The basic form of the transducer is a thin wire embedded in an insulating material, mounted parallel to the plane shock front and fed from a constant current supply. A typical schematic arrangement is shown in figure 1. Any resistance change as the wire is compressed is detected by recording the voltage across the wire on a high speed oscillograph. Since in practice the transit times across the wire for stress waves are shorter than the time resolution of the system, the pressure in the wire is assumed to have become equal to that in the surrounding insulator at the time the measurements are made. The voltage across the wire is made sufficiently large to be recorded without amplification, but to avoid electrical overheating it is only applied a few microseconds before the stress wave reaches the wire.

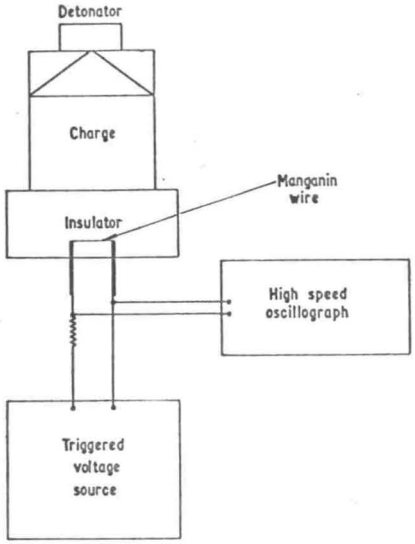

Figure 1. The general arrangement. For simplicity only one wire is shown, but in practice four wires with separate circuits are normally used.

2.1. *Transducer material*

An ideal metal for use as a transducer should have the following qualities:

(i) when it is dynamically compressed the change in resistance due to pressure is much larger than the corresponding change due to temperature;
(ii) the change in resistance is large enough to measure easily;
(iii) the resistivity is sufficiently high for a suitable resistance to be obtained from a reasonably short wire.

As the temperature effect predominates in common metals, only those alloys with abnormally low temperature coefficients are likely to be usable. Some information is available on the resistance under pressure of constantan (Bridgman 1957) and manganin (Bridgman 1949 pp. 70–76, 1950). Constantan is not very suitable for whilst the temperature effect is small the pressure effect is also small, being only a 3% decrease in resistance at 100 kb.

The behaviour of manganin however is more satisfactory, the resistance variation being very small over a wide temperature range, and the pressure coefficient of resistance constant and positive; Bridgman measured a 6% increase in resistance at 30 kb.

2.2. *Insulator material*

The next problem is to find an insulator that retains a high resistivity at the required shock pressures and temperatures. In addition the insulator should be a liquid or a castable solid so that air is not trapped round the wire, where it would ionize and conduct when the system is compressed. There is little relevant information in the literature on