For swift currents in unusually deep shafts (600 ft. was the maximum), a heavy bob was constructed from a sash weight and a thin iron rod, about ¼ in. A hole was drilled in the end of the sash weight, and the ¼-in. rod, ground to a point on one end, was driven in this hole. This construction presents a very small area to the action of the current, and the added weight tends to stabilize the swinging action. No weights or dimensions are given, as experiments for individual cases will best determine the requirements.

The carrying case was constructed of ⅜-in. pine. The inside dimensions are 11½x7½x4 in. deep. The lid is 1½ in. deep. The case may be made much smaller if no room for equipment is desired. The above dimensions allow ample space for phones, bobs, tape, etc. (see Fig. 2).

Methods of Using Instrument—A wooden straight-edge is used as a base for obtaining measurements. This straight-edge is placed across the top of manhole or other structure and leveled with the aid of a carpenter's level. Two small wedges are placed under the low end to maintain the level position of the straight-edge. The elevation of the top of the straight-edge is determined by direct vertical measurement to a benchmark in the structure or with an engineer's level and rod. A robe, coat or other insulating medium is placed on the ground or floor to insulate the observer, as the instrument is sensitive to grounds. (A distinct note will be heard in the phones through 10 megohms resistance.) In very damp locations it is advisable for the observer to wear light gloves.

In preparation for the operation the phone plug is placed in jack *E*, head phones adjusted and leads *C* and *J* connected to binding posts *D*. The clip *K* is clipped on ground and the plum bob lowered to the water surface. The lead *C* is then clipped to the tape at *B* and switch *G* closed. As the needle point of the bob is lowered to the water surface, a distinct high-pitched note will be audible in the phones.

Two methods of making the observations are used. Numerous comparisons tend to indicate that either method is equally accurate. Method 1 was used when a knowledge of the range of surge as well as the average elevation of the water surface was desired. Method 2 was used when the average elevation of the water surface was the only requisite.

Method 1—The tape was lowered until the note in the phones indicated contact with the water. The tape was then gradually raised until only an instantaneous contact was made at the extreme high range, and the tape was read. This operation was repeated five times (ten in case of violent and non-periodic surge). The tape was then lowered until contact was continuous and gradually raised until an instantaneous break indicated the extreme low range and the tape read. As before, this operation was repeated either five or ten times. In still water readings seldom varied more than 0.001 ft.; in water flowing at rate of 4.5 ft. per second the averages of different sets of ten readings should not differ by more than 0.03 ft.

In a comparison of 60 sets of observations taken at the downtake and uptake shafts of the Rondout, Wallkill, Hudson River and Croton pressure tunnels of the Catskill aqueduct, the maximum surge was 2 ft. and the greatest difference between the averages of different sets of twenty readings each was 0.07 ft.

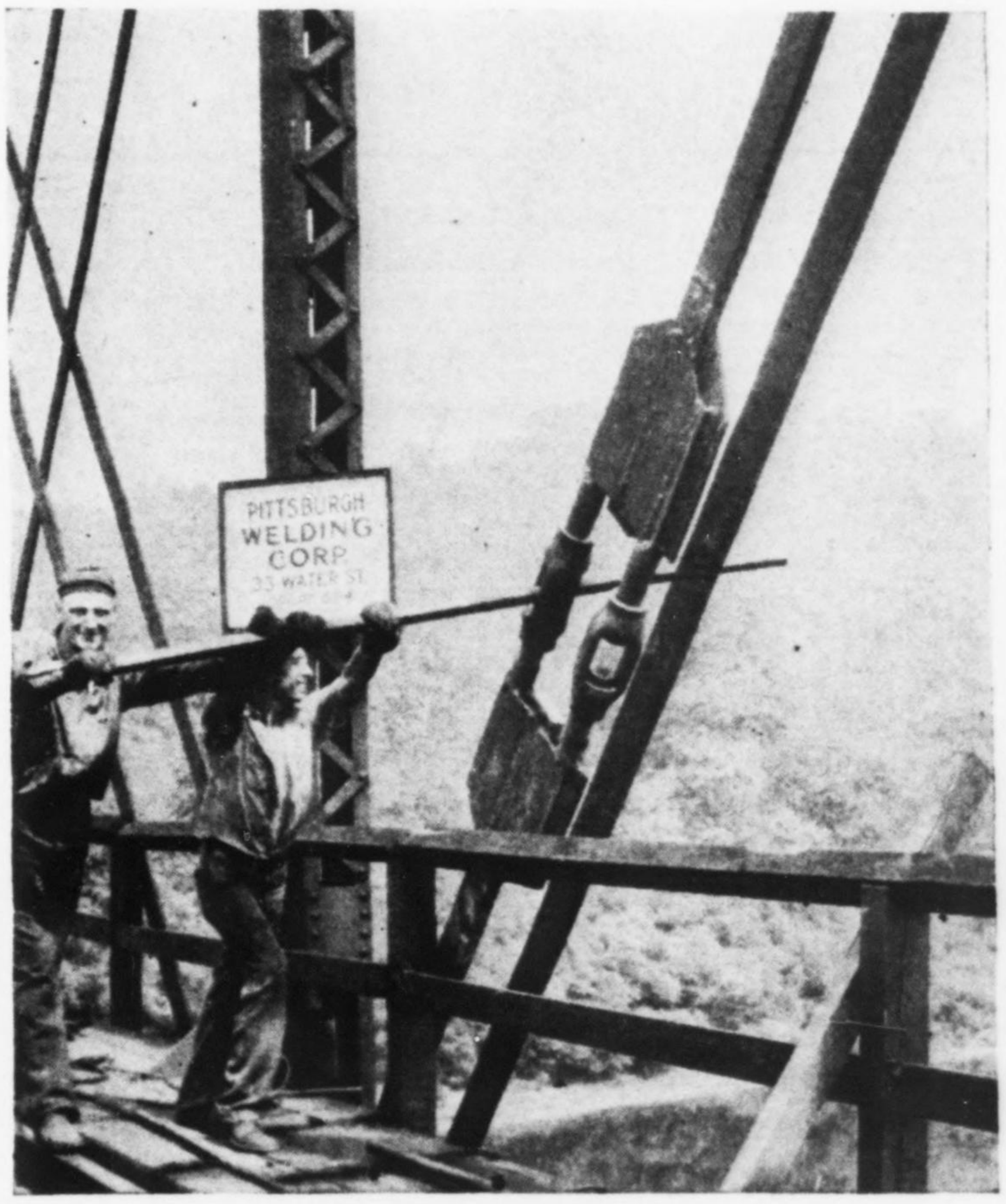
The conditions at these shafts are probably as severe as will ever be encountered in making measurements of this kind. The results obtained tend to show the accuracy which may be expected under abnormal conditions.

Method 2—This method of taking observations is similar to the first, with the exception that no effort is made to measure the crest and trough of the surge. Two sets of five or ten readings (depending on the tranquillity of the water surface) are taken at any convenient intervals and the averages are compared and averaged as stated before.

Turnbuckles Welded Into Bridge Eyebar Diagonals

By H. F. Cole
General Electric Company, Pittsburgh, Pa.

It was recently necessary to provide some means of adjustment in the eyebar tension members of a three-span railroad bridge over the Kiskiminetas River near Pittsburgh, Pa. Particularly in two of the spans, these eyebar diagonals, which were used in pairs, had become so elongated through wear and vibration that one member of the pair was considerably understressed. The repair work consisted in inserting a special turnbuckle detail into one of the diagonals with the use of arc welding and then drawing up the turnbuckles until the diagonal carried approximately the same load as the other eyebar in the pair.



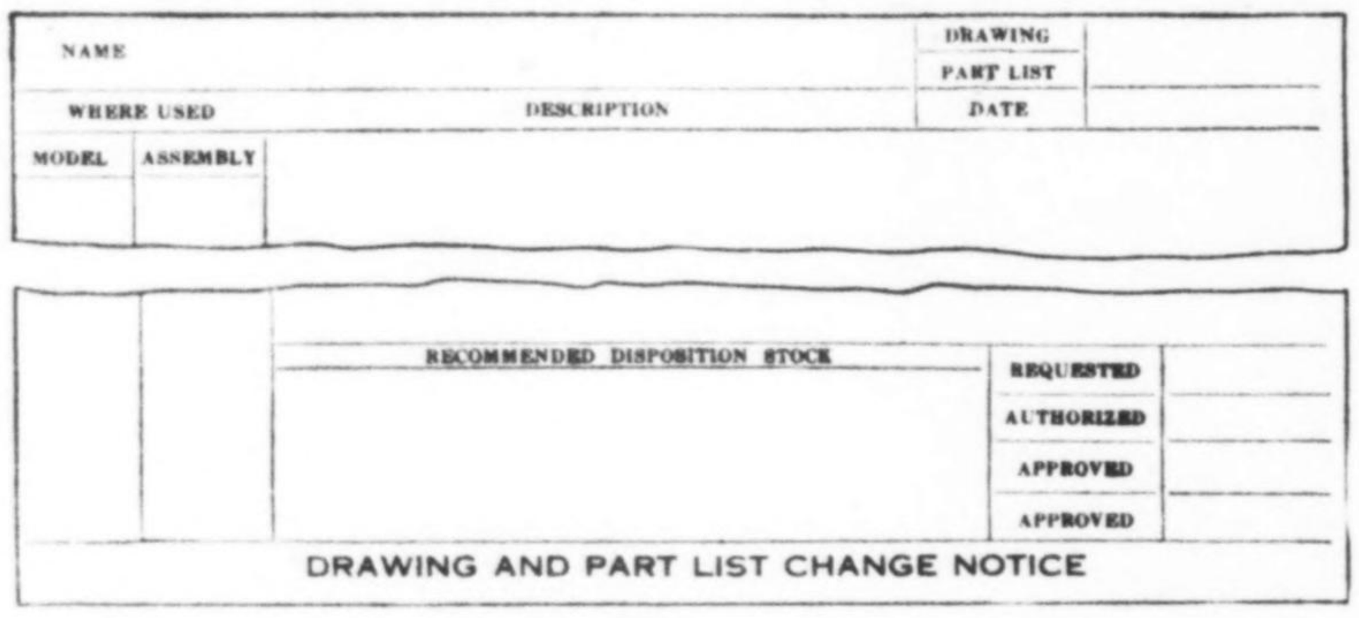
RESTRESSING BRIDGE DIAGONAL WITH SPECIAL TURNBUCKLE DEVICE

As shown in the accompanying illustration, the repair device consisted of two turnbuckles welded between a pair of wing plates at either end. These wing plates were then welded to the eyebar and the workmanship of the weld was tested by drawing up each turnbuckle while the weld was subjected to blows struck on the corner and ends of the plates with a 10-lb. sledge. Small cover. plates were finally welded to the wing plates as an additional factor of safety, after which the section of diagonal, about 18 in. long, between the wing plates was cut out. By vibrating both bars and counting the number of vibrations per minute, it was found quite feasible to adjust the turnbuckles until an equality of loading between the two eyebars was obtained. The device was designed so that the two turnbuckles would develop about 25 per cent more strength than the original bar, and a sufficient number of linear inches of weld was deposited to develop more than the strength of either the turnbuckles or the plates. The turnbuckle arrangement was developed by the Pittsburgh Welding Corporation, which company also did the repair work.

Record of Drawing Changes

By Morton Schwam
Philadelphia, Pa.

When making changes on drawings a record of the changes should be kept in the files for future reference. Such record may be made on a convenient form of change slip as shown herewith. At the time of making a change, the change should be accompanied on the original tracing by a letter of the alphabet or a change


NAME
DRAWING
PART LIST
WHERE USED
DESCRIPTION
DATE
MODEL
ASSEMBLY
RECOMMENDED DISPOSITION STOCK
REQUESTED
AUTHORIZED
APPROVED
APPROVED
DRAWING AND PART LIST CHANGE NOTICE

CONVENIENT FORM FOR RECORDING CHANGES ON DRAWINGS

number inclosed in a circle. The change slip is made out by the draftsman making the change noting in detail the nature of the change, what the particular dimensions or notes were on the tracing before the change and what they were changed to. The change slip is then issued when the drawing is released for reissue as detail information and calling attention to all interested parties of the changes made. The change slip is laid alongside of the tracing when being blueprinted and thus will be part of the one blueprint. Such record of changes will prove invaluable when at some later date someone desires to know what and why a particular change was made.

Chart for Beam Design Gives Equivalent Distributed Loads

By Ernest McCullough
Consulting Engineer, Long Island City, N. Y.

In designing beams and girders the old method of reducing concentrated loads to an equivalent distributed load is still in common practice, but most designers use tables to obtain the proper conversion factor. The diagram given here makes the use of tables unnecessary, resulting in a considerable saving in time. The diagram should be reproduced on tracing cloth or paper, or, preferably, on transparent celluloid. The horizontal lines may be either $\frac{1}{8}$ or $\frac{1}{4}$ in. apart, according to the preference of the designer, while the width may be varied to suit working conditions. For most cases an upper width of $6\frac{1}{2}$ in. and a lower width of 3 in. will prove convenient, each divided into sixteen uniform parts. Connecting lines are drawn and labeled as shown.

To use the chart, place it on the drawing horizontally with the outer line at the supports of the beam or girder. The factor for converting concentrated to uniform load will be found on the sloping line which intersects the loaded point of the beam. The sum of the equivalent distributed loads, added to the weight of the beam or girder and of the fireproofing on the haunches, gives the

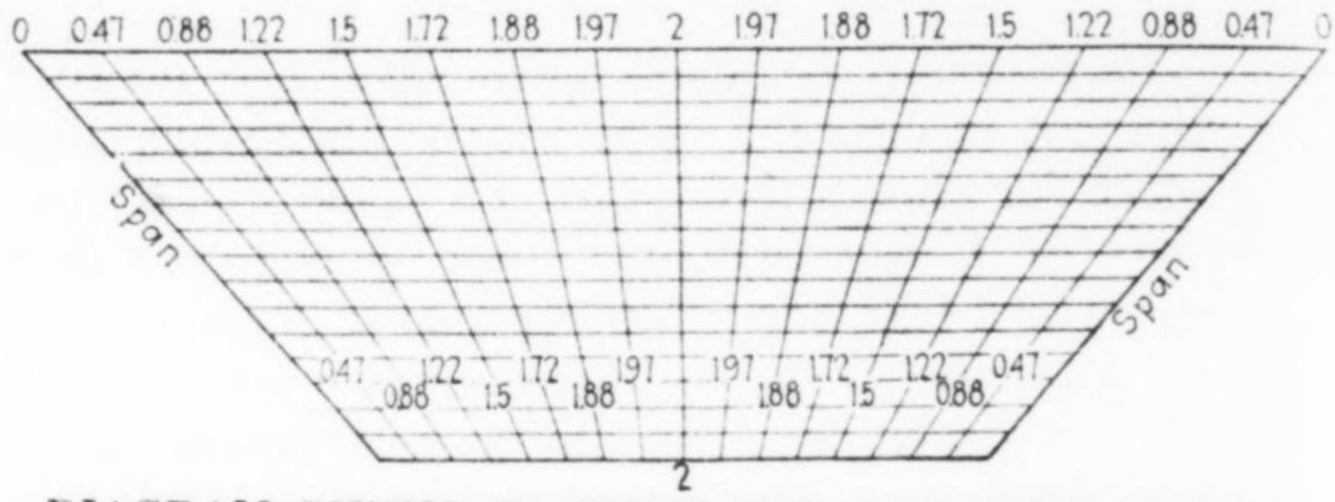


DIAGRAM GIVING FACTORS FOR CONVERTING UNIFORM TO EQUIVALENT DISTRIBUTED LOADS

total uniformly distributed load to be used in obtaining the size of the member. If the concentrated loads are distributed fairly uniformly, one-half the total load may be used as a reaction at either end, but with unequally distributed loads, the true reaction should be obtained by the usual method.

The diagram is based upon the equation

$$M = \frac{Pa(L - a)}{L} = \frac{WL}{8}$$

in which M = moment; P = concentrated load; W = uniform load; L = span; and a = distance to the uniform load from the nearest support.

Test Model Used in Design of Kill van Kull Arch Bridge

In order to check the design calculations of the 1,675-ft. Kill van Kull arch bridge in New York City, the model shown in the accompanying illustration was constructed by the bridge engineers of the Port of New York Authority. Particular use was made of it in checking lateral distortions of the structure and the effect of sway bracing on vertical deflections. It is now on exhibition at the Museums of the Peaceful Arts, 24 West

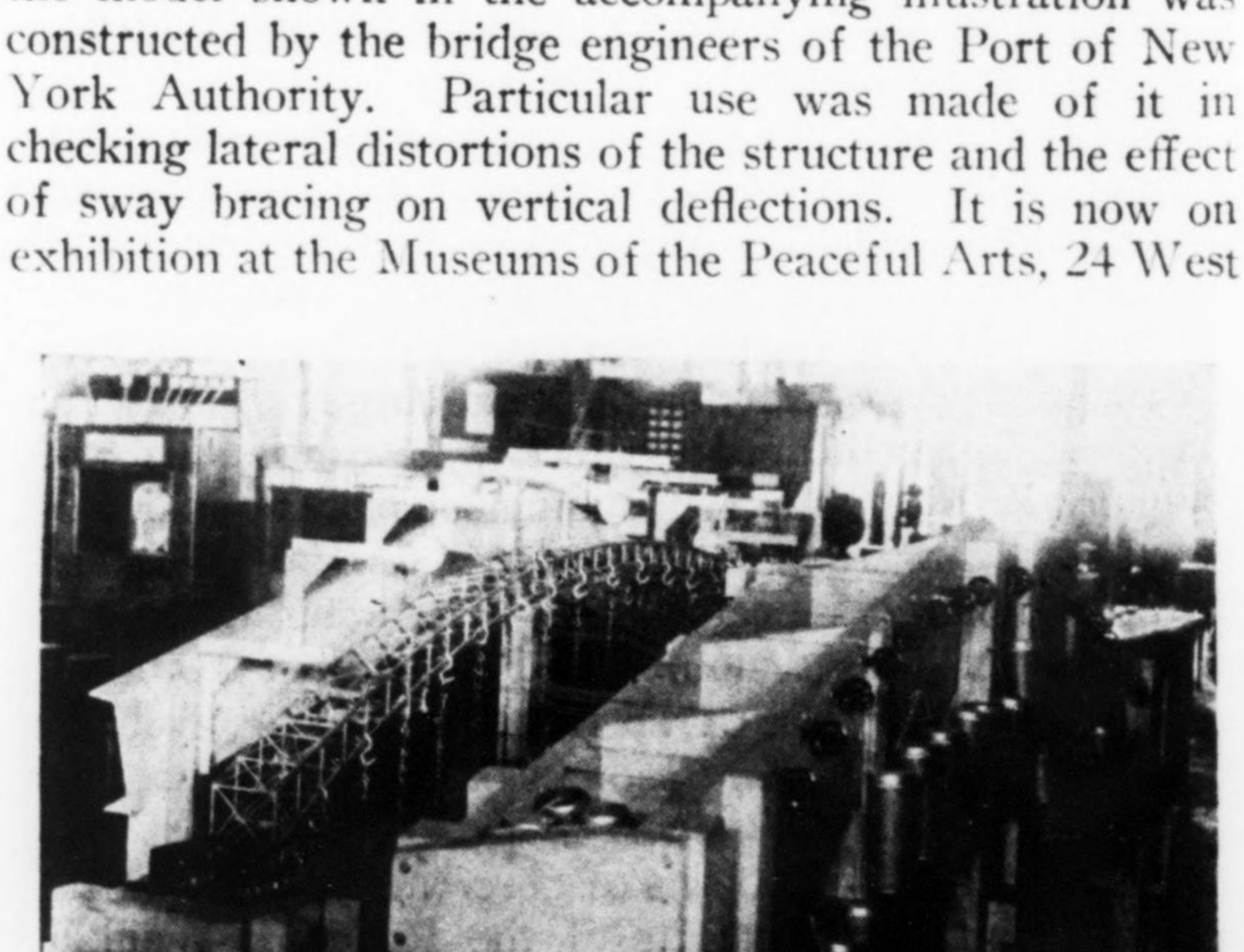


FIG. 1—KILL VAN KULL ARCH BRIDGE MODEL
Showing weights (containers filled with shot) which produce lateral deflections. Note dials on top chords for indicating vertical deflection.