

898,599.

Patented Sept. 15, 1908.

2 SHEETS—SHEET 1.

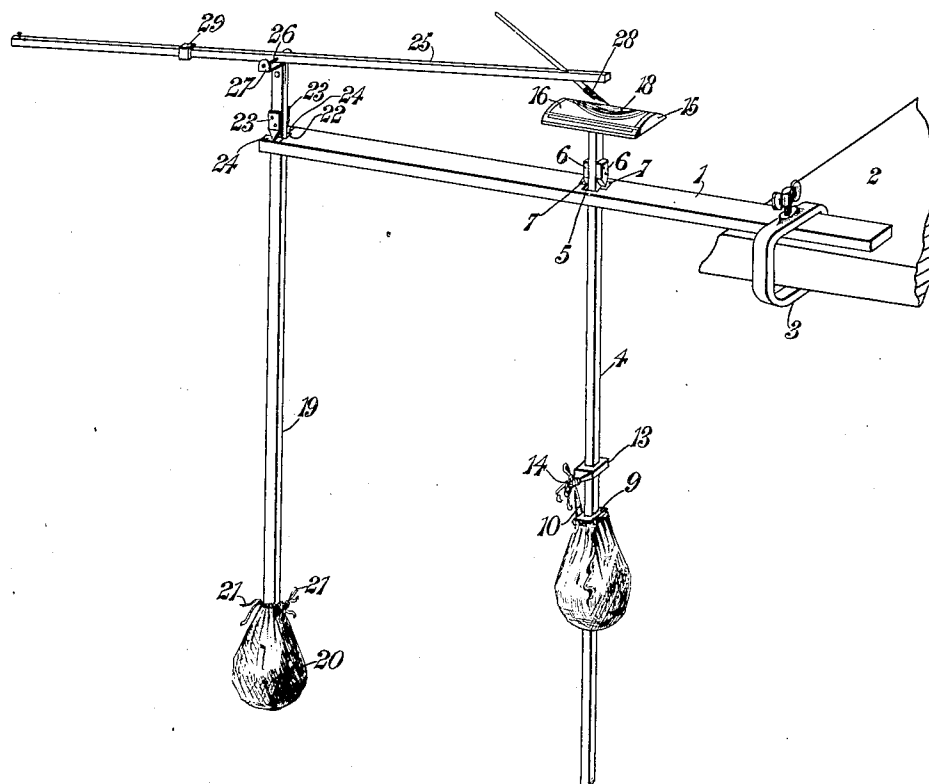


Fig. 1.

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2 SHEETS—SHEET 2.

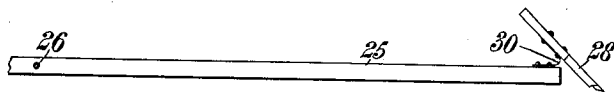


Fig. 2.

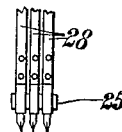


Fig. 3.

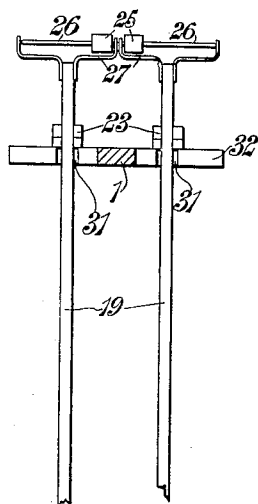


Fig. 4.

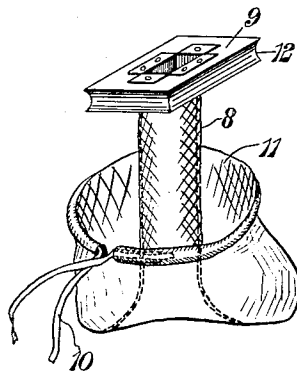


Fig. 5.

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UNITED STATES PATENT OFFICE.

HERBERT PEARCE, OF SALCOMBE, BOWDON, ENGLAND.

PENDULOGRAPH.

No. 898,599.

Specification of Letters Patent.

Patented Sept. 15, 1908.

Application filed February 7, 1908. Serial No. 414,841.

To all whom it may concern:

Be it known that I, HERBERT PEARCE, a subject of the King of the United Kingdom of Great Britain and Ireland, and residing at Salcombe, Stamford Road, Bowdon, Cheshire, England, have invented new and useful Improvements in Pendulographs, of which the following is a specification.

The present invention relates to improvements in pendulographs and consists in a distinctive combination of two or more pendulums whereby the influence of the harmonic property of the secondary pendulum, upon the corresponding property of the principal pendulum, is registered in graphic form.

It comprises improvements in the details of construction, adapted to effect economy in manufacture.

The utilities of a pendulograph are numerous. One of them is to draw the acoustical figures known as Lissajou's curves. A second is to aid the study of harmonics. A third is to draw designs adapted for decorative materials such as wall papers and coverings, hangings, ornaments for ceilings and floors. A fourth is educational and a fifth is that a pendulograph may be an entertaining toy.

Referring to the accompanying drawings which are to be taken as part of this specification and read therewith, Figure 1 is a perspective view of a two pendulum pendulograph: Fig. 2, a detail side elevation and Fig. 3 a detail end elevation: Fig. 4, a detail side elevation showing two independent secondary pendulums; and Fig. 5, a perspective view of the empty pocket of the adjustable weight of the principal pendulum.

1 is the frame of the pendulograph. It may be of any form provided that it can be easily fixed to the top 2 of a table or equivalent support, so that it shall project laterally therefrom far enough to hold the pendulums clear of it and of the ground, and low enough for the action of the pendulograph to be easily seen. Consequently it is advantageously a straight bar adapted to have one end laid upon and held to the table top 2 as shown. The means by which that end is so held, forms no part of the present invention. Any convenient means may be adopted. A screw clamp 3 answers the purpose.

4 is the rod of the principal pendulum. It is mounted on the frame 1 to oscillate at right angles therewith, the axis of oscillation being at a far enough distance below the top

of the rod 4 to allow of the oscillation of the table described further on. The means of mounting consist preferably of a hole 5 through the frame 1 down through which the rod 4 is passed, a knife edge 6 fast to each of two opposite sides of the said rod 4, the two edges 6, 6, being aligned with each other at right angles with the plane of oscillation, and a bearing surface 7 for each edge 6, fast on the frame 1. The hole 5 is of a proper size to allow the rod 4 to oscillate freely. The weight of the principal pendulum must be adjustable vertically thereon. It consists preferably of a tube of flexible material tapering from a diameter just large enough to pass freely up and down the rod 4, to one large enough when it is turned outwards and upwards, to make an annular pocket large enough to receive as much loose stuff, such as sand or small gravel, as shall constitute a sufficient weight.

8 is the smaller diameter of the tube. It is made fast by its end to a plate or block 9 sliding freely on the rod 4, and having a periphery rather smaller than the opposite end of the tube. This end is fitted with a bag string 10. When it has been turned upwards and outwards into the position shown in Fig. 5, thereby making the annular pocket 11, the requisite quantity of loose stuff is put into the pocket and confined there by fastening the said opposite end of the tube to the edge of the plate or block 9. This is done conveniently by laying the end in a groove 12 in the periphery of the plate, drawing the string 10 tight and tying it. The desired adjustability of the weight is attained by suspending it from an automatic locking ring 13 on the rod 4, said ring having its internal face parallel with the side of the rod, its internal diameter just large enough to allow it to slide freely up and down the rod and also having a projection 14 on one side of it to which the ends of the string 10 are made fast. The ring 13 is then put at the desired height on the rod 14 and let go whereupon the weight pulling downwards on the ring from one side only, jams it against two opposite sides of the rod 4.

15 is a table fast on the top of the rod 4. The function of the table is to support the sheet 16 on which is made the register in graphic form 18 above referred to. The top of it is curved to a radius described by any point in it during the oscillation of the principal pendulum.

19 is the rod of the secondary pendulum and 20 its weight. The latter consists of a tube like that of the principal pendulum, but each end of it is fitted with its own bag string 21, 21, and both strings are tied to an annular groove in the rod 19 adapted to receive the double ligature. This weight is not adjustable vertically on the rod 19. The latter is mounted to oscillate on the frame 1 in a plane at right angles with that of the principal pendulum and at a suitable distance therefrom. The means of mounting consist preferably of a notch 22 in and lengthwise of the outer end of the frame 1, to receive the rod 19, a knife edge 23 fast to each of two opposite sides of the said rod 19, the two edges 23, 23, being alined with each other at right angles with the knife edges 6, 6 of the principal pendulum, and a bearing surface 24 for each knife edge, fast on the frame 1. The axes of the two pendulums are preferably in the same horizontal plane. The top of the rod 19 stands up above the frame 1 for a suitable distance to receive an arm 25 which is parallel with the frame 1 and is pivoted on the said top to oscillate freely thereon. The pivot may be of any suitable kind. The one illustrated consists of a light axle 26 passed through and fast in the arm 25, the ends of the axle turning in bearings formed in a bracket piece or crutch 27 fast on the top of the rod 19. The function of this arm 25 is to carry the recording pen. It is therefore long enough to overhang the table 15. 28 is the pen, or equivalent marker, held to the respective end of the arm 25 by any suitable means, *e. g.*, by being passed at a suitable angle through a hole near the said end. 29 is a weight slidable along, or otherwise adjustable lengthwise of, the arm 25 on the opposite side of the axis of the arm, to adjust the pressure of the pen 28 on the sheet 16 and also to raise the said pen off the sheet. A pen may be held to the end of the arm 25 by a bent bar spring 30 as shown in Fig. 2. There may be more than one pen 28 on an arm 25.

Fig. 3 shows three pens all held by respective springs 30. There may be more than one secondary rod 19 (with its weight 20) and its arm 25 mounted in the frame 1. In such a case, each rod 19 is passed down through a suitably dimensioned and shaped hole 31 in a cross piece 32 fast to the respective end of the frame 1. A crutch or bracket 27 may be wide enough and its axle 26 long enough to allow of the respective arm being adjusted laterally thereon as shown in Fig. 4.

I claim,

1. In a pendulograph, the combination with a principal pendulum, of a secondary pendulum oscillating at right angles with the former; a marker operatively connected with the secondary pendulum; a recorder sheet supported on the principal pendulum; and

means for holding the marker in operative contact with the said sheet.

2. In a pendulograph, the combination of principal pendulum, adapted to support a sheet on its top in a position curved to the radius thereof; a secondary pendulum having its axis in the same plane as the principal pendulum but mounted to oscillate in a plane at right angles with that of the said pendulum; an arm pivoted upon the secondary pendulum and extending towards the sheet above mentioned; and a marker carried by the said arm and held by it in touch with the said sheet.

3. In a pendulograph, the combination of principal pendulum, adapted to support a sheet on its top in a position curved to the radius thereof and having its weight vertically adjustable on its rod; a secondary pendulum having its axis in the same plane as the principal pendulum but mounted to oscillate in a plane at right angles with that of the said pendulum; an arm pivoted upon the secondary pendulum and extending towards the sheet above-mentioned; and a marker carried by the said arm and held by it in touch with the said sheet.

4. In a pendulograph, the combination of frame; principal pendulum hung thereon; table on the said pendulum having its top curved to the radius of the respective part of the pendulum; a secondary pendulum mounted on the frame above-mentioned to oscillate in a plane at right angles with that of the principal pendulum; an arm pivoted upon the secondary pendulum and extending towards the table above-mentioned; and a marker carried by the said arm and held by it in touch with the said table.

5. In a pendulograph, the combination of frame; principal pendulum hung thereon and having a weight vertically adjustable; table on the said pendulum having its top curved to the radius of the respective part of the pendulum; a secondary pendulum mounted in the frame above-mentioned to oscillate in a plane at right angles with that of the principal pendulum; an arm pivoted upon the secondary pendulum and extending towards the table above mentioned; and a marker carried by the said arm and held by it in contact with the said table.

6. In a pendulograph, the combination of frame; principal pendulum hung thereon and having a weight vertically adjustable; table on the said pendulum having its top curved to the radius of the respective part of the pendulum; means for holding a sheet on the said table; a secondary pendulum mounted on the frame above-mentioned to oscillate in a plane at right angles with that of the principal pendulum; an arm pivoted on the secondary pendulum and extending towards the table above mentioned; a marker carried by the said arm and held by it in contact with the

said table; and a weight adjustable lengthwise on the said arm.

7. In a pendulograph having principal and secondary pendulums, the combination of a weight for the secondary pendulums comprising an annular bag consisting of a taper tube of flexible material having both its ends tied by its own string about the pendulum rod and loose loading stuff inside the bag, and a weight for the principal pendulum, adjustable both for position and weight and comprising an annular bag consisting of a taper tube of flexible material, a block loose on the pendulum rod and to which block both ends are tied, the larger end outside the latter, loose loading stuff inside the bag, and an automatic locking ring loose on the said rod above the said block and means for suspending the loaded bag from one side of the said ring.

8. In a pendulograph, the combination of one principal pendulum and a plurality of secondary pendulums all oscillating in parallel planes all of the latter at right angles with that of the principal pendulum.

9. In a pendulograph, the combination with one principal pendulum, of a plurality

of secondary pendulums all oscillating in parallel planes each of which is at right angles with that of the principal pendulum; a marker operatively connected with each secondary pendulum; a recorder sheet table supported on the principal pendulum; and means for holding the markers in operative contact with the register sheet.

10. In a pendulograph, the combination with one principal pendulum, of a plurality of secondary pendulums all oscillating in planes parallel with each other and at right angles with that of the principal pendulum; a recorder sheet table supported on its principal pendulum; an arm pivoted and axially adjustable upon each secondary pendulum and extending towards the said table; a marker carried by each arm; and means for holding all the markers in operative contact with the register sheet.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

HERBERT PEARCE.

Witnesses:

EWALD SIMPSON MOSELEY,
MALCOLM SMETHURST.