

temperature is 87° . As the mean surface temperature is 66° , and the depth of uniform temperature may be assumed at 50 feet, the increase is at the rate of 57 feet for one degree. At Louisville, Kentucky, is an Artesian well 2,086 feet deep, with a bottom temperature of $86\frac{1}{4}^{\circ}$. As the surface temperature is $55\frac{1}{2}^{\circ}$, the rate of increase is one degree for every 66 feet. The Belcher well at St. Louis with a depth of 2,199 feet, has a bottom temperature of $73^{\circ}.4$. The surface temperature being 55° , the indicated rate of increase is one degree for 116 feet. This is exceptional. At Columbus, Ohio, an Artesian well 2,775 $\frac{1}{3}$ feet deep gives a bottom temperature of 91° with a surface mean of 52° . This implies a rate of increase of one degree for every 77 feet. Again, the well at the Insane Asylum, St. Louis, is 3,843 $\frac{1}{2}$ feet deep and affords water at 105° , giving a rate of increase of one degree for 76 feet.

In deep mines, the temperature becomes intolerable, and measures have to be adopted for the introduction of fresh air from the surface. In the deep workings on the celebrated "Comstock Lode," the temperature of the water at 2,000 feet is 130° . The water which filled the Savage and Hale and Norcross mines for two years, had a temperature of 157° . At 3,080 feet, the temperature is 170° . To cool the air sufficiently for the endurance of the miners, over thirty tons of ice were consumed daily. [See further, Talk XXI.]

Tunnels through mountains generally attain oppressive temperatures. The Mont Cenis Tunnel through the Alps, between Turin and Chambery, lies 4,093 feet below the surface of the Pass, or 5,251 feet below the summit of Mt. Frejus, and is eight miles in length. The rise of temperature discovered in the rocks is about fifty degrees.

Assuming the rate of increase to be one degree for 60 feet of descent, we should obtain, in the latitude of New York, heat enough to boil water at a depth of about 9,000 feet. At the depth of 50 miles, the temperature would be $4,600^{\circ}$, which is far above the melting temperature of ordinary mineral substances. In this method of reasoning we find an easy