Making and calibrating a dynamometer (Item No.: P1251900)

Curricular Relevance

Area of Expertise: Physik
Education Level: Klasse 7-10
Topic: Mechanik
Subtopic: Kräfte, einfache Maschinen
Experiment: Herstellung und Kalibrierung eines Kraftmessers

Difficulty	Preparation Time	Execution Time	Recommended Group Size
Easy	10 Minutes	10 Minutes	1 Student

Additional Requirements:

- Test piece, e.g. lever (03960-00)

Experiment Variations:

Keywords:

Principle and equipment

Principle

Make und calibrate a spring dynamometer unsing a helical spring. Subsequently, determine the weight in N of a test piece with the model.

Equipment

Position No.	Material	Order No.	Quantity
1	Demo Physics board with stand	02150-00	1
2	Hook on fixing magnet	02151-03	1
3	Torsion dynamometer	03069-03	1
4	Scale for demonstration board	02153-00	1
5	Pointers f. Demonst.Board, 4 pcs	02154-01	1
6	Helical spring, 20 N/m	02222-00	1
7	Fish line, l. 100m	02090-00	1
8	Marker, black	46402-01	1

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Set-up and procedure

Set-up

- Place the hook on fixing mangent near the upper edge of the demonstration board and hang the helical spring onto it.
- Position the dynamometer under it, set the pointer to zero, and secure the scale.
- Mark the position of the lower end of the helical spring with a pointer of the demonstration board (Fig. 1).

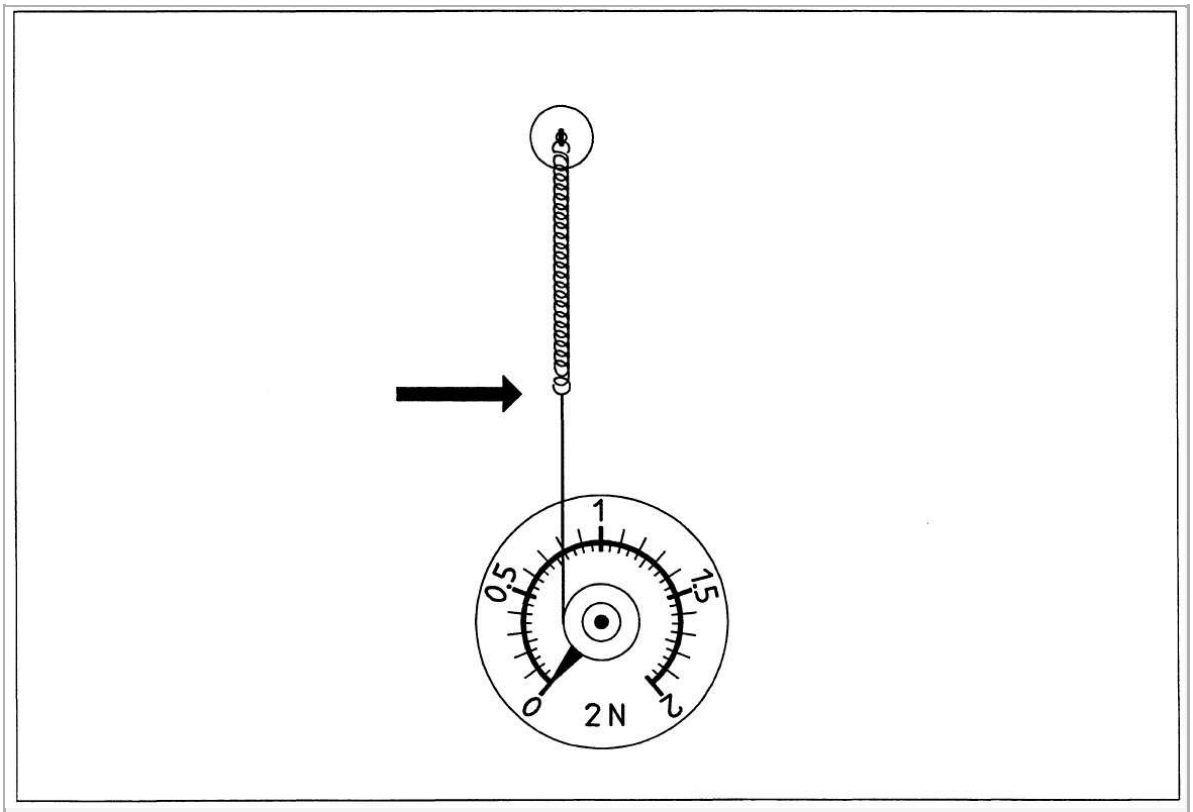

Fig. 1

Procedure

- Move the dynamometer downwards until it indicates a tractive force of 2 N.
- Mark the present position of the helical spring's lower end with the second pointer.
- Remove the dynamometer.
- Draw a scale for the dynamometer model: make a 0 index mark at the upper pointer, a 2-N index mark at the lower pointer. Determine the distance
  between the two marks with the scale for the demonstration board. Divide this distance (measuring range!) into 4 (or 20 - depending on the desired accuracy) equal sections.
- Remove the pointers for the demonstration board and hang the test piece, e.g. the lever) on the helical spring.
- Determine the weight of the test piece.

Observations and evaluation

Results and evaluation

F_G of the test piece (lever): 1,3 N

Forces can be measured with a helical spring. To do this, the springs must be calibrated, i.e. (in this case) to determine which extension of the spring corresponds to which force. The results are recorded as ascale which is appropriately gradated.

Remarks

The gradations of the dynamometer's scale are only linear and thus particularly simple if the proportionality region for the object used for force measurement
is not exceeded (and Hook's Law is valid) - which is the case in this experiment.

At this location one can also mention the measuring principle of the dynamometer, which contains a spiral spring instead of a helical spring.

The term calibration was used in this experiment because it only deals with the determination of the correlation between the initial and final parameters
of a measuring device. The term standardise would not be accurate because this is understood to mean an official certification of measuring devices or measuring means.

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