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ANALYZING DEVICE

Filed June 13, 1938

Fig. 1.

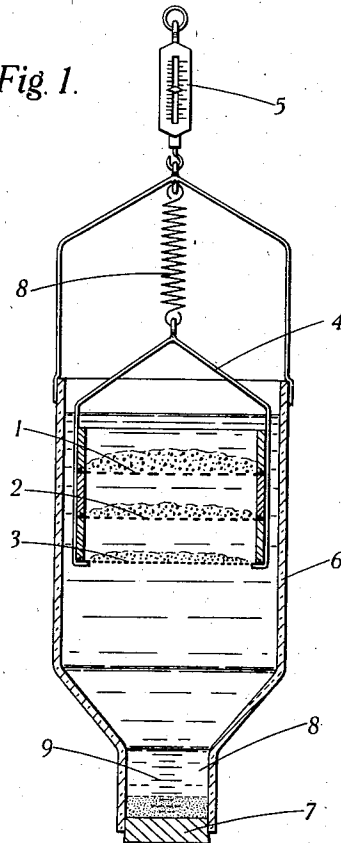
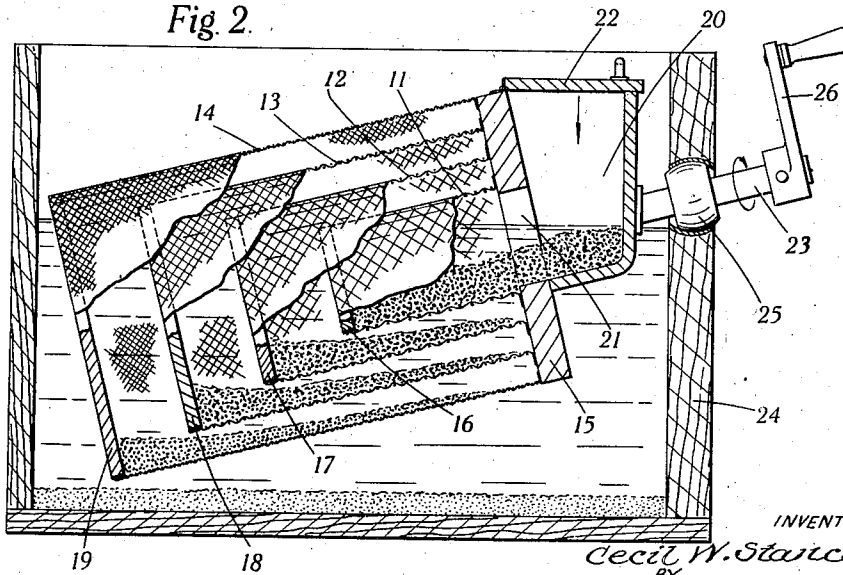


Fig. 2.



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ANALYZING DEVICE

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3 Claims. (Cl. 209—237)

This invention relates to means for testing the proportions of concrete and similar plastic compositions.

In the manufacture of concrete, particularly by mechanical mixers, it is always a matter of some difficulty to ensure that uniform mixing has taken place throughout the batch and up to the present no simple means has been available of examining samples of the mixture to ascertain the proportions thereof.

The concrete as it comes from the mixing machine, or platform in the case of hand mixing, is wet and in accordance with this invention we take a sample of this wet mixture and subject it to a sieve analysis.

The usual concrete is gauged with a specified amount by weight or volume of cement, a specified amount by weight or volume of sand or fine aggregate and a specified amount by weight or volume of gravel or coarse aggregate. Occasionally the coarse aggregate is further subdivided according to sizes.

An object of the present invention is to provide a method of, and means for, analyzing a sample of concrete to ascertain the relative proportion in that sample of cement, fine aggregate and coarse aggregate or aggregates.

By taking different samples of the wet mix from a batch, for example from the beginning and the end of the batch, or from different points just after placing, the degree of uniformity of the mix may be ascertained, thus serving as a test of the efficiency of the mixer.

Another object of the invention is to provide apparatus in which the cement or other binding material is washed from the aggregates which are themselves separated by sieving into two or more grades so that the proportions by weight or volume of the different grades of aggregate and of the cement if required can be determined approximately.

The separation is conveniently effected by placing the sample in the uppermost of two or more superposed graded sieves which are fully immersed in water and agitating the sieves till the cement is washed from the aggregate and the latter is separated on the various sieves.

With the above and other objects in view, the invention consists in the improved combinations and arrangements contained in the embodiments now to be described in detail and features of which are set out in the claims which follow.

In the drawing:

Fig. 1 represents a cross-section of one form of apparatus and,

Fig. 2 represents a cross-section of another form.

Referring to Fig. 1, a number of graded sieves 1, 2, 3 are supported one above the other in a cradle 4 which is removably suspended from a spring balance 5.

The cradle 4 is positioned within a container 6 which is preferably of glass, but may be of any other suitable material, and which is also removably suspended from the spring balance 5. The container 6, if not made wholly of glass may have a glass window in one side.

The container 6 is arranged to be filled with water and its base is provided with a drain cock 7 which as shown forms the entire base of the container.

In order that the approximate cement ratio may be determined the base of the container is conveniently reduced in section as at 8 and is graduated at 9 to give quantities of cement by weight or by volume.

The spring balance 5 from which the cradle 4 and container 6 are suspended is carried by a tripod or other frame and at a suitable point in the suspension of the cradle 4 below the spring balance 5 and a spring 8 is provided by which the cradle 4 may be agitated in order to separate the constituents of the mix placed therein.

The sieves 1 to 3 are arranged to fit one on the other and when three are used they may for example be of the order of $\frac{3}{4}$ " , $\frac{1}{8}$ " and 76 x 76 mesh.

In use of the apparatus a known quantity of concrete forming the sample is placed in the top sieve (which is the coarsest) and the container 6 is filled with a known weight of water. The cradle 4 is then agitated up and down in the water until the aggregates have been shaken down to the appropriate sieves and the cement has been washed off as far as practicable into the water in the container.

When the agitation is stopped the cement settles into the graduated portion 8 at the base of the container and its volume in a saturated state can be read. The calibration may be made so as to give directly the equivalent dry weight of cement.

By weighing the cradle with the sieves empty and with one, two or three sieves respectively containing wet sieved aggregate, the weight of aggregate of each grade may be calculated.

By placing a known weight of water in the container and then weighing the latter containing the cement and water from the mixed sample, the amount of cement and water of the sample may be calculated.

The container may in some cases be arranged to be supported on the ground or on a stand instead of being normally suspended from the spring balance.

It will be appreciated that comparisons of the proportions of the mix in various samples may very readily be obtained with this apparatus.

From a visual inspection of the graded washed aggregates in the sieves a rough indication of the proportions of the mix is given and the quality of the aggregates may also be seen.

Where it is found desirable means may be provided for raising the cradle above the level of the water in the container for weighing purposes.

By providing a series of testers which can be operated at once several samples may be tested at the same time.

In another form of sampling apparatus which is shown in Fig. 2 four cylindrical sieves 11, 12, 13 and 14 of successively finer mesh are arranged coaxially. The sieves are fixed at one end to a plate 15 and are progressively longer so that each sieve lies entirely within the next largest sieve leaving a space between them. The bottom ends of the sieves 11 to 14 are closed by plugs 16, 17, 18 and 19 respectively.

An inlet chamber 20 is provided on the plate 15 and communicates with the interior of the coarsest sieve 11 (that is the innermost one) by an aperture 21 in the plate. The chamber 20 is closed by a detachable cover plate 22.

The sieve assembly is mounted on a shaft 23 coaxial with the sieves which passes through the side of a container 24. The shaft 23 is supported in the side of the container by a rocking bearing 25 which permits rotation of the shaft (for example by the crank 26 or by power driven means) and also permits movement of the sieve assembly as a whole in substantially any direction.

The container 24 is partially filled with water to a depth sufficient to immerse a substantial part of each sieve. A known weight of the concrete to be sampled is then dumped into the inlet chamber 20 and so into the coarsest sieve 11 and the lid 22 is replaced.

The sieves are then rotated by the crank 26 and are also moved bodily in the water by oscillating the shaft 23 so that the concrete is sieved through the sieves, the successive sieves retaining successively finer grades of the materials and the cement and fine sand being washed through into the container.

The contents of the successive sieves are removed separately and dried in an oven and then weighed. The dry weight of the different sizes is thus obtained.

The fine sand which has passed the finest sieve is separated from the cement by further washing and gravity separation and is dried and weighed, its weight being added to that of the other fine sand to give the total weight of sand in the sample.

The cement is also dried and weighed. The total weight of the dried materials can then be

subtracted from the weight of the sample to obtain the moisture content of the sample.

It will be clear that either form of the apparatus illustrated may be arranged as a battery containing a number of sampling units so that a plurality of samples may be treated simultaneously. When the form shown in Fig. 2 is so arranged, it is desirable to connect the shafts of each unit by means of a side bar so that the units all move similarly and to rotate the sieves by a common drive.

It is to be understood that the invention is not restricted to the details which have been described as they have been given by way of example only, but that it includes all such embodiments as come within the broad idea underlying it.

I claim:

1. Apparatus for the analysis of concrete comprising a receptacle for water, a shaft protruding through the side of the receptacle, a rocking bearing between the shaft and the side of the receptacle, a hopper rigidly connected to the shaft within the receptacle, a plurality of coaxial sieves of mesh size decreasing from the inner to the outer sieve mounted coaxially of the shaft on the wall of the hopper the interior of the innermost sieve communicating at one end with the hopper through the wall thereof and being closed at the other end, the other sieves being closed at each end, and means for rotating the shaft about its axis and oscillating the shaft in a rocking bearing.

2. Apparatus for the analysis of concrete comprising a receptacle for water, a shaft protruding through the side of the container, a plate member rigid with the shaft and having a central opening coaxial with the shaft, an inlet chamber carried by the plate and in communication with the central opening therein, a plurality of sieves of mesh size decreasing from the inner to the outer sieve projecting from the plate member coaxially of the shaft, the innermost sieve surrounding the opening in the plate and the remaining sieves being closed by the plate against direct communication with the inlet chamber, all of the sieves being closed at the end remote from the plate member, and means for rotating the shaft.

3. Apparatus for the analysis of concrete comprising a receptacle for water, a shaft protruding through the side of the container, a plate member rigid with the shaft and having a central opening coaxial with the shaft, an inlet chamber carried by the plate and in communication with the central opening therein, a plurality of sieves of mesh size decreasing and of length increasing from the inner to the outer sieve projecting from the plate member coaxially of the shaft, the innermost sieve surrounding the opening in the plate and the remaining sieves being closed by the plate against direct communication with the inlet chamber, all of the sieves being closed at the end remote from the plate member by removable plug members, and means for rotating the shaft.

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