SIMPLE SOUND RECORDER.

BY GEO. M. HOPKINS.

The complex nature of sonorous vibrations is beautifully exhibited by the records made by the phonautograph; but the instrument is so bulky, so expensive, and so inconvenient to use that few students are able to avail themselves of actual experiments in this direction.

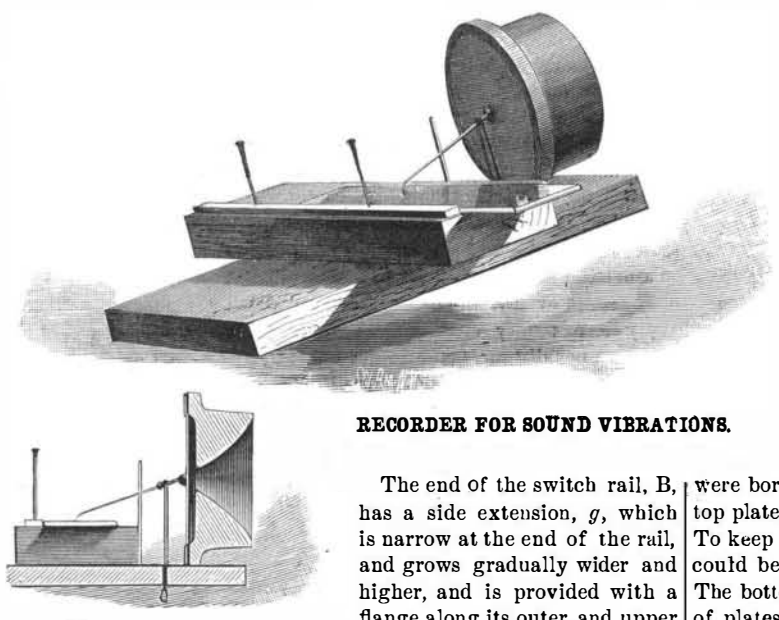
The annexed engraving shows an exceedingly simple device, by means of which sounds may be autographically recorded fully as satisfactorily as with the phonautograph. The main difficulty with this sort of apparatus seems to have been the propelling of the smoked plate at a uniform rate of speed under the stylus. In the instrument illustrated this is accomplished by simply inclining the support of the plate and allowing the plate to slide off quickly by its own gravity.

This apparatus consists of a wooden mouthpiece like that of a telephone, with a parchment diaphragm glued to its back, and provided with a tracing point, which is slightly inclined downward toward the guide for the plate.

This tracing point is a common sewing needle, having its pointed end bent downward. It is cemented at the eye end to the center of a diaphragm by a drop of sealing wax. The mouthpiece is attached to a base supporting the crosspiece upon which the smoked plate is placed.

A thin strip of wood fastened by two common pins—one at each end—serves as a guide for the smoked plate.

To prevent the needle from being deflected laterally by the moving glass a long needle is driven down into the baseboard in contact with the tracing needle; and to give the needle point sufficient pressure to keep it in contact with the smoked plate a very small rubber band is slipped over it and drawn down through a small hole in the baseboard, as shown in Fig. 2, until the necessary tension is secured.



RECORDER FOR SOUND VIBRATIONS.

The best plates for the purpose of making the tracings are the microscope slide glasses with ground edges. They may be readily smoked over a gas jet turned down quite small, or over a candle or kerosene lamp. The flame in any case should be small and the film of smoke fine and very thin.

The smoked plate is placed on the support and against the guide and under the needle, and the instrument is inclined until the plate rests against the guide. Now the mouth is placed near the mouthpiece, and a vowel is uttered, while the instrument is inclined sidewise at a sufficient angle to permit the glass to slide off quickly. Of course the glass should fall only a very short distance, and it is well to provide a soft surface for it to alight on.

If all this is done with the slightest regard for precision a beautiful tracing will be secured, which will show the composite nature of each sound wave. It is surprising how perfectly regular and uniform the entire tracing will be, considering the comparatively crude means employed in producing it.

The beginning of the sinuous line will be somewhat imperfect owing to the slow initial movement of the plate in its descent, but the greater portion will be found perfect.

After having made one line, the pins holding the guide are moved forward, placing the guide in a new position, when the operation of tracing may be repeated with another vowel. Monosyllables and short words may be recorded. If the plate is made long enough it will, of course, receive an entire sentence.

These tracings may be covered with a second microscopic glass plate to protect them, or they may be mounted as a microscopic object for a low power by putting a thin cover over them in the usual way. Used as a lantern slide they give fine results.

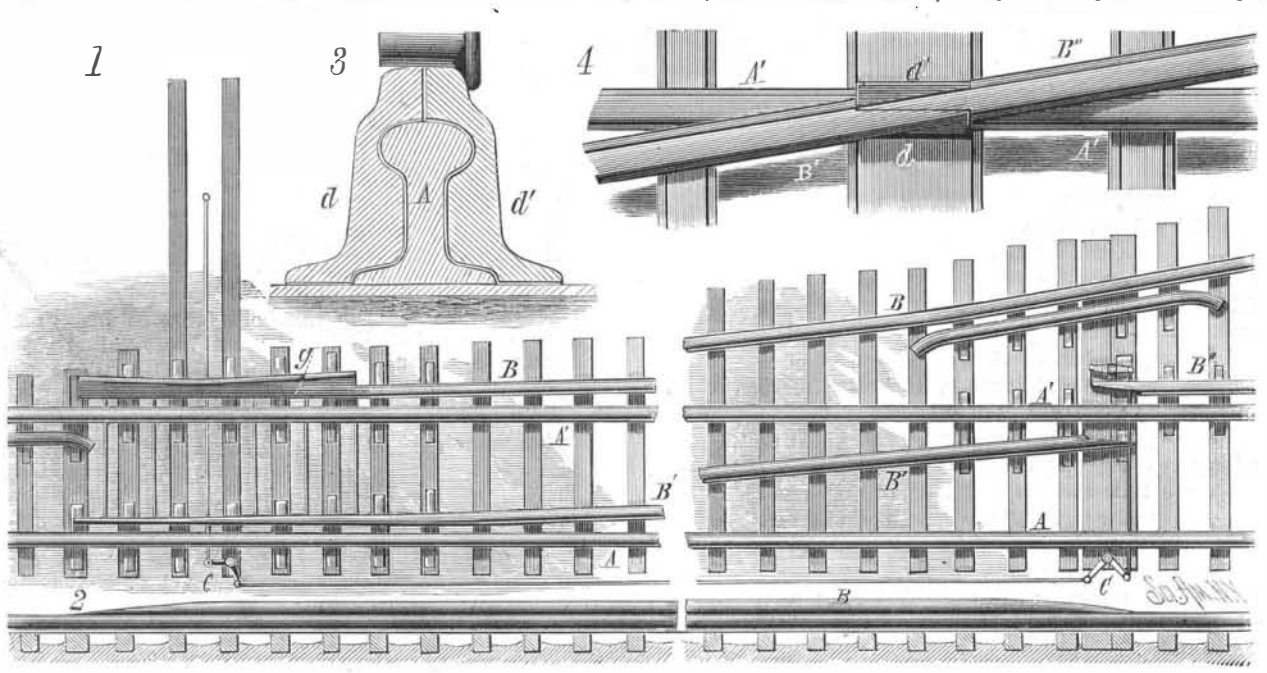
IMPROVED RAILROAD SWITCH.

The engraving shows an improved railroad switch recently patented by Mr. John H. Hortman, of Hopewell, Mercer Co., N. J. The principal novelty in this invention consists in making the switch rails high enough at the points where they take the wheels from the main track to elevate the cars, so that the flanges of the car wheels will be carried over the main rails.

Fig. 1 in the engraving is a plan view of the main track and switch, showing the switch open; Fig. 2 is a side elevation of the main track and switch; Fig. 3 is a transverse section of the main track rail and the switch rails at the junction of the latter; and Fig. 4 is a plan view, showing the inside switch rails closed and overlapping the main track rail.

The switch rails, B B′ B″, are higher at their junction with the main track rails, A A′, than the general level of the track, and the ends, *d d′*, of the switch rails are tapered, and are inclined from the extreme ends upward to the point of meeting, where they are high enough above the main track rail to carry the flange of the car wheel over the main rail. They are cut away below (as shown in Fig. 3) to receive the main rail as they are closed together to form a continuous switch rail. This rail is lapped on a joint that is parallel with the median line of the main rail, so that the wheels may be carried upward and over the main rail without shock or jar.

Both ends of the switch rails are moved simultaneously by means of a switch lever and rods and the bell crank levers, C, and a straight lever connected with the tapered end of the rail, B″.



HORTMAN'S RAILROAD SWITCH.

The end of the switch rail, B, has a side extension, *g*, which is narrow at the end of the rail, and grows gradually wider and higher, and is provided with a flange along its outer and upper edge, which serves as a guide to the car wheel, and pushes the wheel over, while it is raised up, so that its flange passes inside the main track rail before the wheel leaves the extension on the end of the rail.

This invention is intended to avoid all of that class of accidents due to misplaced switch rails by always leaving the main track entire.

Further information in regard to this invention may be obtained by addressing the inventor as above.

The Queen of Bedders.

This rose, which belongs to the Bourbon class, is of a rich, glowing crimson color, very double, and blooms from early summer until frost. Although not a very strong grower, it will amply repay this defect by the enormous quantity of flowers that it produces, which contrast so well with its bright foliage. A bed of these roses, 20 x 50 feet, has been known to have over 20,000 flowers and buds on at one time, a statement which, considering its reliable source, would alone recommend this variety to any one wanting a good plant for that purpose. Now is a good time to plant roses, and the above variety can be had at a reasonable price from any of the firms advertising roses in this paper.

Those who intend planting roses, and wish to have success, should go to the trouble (if the soil is not naturally good) of digging their ground at least 18 inches deep, filling the bottom with a layer of manure, and broken stones for drainage, then filling up with *good rich soil*, adding plenty of sand, sifted cinder, ashes, and lime. But to those who do not wish to go to this trouble, it is sufficient to say that roses will grow in almost any kind of soil. Do not forget to peg down any kind that is of too rampant a growth; they will do better for it.—*Farm and Garden.*

The Hudson River Tunnel.

Work is progressing rapidly and favorably on the New Jersey side of the tunnel. The imperfection in the arch of one section of the brickwork near the second air lock has been repaired. This was effected by removing one plate at a time, excavating the silt until the plate could be readjusted at the proper grade, and then carrying over the brickwork. It was only necessary, says *Engineering News*, to remove the arch from the spring lines, as the remaining portion was perfect. But a few hours were required to bring the section—10 feet—up to grade, when the alignment was as perfect as could be desired. The heading of the north tunnel is now about 950 feet from the shaft.

The caisson at the New York end we described and illustrated in our issue of December 24 last. This caisson was sunk in sand, which followed the water into the chamber upon the least reduction of the air pressure, and which presented a seemingly insurmountable barrier to all future progress; yet the main difficulties have been overcome most creditably, and the north tunnel is now on its way across the river.

Two or three days since we visited this portion of the work, and after donning the regimental raiment, entered the air lock and descended the iron shaft into the caisson. The masonry of the two tunnels has been completed up to the arch of the roof. In the caisson at the New Jersey end, it will be remembered that the tunnels were united in one large chamber; but, in this case, the tunnels have been separated by a common central wall.

When everything was in readiness to cut through the river side of the caisson, auger holes were bored through and the woodwork chipped out and the top plates inserted, braces holding them securely in position. To keep the exposed portion from flaking, before the plates could be adjusted, wooden sheathing was held against it. The bottom of the tunnel was started as soon as the ring of plates was finished, and then the sides and arch were built. At a distance of 12 feet from the side of the caisson a bulkhead of iron plates was built and braced by struts resting against the caisson. This plan was due to the ingenuity of Chas. W. Clift, the master machinist of the entire works. This bulkhead will be moved forward, section by section, until the work is free from sand, and will be braced from the end of the completed masonry. In order to prevent the escape of air, the joints and exposed portions of the heading are covered with a layer of silt brought from the other side. This renders the work practically air-tight, and has proved an economical and effective substitute for other materials calculated to accomplish the same results.

The masonry is 2 feet thick, and is lined with compressed asphalt and limestone bricks 4 x 5 x 12 inches. The seams are of pure Saylor's American Portland cement. This method of construction renders the work both air and water tight, and if the brickwork be of ample strength, the fact that the bond between cement and asphalt is not perfect, and the fact that brick made of asphalt and limestone, although brittle when struck a sudden blow, will yield slowly to compression, are problems which in this case become of minor importance.

The exposed parts of the caisson have been covered with a layer of cement as a preventive against fire and decay.

The bottom of the tunnel is 56 feet below mean low tide, the air pressure 17 pounds, and the temperature 84° Fahr.

Oiled Floors.

The dangers attending oiled floors and seats in public buildings, appear to have been illustrated in the recent destruction of Walker Hall, one of the Amherst College buildings, whose floors had been oiled only the day before. The danger is not so much in saturating the woodwork, but in the waste used in performing the operation, which careless workmen are liable to leave behind them. The *Springfield Republican*, in speaking of this fire, relates also another instance: that some years ago contractor Johnson, who built the Northampton First Church, and many other similar edifices in the Connecticut Valley, "had an impression" one evening that something was not right about a church he was finishing, the pews of which the workmen had been oiling that day; so he went to the building and unlocked it to find that flames were just breaking out near the entrance of the audience room. When one of the men left work at 6 o'clock he laid the piece of cotton waste which he had been using on the rail of the last pew, and the result was spontaneous combustion in three or four hours.