entered.

View from Port and Underneath, Showing Injury to Keel between Frames 14 and 19. Kure, July 25, 1900.

View from Port, Showing Temporary Patches Put on by Diver over Injuries between Frames 19 and 24.

INJURY TO UNITED STATES BATTLESHIP "OREGON."