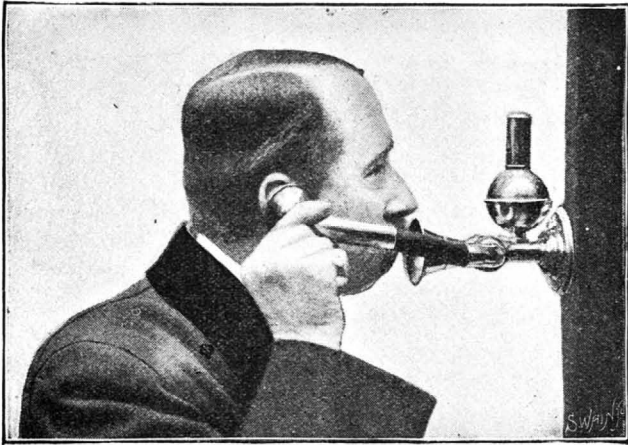


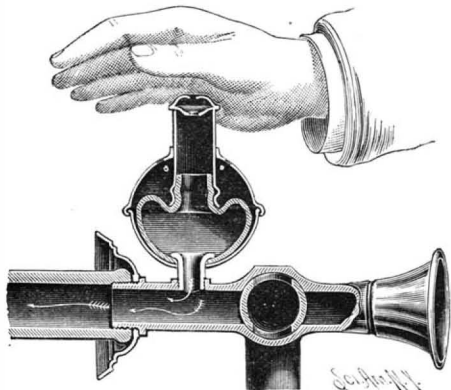
AN IMPROVED SPEAKING TUBE.

This device, patented in America, Europe, Australia and other countries by Mr. H. A. Cutmore, does away with many objectionable features of the old-fashioned speaking tubes, the whistle being automatic and there being no necessity of changing the tube from mouth to ear, and *vice versa*, during conversation. A few inches beyond the mouthpiece into which the speaker talks is a cock, in which is a plug leading to a flexible



CUTMORE'S "HOMACOUSTIC" SPEAKING TUBE.

tube, at the end of which is an ear cup, the arrangement being such that when the ear cup hangs down the passage to the mouthpiece is closed, and when raised to the ear the passage is opened, and the voice from the speaker at the distant end of the tube comes through the flexible tube to the listener. Just beyond the ear tube connection, in the top of the main tube, is a connection with a globular metallic air chamber, in which is a rubber bulb and whistle, a plunger working vertically in the top of the chamber, and by pressing with the hand upon this plunger, as shown in one



SPEAKING TUBE WHISTLE.

of the views, the usual call or whistle is sent to the distant end of the tube. By means of a switch plate, shown in another view, the operator may be placed in communication with any number of other rooms without the multiplication of flexible tubes, mouthpieces, whistles, etc. The lower plate of the switch is rigidly fixed to a given number of speaking tubes, and on it revolves an upper plate provided with whistles and indicator shutters corresponding with the different tubes, the upper plate being revolved by a small knob to connect with any of the different tubes through which a call may have been received or it may be desired to talk. The throwing back of the shutter, as shown, indicates the tube through which the call comes, and the pressing upon the plunger sends the call when the proper connection has been made. The improvement can be readily fitted to existing speaking tubes at small cost.



SPEAKING TUBE SWITCH.

for fixing on the floor by the side of a desk, novel tube connections for use under a desk or on a wall behind a chair, and double ear tubes for use in factories, machine shops, etc., where there may be an unusual

amount of noise. A form of instrument has also been especially designed for use on board ship in connection with a system of electric signals.

Further information relative to this improvement may be obtained of Mr. S. Stretch, Jr., No. 527 West Twenty-third street, New York City, where it may be seen in practical use.

Forell's Portland Cement.

Roman cement has been defined at the international meeting of cement makers as a product obtained by heating aluminous chalky marl below the temperature of fritting until the carbonic acid is driven off and then reducing it to a fine powder. All Roman cement thus made contains a varying percentage of lime and hydraulic factors. The hydraulic factors mostly consist of hydrate of alumina, hydrate of silica, and peroxide of iron, the amount of the hydraulic factors depending upon the nature of the raw material used. When water is added to the Roman cement, these hydraulic factors combine with the lime and cause the cement to set. This setting, however, is very imperfect, as the combination of the lime with the hydraulic factors is very incomplete.

According to the invention of Carl von Forell, of Brunswick, Germany, powdered hydrate of calcium is added to the powdered Roman cement, so that the lime and the hydraulic factors contained in the mixture may, respectively, be in the proportion of seventeen to ten. The amount of the hydraulic factors in the Roman cement is first ascertained and the hydrate of calcium added, to bring the mixture up to the desired proportions. The mixture is then ready for use, and will be found to possess the essential characteristics of Portland cement, although much cheaper to make, as true Portland cement requires a very high temperature and thorough calcination for its production.

Another improved cement of Forell is made as follows:

Roman cement is analyzed and the amounts of lime and of the hydraulic factors are accurately determined. A chemical substance is then added to the cement, so that the mixture shall contain seventeen parts of lime to ten parts of the hydraulic factors. The chemical substance preferred for this purpose when the cement contains lime in excess is the silicate of alumina, which is a hydraulic factor, and this substance is mixed with the cement in the form of powder. The resulting composition of matter is a very superior artificial cement, and the exact proportions of the mixture are very important, as when water is added to the mixture there ensues a perfect and complete combination between the lime and the hydraulic factors, and neither the lime nor the hydraulic factors remain in an uncombined condition in the cement.

This cement is very strong, but sets with only moderate thickness. The use of silicate of alumina is preferred, because of the existence of lime in the form of silicate of lime in cements which are burned at a comparatively low temperature, and because lime and silica have the property of combining with each other in various proportions.

An Eight Mile Submarine Tunnel.

The shore and submarine borings between Capes Traverse and Tormentire have proved beyond a doubt the correctness of deductions published years ago by Sir William Dawson, Dr. Selwyn, and Dr. Ells, of the Dominion Geological Survey, which pointed to a continuous and watertight formation under the Northumberland Straits, along the alignment of the eight mile tunnel proposed in 1886 by Sir Douglas Fox in consultation with the Hon. W. W. Sullivan (now chief justice), as being the only feasible means of placing the Province of Prince Edward Island in "continuous daily communication" with the mainland of Canada as demanded by the "terms of confederation."

The geological formation under the Northumberland Straits is the Lower Permian, consisting of alternating layers almost horizontal, but dipping toward the island, of red clay shale and fine red sandstone, structures eminently and economically suitable for subaqueous tunneling. Consequently there is every prospect of this advanced engineering project being commenced by the government before the close of 1893.

Sir Douglas Fox, the Dominion consulting engineer, will probably grade the tunnel from the mainland through a 30 foot continuous bed of red clay shale for six miles, thence for the remaining two miles to Prince Edward Island intersecting numerous alternating beds of shale and sandstone.

Mr. Alfred Palmer, Mills building, New York City, reporting engineer of the scheme, and Mr. Herbert Hind, resident engineer of the Hudson River tunnel, hold a Canadian patent which will enable the contractors to carry out this immense undertaking within the short space of two years.

Their invention consists of sinking shafts or caissons, with or without the aid of air pressure, at predetermined points (say one mile intervals) along the axis of the proposed tunnel, and down to the level of the proposed tunnel, thence driving headings in both directions. Thus by this simple method twelve or

more headings may be driven at the same time and the work carried on, with six or more times the speed over the usual method of driving two headings, one from each shore, and meeting in the center.

The proposed tunnel is to be constructed of brick set in cement (large quantities of clay free from lime being found in the island), but where the slightest dampness manifests itself, cast iron segments grouted behind with cement will be used, as in the St. Clair (Sarnia) and Hudson River tunnels.

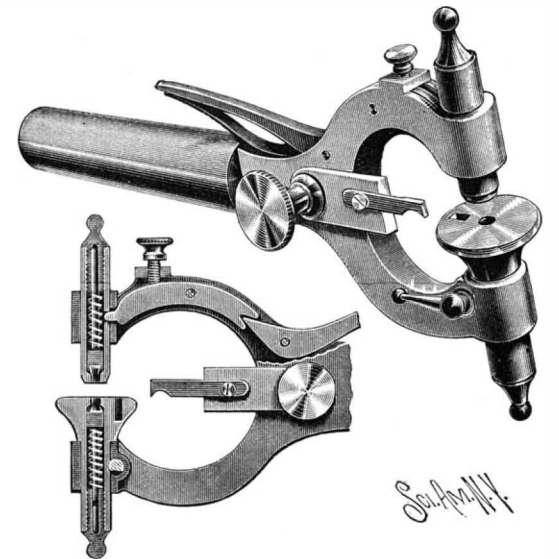
Electricity for all power and light will be used throughout the construction of the work. Traffic also will be worked by its agency.

The method suggested by Sir Douglas and Mr. Francis Fox for ventilating this lengthy tunnel is to place an exhaust fan at one end of the tunnel, and by closing a door at the other end a partial vacuum is thus formed until fresh air enters, each time the door is opened to permit of the passage of the trains.

In our issue of November 26, 1892, we illustrated the novel apparatus used for testing the geological formation, and as the attention of the scientific world is already being drawn to this advanced and interesting engineering project, we shall hope at some future time to illustrate and describe the same for the benefit of our readers.

AN IMPROVED WATCHMAKER'S TOOL.

The tool shown in side view and enlarged section in the illustration combines a calipers for truing balance wheels, a beat indicator, and a poising tool. It has been patented by Mr. George W. Cameron, of Poplar Bluff, Mo. The fork of the tool has tubular bearings, in the lower one of which is held a threaded sleeve containing a spring sliding block and a screw plug, while in the upper bearing is a sliding sleeve carrying a sliding block, spring and screw-threaded plug, the latter serving to adjust the tension of the spring with-



CAMERON'S WATCHMAKER'S CALIPERS.

out changing the position of the block. A lever mechanism applied to the handle and fork positively adjusts the sliding sleeve and its contained parts up or down. The threaded sleeve in the lower bearing carries also a jewel block, spring and screw plug, and a nut for clamping the latter in place. In line with the space between the two heads is adjustably held an indicator arm. The adjustment of the tool, by means of the nuts and sleeves, for the different uses to which it may be put, can be very readily effected.

Ants in Africa.

A correspondent of the *Daily Graphic* writing from Umtali says:

Sir John Lubbock ought to come and live here; he could revel in ants. There are millions and tens of millions of them. The ground round our huts is riddled with deep holes, the entrance to white ants' nests. These insects are terribly destructive; a leathern bag will be eaten into holes in one night. I think everything in the country would be devoured by them if it were not for the black ants. These are quite half an inch long, and they prey on the smaller white ants. One suddenly sees a long black line extending for thirty or forty yards along the hospital compound. The line moves with a sharp, rustling sound, like the crisp rustling of dried leaves. One looks closer and finds that the black line is an army of ants going to storm a white ant heap. One ant alone goes at the head of the column, which is about eight inches wide. On each side run single ants, bustling up stragglers and rushing to drag sticks and straws out of the way of the army, which streams down into the nest it has in view, and in about ten minutes streams home again in excellent order, each black ant carrying a white one. It is a most curious sight. There are very few birds to be seen; a few golden orioles and some dear little black and gray birds, the size of tomtits, are all that one comes across.