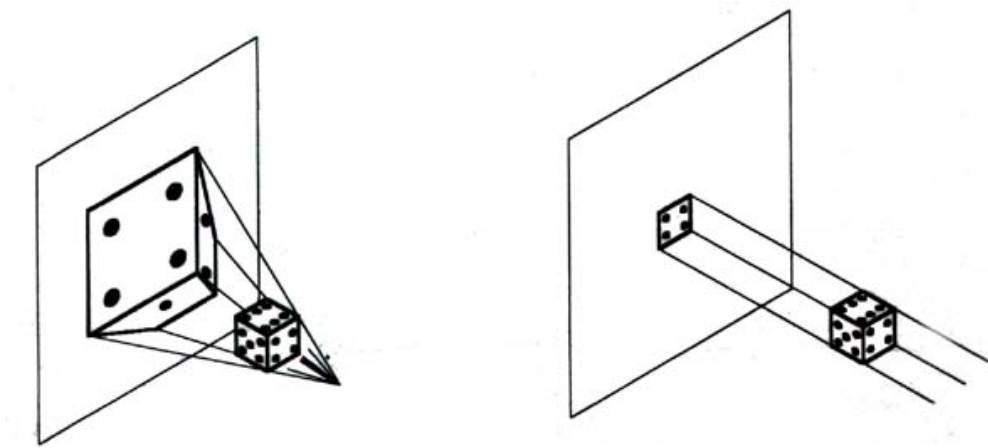


## DESCRIPTIVE GEOMETRY AND MECHANICAL DRAWING

Descriptive geometry is a mathematical-graphical procedure that has for its purpose the visualization of structures and their exact representation in drawings. After analysis of any structure, each element is shown in the drawing in its exact geometrical relation to the other elements.

The basic methods of descriptive geometry are the projection method and the direct method. There are two general types of views, perspective and orthographic. A perspective view, by means of converging rays of light that meet at the eye of the observer. An orthographic view of an object is observed in a chosen direction by means of parallel rays of light.

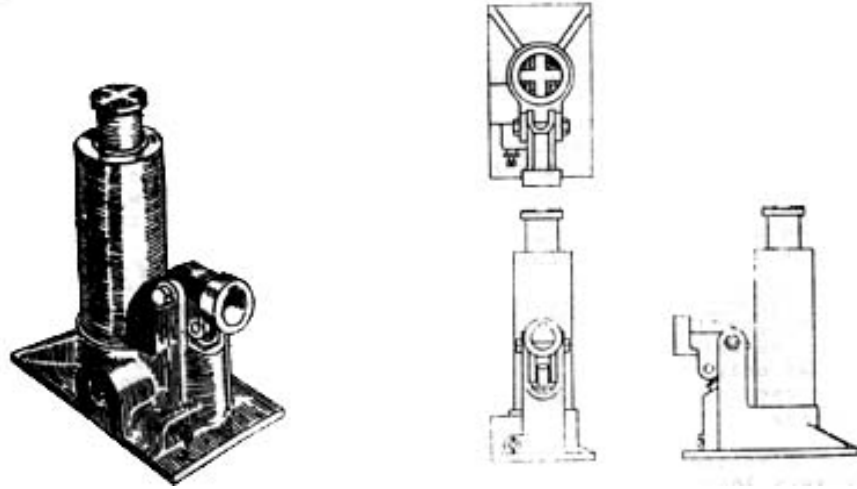


Mechanical drawing. Language is defined as the expression of thought. But if we attempt to describe in words the appearance and details of machine, or bridge, or building, we find it not only difficult but in most cases impossible. Here we must use another language, the universal graphic language of drawing.

A written description of a new machine part would have to be very long. A picture of it would serve the purpose much better, but the picture would give only the external appearance without telling what was inside. It would be impossible to construct a locomotive or an airplane from either a word description or a picture.

Fortunately, another form of description has been developed by which the exact shape of every detail of any structure may be defined accurately and quickly. This method consists of the making of a series of views arranged according to a definite system, with figures added to tell the sizes. This is known as "mechanical drawing" and it forms so important a part of all industrial and mechanical work that it is called the "language of industry".

Shape description. There are two things that a designer, inventor or builder must be able to do: first, he must be able to visualize what an object looks like without actually having the object; second, he must be able to describe it so that it could be built. His problem then is how to represent solid objects on a sheet of paper in such a manner as to tell the exact shape. This is done by drawing a system of views of the object as seen from different positions.



A picture of a hydraulic jack for an automobile shows this tool as it ordinarily appears to us, but it does not show the true shapes of the parts. The top of the cylinder appears as an ellipse, although we know it really is circular. If we look down at the jack from above, we obtain a view showing the exact shape of the cylinder, and the outline of the other parts as seen from above. This is called a top view or plan. This view does not tell us the high of the jack, so it is necessary to take another view from a position directly in front or else from the left or right side. In this way either a front view or side view, to show the high, is added. Often, as in this case, both the front and side views, in addition to the top view, are needed to describe the object. The three views taken together completely define the shapes of all visible parts of the jack and their exact relations to each other.

Sometimes a left-side view describes the object or construction more clearly than the right-side view and in such cases it should be used. It is sometimes desirable or necessary to can then be projected to all six faces or planes of an object.

Sections. We know that the parts of an object that cannot be seen are represented by hidden lines composed of short dashes. This method is satisfactory where the object is solid or the interior simple. There are many cases, especially where there is together, in which the hidden lines become confusing or hard to read. This difficulty is avoided by using a sectional view. A sectional views obtained by supposing the piece to be cut apart by an imaginary cutting plane, and the front part removed, thus exposing the interior.