April 30, 1929. L. HÄRTER 1,711,347

METHOD OF DETERMINING THE BEHAVIOR OF THE INDIVIDUAL PARTICLES OF A BODY WHEN SUBJECTED TO STRESS

Filed June 17, 1926

FIG. 1.

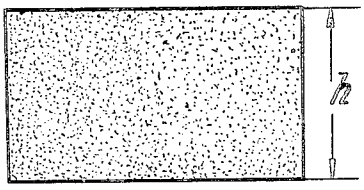


FIG. 2.

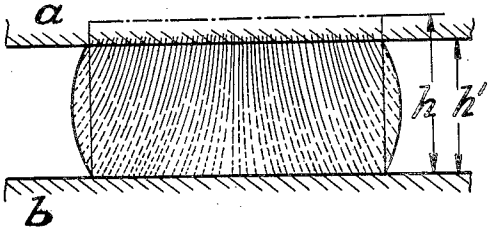
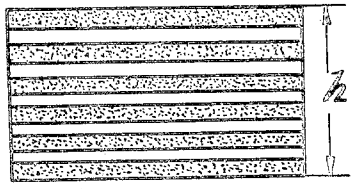


FIG. 3.



Inventor:
Ludwig Härter.

Patented Apr. 30, 1929.

1,711,347

UNITED STATES PATENT OFFICE.

LUDWIG HÄRTER, OF FULDA, GERMANY.

METHOD OF DETERMINING THE BEHAVIOR OF THE INDIVIDUAL PARTICLES OF A BODY WHEN SUBJECTED TO STRESS.

Application filed June 17, 1926, Serial No. 116,757, and in Germany December 4, 1925.

My invention relates to a method of determining the behavior of the individual particles of a body when subjected to tension, compression or like stresses.

The method of my invention consists in dotting the surface of a section parallel to the direction of the stress, for example by spraying the said surface with a dye or colour which is visible in sufficient relief, and obtaining a pictorial record of the surface on a photographic plate while simultaneously therewith subjecting the body to stress which increases continuously or in stages in such wise that the maximum load is attained within the permissible or necessary duration of exposure of the photographic plate. Under the influence of the stress applied, the particles and consequently also the dots, travel along paths which are indicated by lines on the photographic plate. This method has proved applicable with all possible kinds of stress. Depending on the nature of the material and of the stress, it is found that the particles travel along parabolic, spiral or like curved paths. The method in question thus renders it possible to form exact conclusions as to what is passing within a body subject to stress, and thus to form valuable conclusions as to the optimum shape to be given to the body or the optimum distribution of the material thereof.

The method of my invention will now be explained with reference to the accompanying drawing in which Fig. 1 shows a vertical section through a metal block prior to the application of stress. Fig. 2 represents a "time-exposure" of the same block made while assuming its compressed state, while Fig. 3 is a section similar to Figure 1 and illustrates a modified method of dotting the section under observation.

In Fig. 1 is represented a prism of lead which is subjected to compression so that its height is reduced from h to h^1 as shown in Fig. 2. The surface of a section parallel to the direction of compression is dotted by spraying the same with a dye which appears in strong relief as shown in Fig. 1. A record of the dotted surface is then obtained on a photographic plate, the body being subjected to the required compression, increasing continuously or in stages in such wise that the limiting pressure is attained within the permissible or necessary period of exposure for obtaining a photographic record. If, for example the plate must be illustrated for an interval of 60 seconds, the compression exercised continuously or progressively on the body must attain its maximum within 60 seconds, the height of the body being then reduced from h to h^1. As shown in Fig. 2, there then appear on the photographic plate lines which indicate exactly the paths of the several particles which have been displaced in consequence of the applied pressure. In order to be able to determine the extent of displacement of the particles on the surface under observation the spraying of the surface may be effected along intersecting lines forming a coarse mesh or in strips. The last mentioned case will be understood from Fig. 3. Spraying of the surface in strips may be effected by the aid of a stencil. Instead of thus dotting the surface of a section of the body under observation, I may by means of the same method, make a record of the circumferential surface of the body, as for instance, if the latter is being subjected to torsion.

What I claim as my invention and desire to secure by Letters Patent of the United States is:—

1. A method of determining the behavior of the individual particles of a body when subjected to tension, compression or like stress, consisting in dotting the surface of a section of the body parallel to the direction of the stress by means of a dye which appears in sufficient relief, subjecting the body to increasing stress, and exposing a photographic plate during the time of application of stress, to obtain a record of the paths of the dots.

2. A method of determining the behavior of the individual particles of a body when subjected to tension, compression or like stress, consisting in, dotting in strips the surface of a section of the body parallel to the direction of the stress by spraying by means of a dye which appears in sufficient relief, subjecting the body to increasing stress, and exposing a photographic plate during the time of application of stress, to obtain a record of the paths of the dots.

LUDWIG HÄRTER.