For each tube one has:

- plotted the curve showing how the first displacement of the zero (up to 15 % of the stroke) varies with the pressure p;
- plotted the curve showing how the second displacement of the zero (up to 2 % of the stroke) varies with the pressure p;
- determined the force which applied to the end of the tube under an angle engenders the same deformation Z as the applied pressure p. This last quantity is a measure of the useful work of the tube, when it strains.

Tubes made of steel and phosphorous bronze of following size 150 x 17 x 8, with an elliptic section and subjected to rated pressures ranging from 0,8 to 800 kg/cm2 have been used for experimentaly taking the first measurements. Each "Bourdon" tube has been taken a maximum number of measurements so that it could be classed into the right group after examining the results experimentally obtained. To this purpose each "Bourdon" tube is taken 30 measurements which include:

- width and height of the tube at three different places (base, middle part and end)
- its thickness
- the displacement of the end the tube in the direction of both axes
- expansions and contra—ctions of the tube
- the different rotation angles carying with the applied pressure
- the plotting of the trajectory of the tube
- the variations of the curvature radiuses when the tube is used for measuring pressures.
- the force applied to the end of the tube and necessary for engendering the same displacements as those engendered when the tube is subjected to a pressure
- the value of the elasticity modulus of the material used
- the plotting of the shape of the tube section.



Most of the measurements were made by means of an optical bench, the precision of the measures being equal to $\pm$ 2,5 microns. The different angles were measured by means of a picture projector, which projects on paper the picture of the tube enlarged to a scale of 2/1. By marking the different positions of the tube, when the latter is subjected to a pressure, controlled by a manometric balances we can draw the series of lines which are necessary for measuring the different angles. By using this method, the angles can be read with a precision amounting to 30 minutes.

The section of the tubes is plotted by means of a photographic plate. With a view to eliminating any optical aberration, the impression of the sections is obtained by enlarging said photographic plate.

The Young modulus is obtained by measuring the set of a small bar, tailed in on one side and subjected on the other side to a certain force. Said small bar is taken from the tube in a direction parallel to the longitudinal axis of said tube and in the middle part of the latter. It has a triangular or rectangular section of which the size is equal to 70 x 15 mm. The results obtained by carrying out adequate tests have been analysed by the engineers of the Department "Manometers and Thermometers" of the "Compagnie Générale des Conduites d'Eau", Liège. They already show that this method is applicable to the generality of the cases and it is a method on which a new theory relating to the manometric tubes can be based.

## II. RESEARCHES IN CHEMISTRY.

### A. CHEMICAL REACTIONS.

The "Institut Belge des Hautes Pressions" had contemplated for years, publishing studies on chemical reactions. An experimental thermodynamics section had been consequently created not only with a view to developing and applying methods for measuring different thermodynamical quantities, as we explained otherwere (4), but also with a view to encouraging research work in the field of chemistry. The execution of this work was however delayed because shortage of buildings, suitable to this purpose, this being due to the fact that the new laboratories of the Institute were only made available in April 1963. From that moment, no effort has been spared with a view to creating the equipment necessary for successfully conducting said research work, which started in December of the same year. What this research work aims at, has been explained on several occasions and this is a thing which we now only need to mention without going into details (4).

The fields in which said research work is to be done have been determined by the requirements on the Belgian industries:

The main fields, which are now inverstigated are the following:

- Synthesis and polymerizations carried out by means of organic compounds subjected to the action of hydrogen, carbon monoxide, ethylene and methane.
- Building of fluorinated compounds.
- Polymerization by oxo-syntheses.
- Physical and chemical research work on the acetylene.



Such kind of research work is normally included in the programme of the laboratories, which study the action of the high pressures on the chemical reactions. In the present case, the selection of the reactions to be studied has been based on the researches already in progress in some Belgian laboratories and their results have not yet been disclosed as being at least up to now of a rather confidential nature. This is accounted for by the fact that our laboratory started working a little more than one year ago and consequently has not yet been in a position to successfully achieving research work of which the results are worth publishing.

The techniques, actually made use of, permit of doing research in a highly corrosive medium up to a pressure of 3000 atm approximately, at a temperature of 400°C. The volume of the reactors lies between 250 cm3 and 5 liters; they are mechanically stirred up or provided with electromagnetic stirrers.

The gases used for bringing about a chemical reaction are first compressed at a pressure of 1000 atmospheres by means of membrane compressors or by means of a piston compressor. They are then eventually compressed up to a pressure of 3000 atm by means of a supercharger separator and then led straight to the reactors or kept in stand-by containers. The pressures as well as the inner temperatures of the reactors are recorded by applying classical methods.

The reactors, superchargers and special containers are placed in adequate cubicles, which are placed too in buildings of which the walls are particularly thick. Photographs 1, and 2 show the compressors room as well as the outside of both cubicles.