H. A. SCHWAGER.

SPRING CALCULATOR.

APPLICATION FILED AUG. 1, 1914.

1,122,429. Patented Dec. 29, 1914.

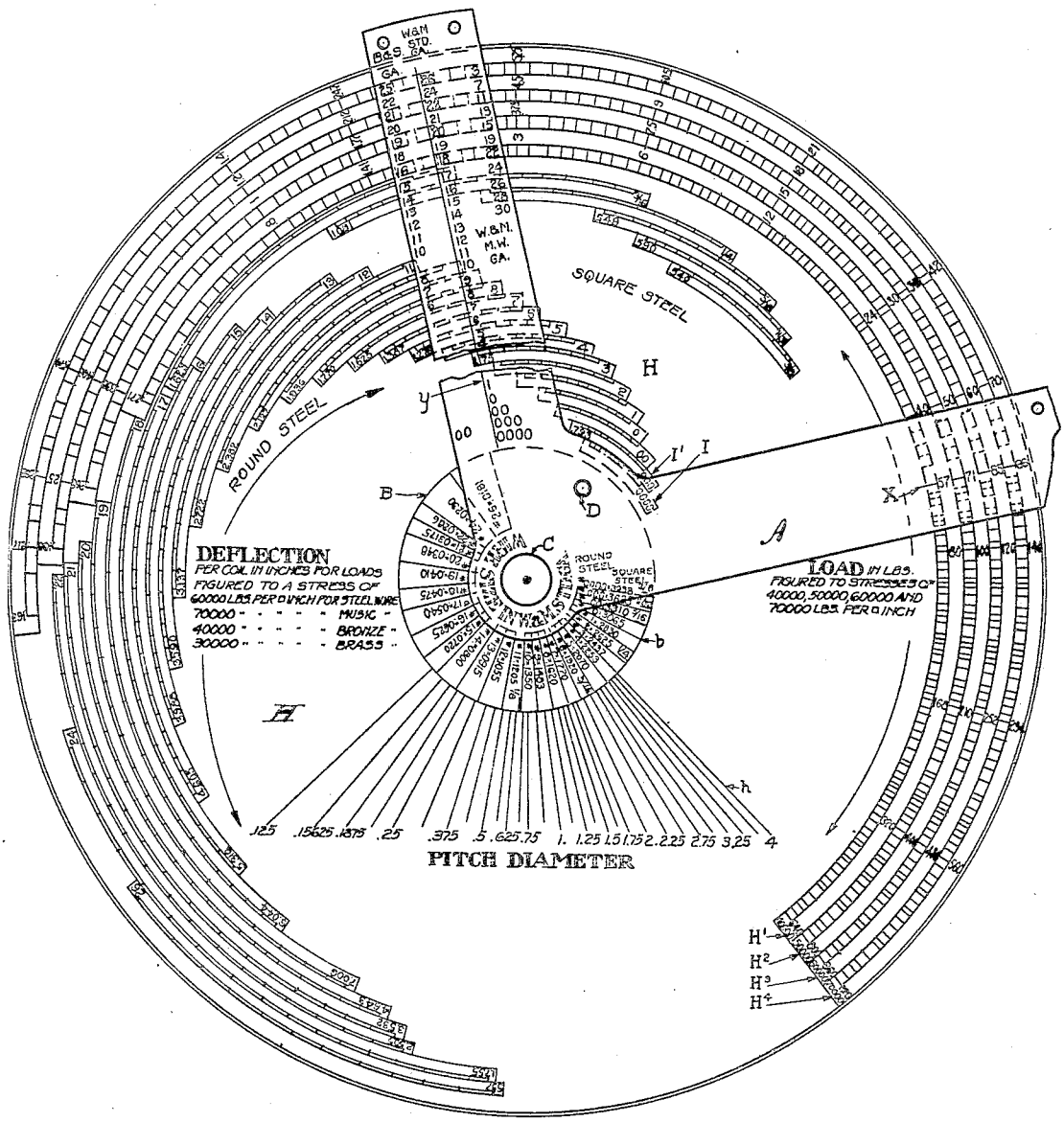


FIG. 1

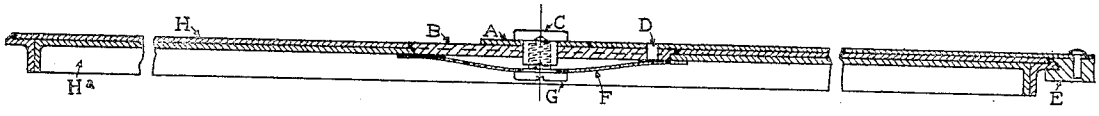


FIG. 2

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SPRING-CALCULATOR.

1,122,429. Specification of Letters Patent. Patented Dec. 29, 1914.

Application filed August 1, 1914. Serial No. 854,464.

To all whom it may concern:

Be it known that I, HENRY ALFRED SCHWAGER, citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have invented a certain new and useful Improvement in Spring-Calculators, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to a computing chart and is especially designed for the calculation of helical springs.

The object of this invention is to provide a simple, easily readable, and comparatively inexpensive device, adapted to indicate the "safe load" of a helical spring constructed of either round or square wire of standard gage, of different materials, and of any required pitch diameter; and the deflection per coil. By its use springs may be formed to carry a certain load, with a predetermined gage of wire, and pitch diameter, or the "safe load" of a spring already constructed may be ascertained, the material, gage of wire, and pitch diameter being known.

Other advantages and improvements will hereafter appear.

In the drawings: Figure 1, is a plan view of the device indicating its double swinging arm and the small disk engaged therewith, in one of its adjusted positions. Fig. 2, is a central cross sectional view through the disks and the swinging arm.

Referring to the letters of reference placed upon the drawings, A, denotes an L-shaped or double indicating arm formed of celluloid or other transparent material.

B indicates a relatively small disk provided with radial lines *b*, representing different gages of round and square steel, bronze and brass wire.

C is a plug serving as a pivot for the double arm and disk B, which are in turn connected together to operate as a single unit by the rivet or dowel pin D.

H indicates an annular disk mounted upon a base plate H^a, concentric with the disk B.

F denotes a spring washer beneath the disk B the projecting edge of which bears against the plate H^a.

G, is a fillister hand screw engaging the plug C, and bearing against the spring washer which serves to maintain the disks and the double indicating arm in operative relation.

h denotes a plurality of radial lines on the disk H registering with the radial lines *b*, on the disk B: representing pitch diameters which the various wires indicated on the disk B may be coiled to form springs adapted for certain loads.

x, *y*, denotes hair lines on the double arm A, respectively indicating "load" and "deflection."

H', H^2, H^3, H^4, are concentric columns denoting the load given in pounds, figured to stresses of 40,000, 50,000, 60,000 and 70,000 pounds per square inch.

The deflection per coil is given in inches, figured to a stress of, 60000 lbs. per square inch for steel wire, 70000 lbs. per square inch for music wire, 40000 lbs. per square inch for bronze wire, 30000 lbs. per square inch for brass wire.

Each size of wire mentioned on disk B has a concentric column I, I', etc., on disk H where the value of deflection is given. The wire sizes as given on disk B are expressed in what is known as the Washburn & Moen standard gage for round steel, and in fractions of an inch for square steel. It will be obvious however that any "standard gage" may be employed.

The calculator as set affords a reading for #3 wire, which registers with 4 inch pitch diameter, and for which setting the hair lines on arm A indicates a load of 85 lbs. when stressed at 60000 lbs. per square inch, 99.2 when stressed to 70000 lbs., 70.8 when stressed to 50000 lbs., 56.7 when stressed to 40000 lbs.

60000 lbs. per square inch is generally taken as the safe load for common spring steel. The load under such stress is 85 lbs. The deflection per coil for this load can be found in the deflection column of #3 wire, and is 1.175 inches. Now if a spring of the same dimensions, but of bronze instead of steel, were made, the safe load may be read in the column of 40000 lbs. stress, and the answer being 57 lbs., for which load the same deflection of 1.175 inches is indicated.

To determine what the opportunities are with a steel spring loaded to 85 lbs., beginning with #3 we find it registering with 4 inch pitch diameter; #4 with approximately 3-3/16; #5 at 2-15/32; #6 at

1-31/32; #7 at 1-17/32; #8 at 1-5/32; #9 at 29/32; #10 at 43/64 and 1/8 at a little less than 21/32. It will now be seen for example that a spring of 85 lbs., safe load, has nine sizes of wire open to selection out of those represented on the chart, ranging in pitch diameter from 21/32 to 4 inches.

It will be understood that every line on the chart shown in the load columns is followed by a figure, and every line shown in a deflection column is preceded by a figure, but due to the small space available on the drawing, it is impracticable to incorporate all of the figures. It will also be obvious that the figures on the indicator arm denote the wire number or gage, and are designed to register with the respective concentric rows of graduations on the stationary disk denoting "deflection."

Having thus described my invention what I claim is:—

1. In a device of the character described, a rotatable radially graduated disk, an indicator comprising two arms in spaced relation adapted to rotate with the disk as a single unit, and a stationary disk having a plurality of sets of graduations, with certain of which the graduations on the rotatable disk and the respective swinging arms of the indicator are adapted to register.

2. In a device of the character described, a rotatable disk provided with radial graduations denoting metal gage, a stationary disk concentric to the rotatable disk having a plurality of radial graduations denoting pitch diameter adapted to register with the radial graduations of the rotatable disk, together with other groups of radial graduations in concentric rows denoting respectively "load" and "spring deflections," and an indicator formed of transparent material connected with the rotatable disk to rotate therewith, comprising two arms in spaced relation to each other having indicator lines adapted to register with the graduations on the stationary disk, one of said arms provided with rows of numerals indicating wire gages adapted to register with the concentric rows of graduations on the fixed disk denoting deflection.

3. In a mechanical calculating device, the combination of a rotatable, radially graduated disk, a transparent indicator secured to said disk and rotatable therewith comprising two arms held in spaced relation, an annular stationary disk concentric with the rotatable disk having radial lines adapted to register with the radial lines of the rotatable disk and with a plurality of groups of graduations in concentric rows, one arm of said indicator having numerals in rows adapted to register with the rows of graduations on the stationary disk, each arm having also indicator lines adapted to register with the respective graduations on the stationary disk, whereby one arm may indicate values obtainable through the registration of factors represented by the radial lines on the movable disk with other factors represented by the radial lines on the stationary disk, the other arm indicating values obtainable through the registration of the two factors and the reading on the first named arm.

In testimony whereof I sign this specification in the presence of two witnesses.

HENRY ALFRED SCHWAGER.

Witnesses:

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