Steel Railway Ties.

Experiment is being made by the Delaware and Hudson Railroad Company to test the adaptability and superiority of steel ties for railroad uses. On a section of the road leading south from Ballston for nearly half a mile, the wooden sleepers have been removed and the track reconstructed with the steel ties. So far they give good satisfaction. As trains pass rapidly over this piece of road, a peculiar buzzing noise is noticeable, also the vibration caused by the wheels upon the rails is observably greater; but it is also the smoothest and pleasantest riding piece of road between Troy and Saratoga. The test of the safety and adaptability of the steel ties is being made under the supervision of A. J. Swift, chief engineer of the road, and they will be adopted or rejected upon his recommendation.

So far he regards the steel ties as a success; but no more will be laid until those now in use have had the test of the winter to see in what manner, if any, they will be affected by ice, frost, and snow, and if they are equally safe in clay and quicksand and gravel. If they stand all these tests, Mr. Swift has no doubt of the steel ties being speedily adopted for general use as the old wooden sleepers need to be replaced. The objection of their greatly increased first cost is fully met and overcome by their durability. Of their greater safety, if they stand the test, there can be no doubt, as by their use it is impossible for the rails to spread or in any other manner to become displaced. They also give to the track the perfect effect of a continuous rail. The steel ties are in shape an inverted "T." They are seven feet long, seven inches wide, and are laid twenty-two inches apart from centers. At either end of the tie is a socket, in which is laid a block of wood, four by five inches square and about sixteen inches long, and upon which the rail is laid and firmly held in place.

AN IMPROVED SWITCH WORKER.

The accompanying illustration represents a device adapted for attachment to street railway cars and similar vehicles, and so constructed that the driver may with one hand, and without interfering with his regular duties, readily open or close a switch in the path of the vehicle, the part of the device contacting with the rails, when released, automatically leaving the switch and taking a position some distance above the track. In a suitable casing, adapted to be arranged vertically over one rail of the track in the end of the car body, is held to slide a bar having a central bore, in which a downwardly projecting switch rod is adjustably secured by a thumb or other screw. The lower end of this switch rod may be simply wedge-shaped, as shown in one of the views, or a beveled wheel may be mounted therein, as shown in the small view. The vertical bar in which the switch rod is secured is normally spring-held at the desired height above the track, but is pushed downward to move the rail by a rack and gear wheel operated by a hand lever within convenient reach of the driver. On the upper end of this bar is a beveled gear, meshing into other gear, and operated

HEITMEYER'S SWITCH WORKER.

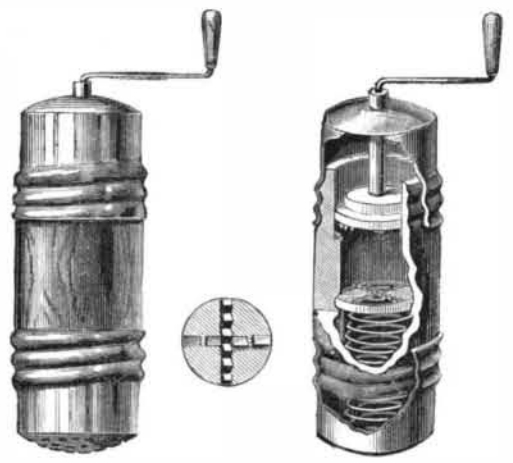
by another hand lever, whereby the vertical bar and its attached switch rod may be turned through one-half of a revolution. By this means the wedge-shaped end of the switch rod, or the beveled wheel thereon, may be turned to engage the switch rail of an open switch when it is desired to close the same.

For further information relative to this invention, address the patentee, Mr. H. G. Heitmeyer, 474 Race Street, Cincinnati, O.

AN iron elevated railway, much like the New York pattern, six miles long, is now in process of construction in Liverpool. The cars are to be worked by electricity.

AN IMPROVED NUTMEG GRATER.

The illustration represents a simple device by which a nutmeg or similar substance may be ground as used and shaken as pepper is shaken from a common pepper box. It has been patented by Mr. Cassius M. Maxson, of Allentown, N. Y. The cylindrical part of the grater may be made of porcelain, glass, wood, or any other suitable material, and decorated to look neat and attractive. The ends are closed with caps, screwed or otherwise fastened on the body, one of the caps being perforated while the other forms a bearing for a small crank shaft, to the inner end of which is secured a



MAXSON'S NUTMEG GRATER.

grinding disk, shown in the small sectional view. The opposite grinding disk has a longitudinal movement upon ribs on the inner side of the body, and is held pressed against the nutmeg, and pressing the latter against the other grinding disk, by a coiled spring. A portion of the teeth in each grinding disk are arranged to cut grooves in the nutmeg, the other teeth cutting off the ridges thus formed, while in the lower disk are openings through which the grated nutmeg may pass to the openings in the lower cap. To insert the nutmeg, this cap, the spring, and the lower disk are removed, the parts being afterward returned to working position, as shown.

Spontaneous Combustion of Hay.

After a series of very careful experiments, Prof. Cohn, of Breslau, has found that the heating of damp hay to a temperature sufficient to cause the spontaneous combustion of it is due to a fungus. He first studied the heat-generating action of *Aspergillus fumigatus*, which has the bad reputation of heating barley in the course of germination and of rendering it sterile. Through the effect of the respiration of the little germ, that is to say, through the combustion of the starch and other hydrocarburets which the diastasic ferment converts into maltose and dextrine, the temperature is raised by about 40°. The heating of the germs to more than 60° occurs only through the intervention of the *Aspergillus*, which acts as a ferment. Under these conditions it reaches its greatest development and produces its maximum action. In this state it rapidly burns the hydrocarburets.—*La Petite Revue.*

Our Latest New Steel Cruiser.

The San Francisco, a sister ship of the Philadelphia, built at the Union Iron Works, San Francisco, had her trial trip in the Santa Barbara channel, on the California coast, on the 27th of August, with results which were extremely gratifying to her builders, as well as to the Bureau of Construction of the Navy Department, after whose plans she was built. The run was for four consecutive hours, during which time the average speed maintained was 19·516 knots per hour. During a portion of the run, however, the water got into the ducts which supply the current of air used in a forced draught, and the fans began to force water into the furnaces. This caused a material loss of speed, and it is claimed that, making a proper allowance for this accident, the average speed would exceed 19·7 knots per hour, which would make the record of the San Francisco higher than that of the Philadelphia. The contract for the vessel provided that the builders should receive $50,000 additional for each one-quarter knot attained over 19 knots per hour, and they therefore earn $100,000 over the contract price, which was $1,426,000.

This is the second vessel of our new navy which has been built upon the Pacific coast, the Charleston having had her trial trip a few months ago, and all the castings made there, and the finish and staunchness of the vessels have been declared to be as perfect as ever went into an American ship. Experts declare that the San Francisco has finer lines than those of any other vessel of the new navy, and that for this reason, and the strength of her boilers, she should also be the swiftest vessel among the new cruisers.

The dimensions of the San Francisco are: Length over all, 328 ft.; length on load line, 310 ft.; breadth, 49 ft.; draught forward, 16 ft. 9 in.; draught aft, 20 ft. 11 in.; displacement, 4,038 tons; horse power, natural draught, 7,500 horse, forced draught, 11,000 horse. The vessel has a protective deck for its full length, sloping down to its sides about four feet below the water line, the sloping sides being two and a half inches thick and the top portion one and a half inches thick. The machinery and all the vital parts of the ship are below this deck, under which, along the sides, the space is used for coal bunkers. The vessel also has a double bottom and many water-tight compartments. She is driven by two three-bladed built-up screws of fourteen feet diameter each, and two horizontal triple expansion engines. She has three hollow masts with two military tops for Gatling guns, and her armament will consist of twelve six-inch breech-loading rifled guns, four Hotchkiss revolving cannon, one one-pounder rifle, and two Gatling guns. She will require a crew of 300 men.

AN IMPROVED BOB SLED.

The illustration represents a novel construction of bob sleds, designed to provide for a uniform movement of both the forward and rear sleds in turning corners, and by which a minimum of strain will be exerted upon the several parts of the sled. It has been patented by Mr. Jesse Yenne, of Egan, Montana. The forward ends of the runners of each sled are pivotally connected by a cross bar, the cross bars having reduced ends seated in essentially dovetailed recesses, whereby the runners are capable of a limited independent longitudinal movement. Upon the upper face of each runner a rave is rigidly secured, of somewhat triangular shape, in the upper flat part of which is an elongated slot or opening. Directly under this slot a plate having a central opening is bolted to the upper surface of the runner, and in each runner, below the opening in the plate, is an essentially dovetail recess, the widest portion of which is at the bottom. In the main bolsters at each end is secured a pin, the upper end of which passes through and slides in the slot of the rave, while the lower end of the pin enters the dovetail recess in the runner. A sand bolster is pivoted upon the main bolster in the usual manner, but when the main bolster only is used, it is made in two sections, the upper surfaces of the raves then passing through recesses in the opposed faces of the bolster sections. The forward end of the reach bar connecting the sleds is connected to the front cross bar of the forward sled, its rear end passing through an opening in the main bolster of the forward sled, and having a slot through which passes the pivotal pin of the sand bolster. Each cross bar of each sled has a rigidly attached tongue, the tongue of the rear sled being attached to the rear end of the reach bar. Upon the cross bar of the forward sled, and also upon its tongue, a block is rigidly fastened with staples, one of which passes through the forward end of the reach. This attachment is designed to facilitate loosening the rear sled should its runners become frozen to the ground, by throwing up the tongue to turn the forward cross bar, and thus force the reach rearward to act as a lever upon the tongues of the rear sled. The construction is such that the bolsters have movement upon the raves and in the runners, while the reach is capable of lateral movement, the peculiar connection between

YENNE'S BOB SLED.

the cross bars and runners being designed to permit the runners of the sleds to run in parallel lines, one in advance of the other.

The Electrical Telegraph.

In 1747 Bishop Watson sent the discharge of a Leyden jar through 10,600 feet of wire suspended on poles on Shooter's Hill, and a plan for an alphabetical telegraph to be worked by electricity appeared in *Scots Magazine* for 1753, which, however, seems never to have been realized. At Geneva, in 1774, a telegraph line was erected by Lesage, consisting of 24 pith ball electroscopes, each representing a letter.—*M. Farrant, Science Gossip.*