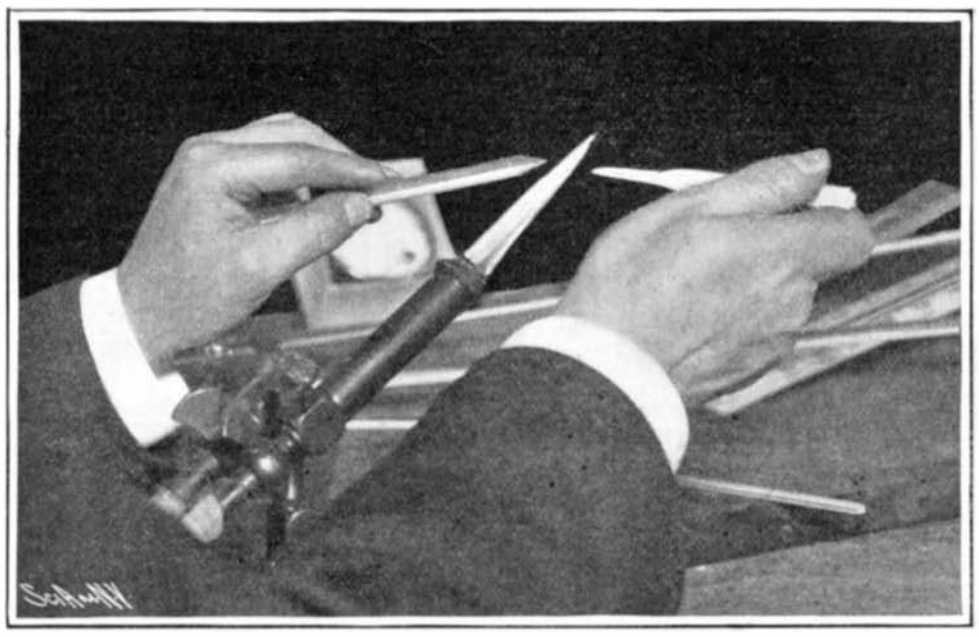
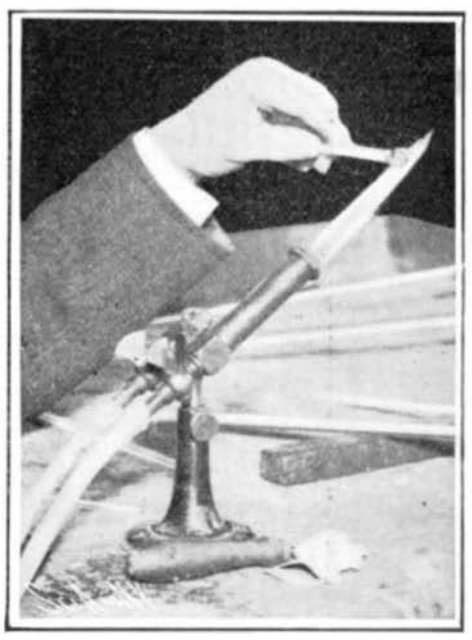
HOW TO MAKE A MERCURY THERMOMETER.

The first thing to be considered in the making of a thermometer is the character of the glass to be used. The thermometer maker always selects a length of annealed glass, so hard that it melts with readiness only in the blowpipe, and absolutely uniform in bore. The length of glass is held in the blowpipe at the point where it is to be severed until it becomes so thoroughly plastic in the flame that it almost drops apart. When the glass has been thus softened it is withdrawn from the flame, grasped at each end, and quickly pulled apart. The result is two tubes, sealed at one end.



Melting the Glass and Drawing It Apart.



Heating the End Before Blowing.

The next step is the formation of the bulb. One of the two tubes obtained by the process just described is held in the blowpipe, the sealed end being subjected to the heat. When the glass has been melted sufficiently, the tube is removed from the blowpipe. By blowing through the open end, a bulb of any size can be formed.

After the End Has Been Heated in the Blowpipe the Bulb is Blown.

Creating a Vacuum by Boiling Mercury in the Bulb.

Immersing the Tube in Mercury so That the Metal Rushes Up to Fill the Vacuum.

After the bulb has been blown, the next step is the filling of the tube with mercury. To effect this, the open end is plunged in a vessel of mercury. The liquid metal rises slightly in the tube. The tube is then reversed, so that the mercury runs down into the bulb. By heating the bulb in an alcohol flame or Bunsen burner, the mercury is made to boil. The vapors given off drive out the air, thereby creating a vacuum. When this point has been reached, the open end of the tube is plunged into mercury, which in order to fill the vacuum, rushes up and completely fills the tube. The open end is now closed with sealing wax in order to prevent the entrance of air. Hermetic sealing is effected by holding the tube in the blowpipe beyond the wax-plugged open end, by drawing the molten end off.

Two fixed points must now be taken. The lower is usually taken first. The thermometer is placed vertically in finely-pounded melting ice, or preferably snow, contained in a vessel which will allow the water to drain away. The whole of the mercurial column should be immersed in the ice. After from twenty minutes to half an hour the thermometer may be raised until the top of the mercury is seen just sufficiently for its position to be noted. This is the freezing point—32 deg. on the Fahrenheit thermometer, 0 deg. on the Centigrade.

The temperature of water boiling is the higher fixed point. To determine this the tube of mercury is held in the steam of boiling water, which can be done by running the tube through a cork and suspending it by a wire or other means in the vapor. As the boiling point depends upon the pressure of the atmosphere, the height of the barometer must now be taken. If it stands at 760 millimeters, the temperature is 100 deg. C. If not, a calculation will be necessary; 1 deg. C. or 1.71 deg. F. must be added or subtracted for every 26.7 millimeters above or below 760 millimeters. The interval between the two fixed points is then divided into 100 parts or degrees for a Centigrade, or 212 parts for a Fahrenheit thermometer. To graduate the scale above 100 deg. a column of mercury is measured below that point, then made to pass above step by step; the portions of the tube filled by the column are then divided into the number of degrees which it represents.

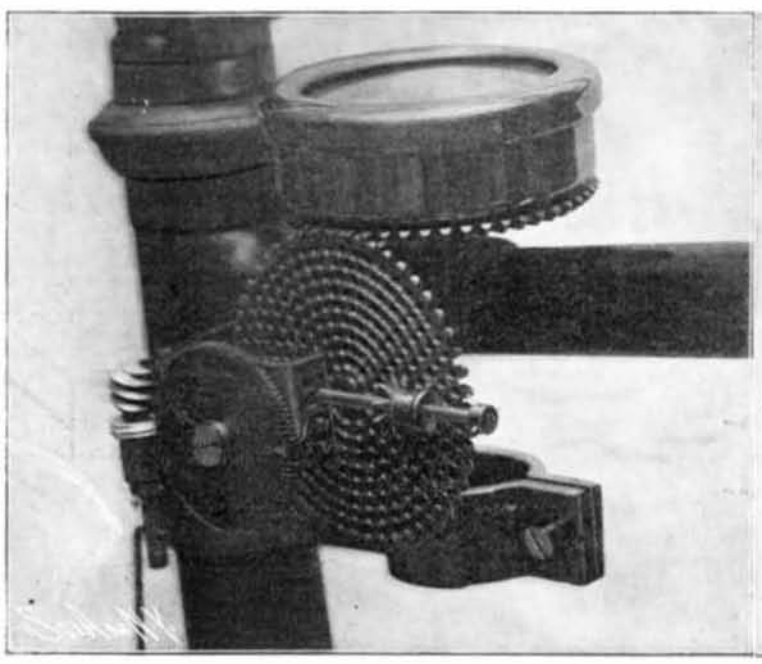
A thermometer made in the manner described is not an absolutely scientific heat-recording instrument. Still, it will be found sufficiently accurate for use in ordinary life.

A TACHOMETRIC WATCH FOR BICYCLES AND OTHER VEHICLES.

BY EMILE GUARINI.

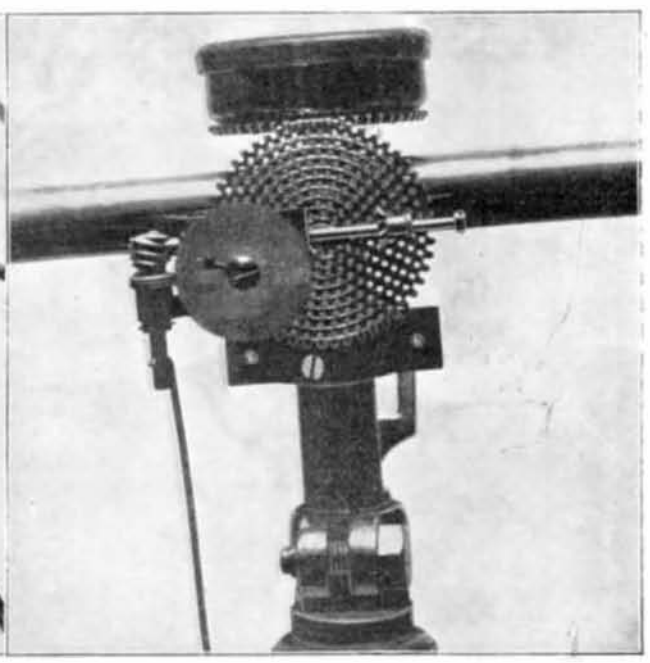
The principle of the tachometric watch, illustrated herewith, is very interesting and very simple. It consists in causing the case of a watch to be revolved by the wheel of a vehicle in a direction contrary to that of the hand of the watch and at the same rate of speed.

(*Continued on page* 162.)



Tachometer Attached to Steering Head Below the Top Bar of Frame.

View Showing the Complete Apparatus Applied to a Bicycle.



Tachometric Watch Shown Mounted Upon the Post of Handle-Bar.

A TACHOMETER FOR SHOWING THE SPEED OF VEHICLES.