PHIPPS&BIRD

Phipps & Bird, Inc. *Manufacturers of Scientific Instruments* P. O. Box 27324 Richmond, Virginia 23261 (804) 264-7590

HEART LEVER

7032-000 7034-000

7030-000

OPERATING INSTRUCTIONS AND PARTS LIST

The equipment described in this manual is not designed or intended for clinical or diagnostic use.

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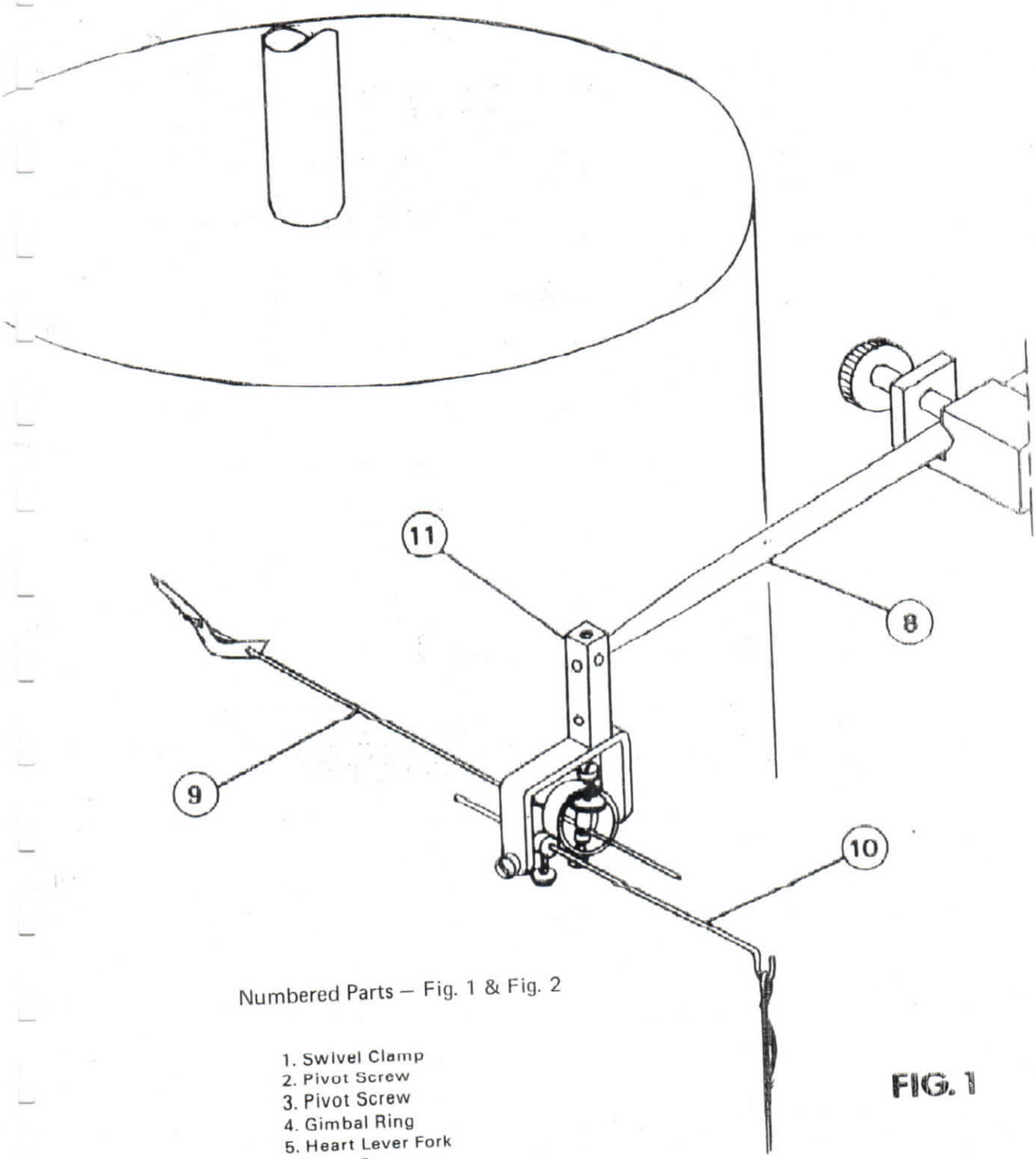


FIG. 1

Numbered Parts — Fig. 1 & Fig. 2

1. Swivel Clamp
2. Pivot Screw
3. Pivot Screw
4. Gimbal Ring
5. Heart Lever Fork
6. Pivot Screw
7. Lever Loading Screw
8. Heart Lever Support Rod
9. Stylus, Smoke Writing
10. Operating Lever
11. Block
   - A Clamp Nut
   - B Stylus Hole

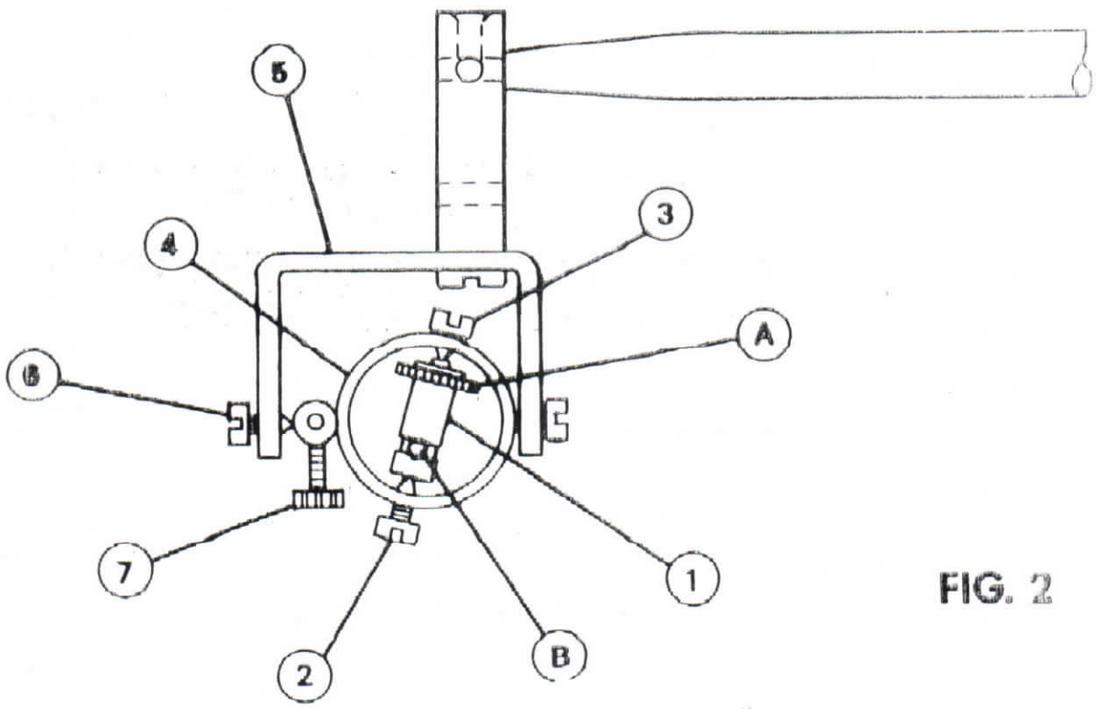


FIG. 2

ASSEMBLY AND OPERATING INSTRUCTIONS FOR HEART LEVERS 7032-000 AND 7034-000

ASSEMBLY

The numbered references in the directions below correspond to the numbered parts in Fig. 1 and Fig. 2 of this manual.

Fasten the heart lever support rod (8) to kymograph support rod (Phippe & Bird 7011-000 or 7012-000) by means of a double right angle clamp (7026-000). The heart lever support rod should be in the horizontal position with respect to the lab table top. (Fig. 1)

The "U" shaped heart lever fork (5) should be in the inverted position as illustrated. The selection of screw holes in the support block (11) allows for a variety of positions for the lever rod-block-fork assembly, thus providing for the best possible recording results under different experimental conditions. (Fig. 1 & 2)

Unscrew the clamp nut (A) thereby exposing the hole (B) for inserting either the pen or stylus. Having inserted same, adjust pen or stylus shank to desired length and retighten clamp "A". (Fig. 2)

Insert the end of the operating lever (10) through the hole in the small cylinder boss as shown in Fig. 1, and tighten lever loading screw (7). (Fig. 2)

Attach one end of a thread to the hook-end of the operating lever (10). The other end of the thread is to be attached to the apex of the animal heart by means of a small fish hook or bent insect pin. (Fig. 1)

ADJUSTMENT AND OPERATING NOTES FIGS. 1-2-3

GIMBAL ASSEMBLY - Adjust pivot screws (2 & 6) to allow for the free swiveling action of the swivel clamp (1) and gimbal ring (4). (Refer to Fig. 2)

PEN & INK RESERVOIR - Insert the shank of the inkwell (13) into the hole in inkwell support (14) as illustrated in Fig. 3. Adjust the inkwell so that the pick-up end of the pen will dip into the well without touching either the bottom or the sides of the well at either extreme of the pen stroke. (Refer to Fig. 3)

PEN & RESERVOIR, CHARGING - This operation employs the use of the accessory pen starter, 7028-000. Fill the reservoir of the inkwell, (13) with Phipps & Bird writing fluid (7020-000, 7020-500, or 7021-000). Push the plunger of the empty pen starter syringe all the way in. Insert the tip of the pen into the opening in the starter tube and very slowly withdraw the plunger of the starter until the ink flows through the pen.

CAUTION: The ink flows from the inkwell (reservoir) and through the pen by capillary action. The purpose of the pen starter is to overcome the initial resistance against this action. As this resistance is exceptionally small, it should not be necessary to withdraw the plunger more than 1/4" from the syringe. A greater draw will only result in pulling an excessive amount of ink into the pen starter tube and syringe assembly.

POSITIONING OF TOTAL ASSEMBLY - Move the completely set up heart lever - support rod assembly to a position relative to the kymograph drum so that the writing point of the pen rests lightly against the kymograph recording paper, and such that the writing arm of the pen (15) or stylus (9) and the operating lever (10) are parallel. If all adjustments are correct, the writing tip will return to the recording paper surface when the pen is pulled away and released. (Fig. 1 & 3)

OPERATING ARM & THREAD - At this point, the thread connecting the operating arm hook to the heart pin (or hook) should be adjusted to bring the operating lever to a horizontal position with respect to the laboratory bench top.

GIMBAL LUBRICATION - A minute amount of machine oil applied to the pivots will keep them working freely and prevent rust.

PEN & INK RESERVOIR, CLEANING - After using the heart lever pen, the pen (15) should be flushed with water followed by isopropyl alcohol or acetone. Failure to do so will only result in a clogged, unserviceable pen. (Fig. 3)

CAT. NO. 7034-000

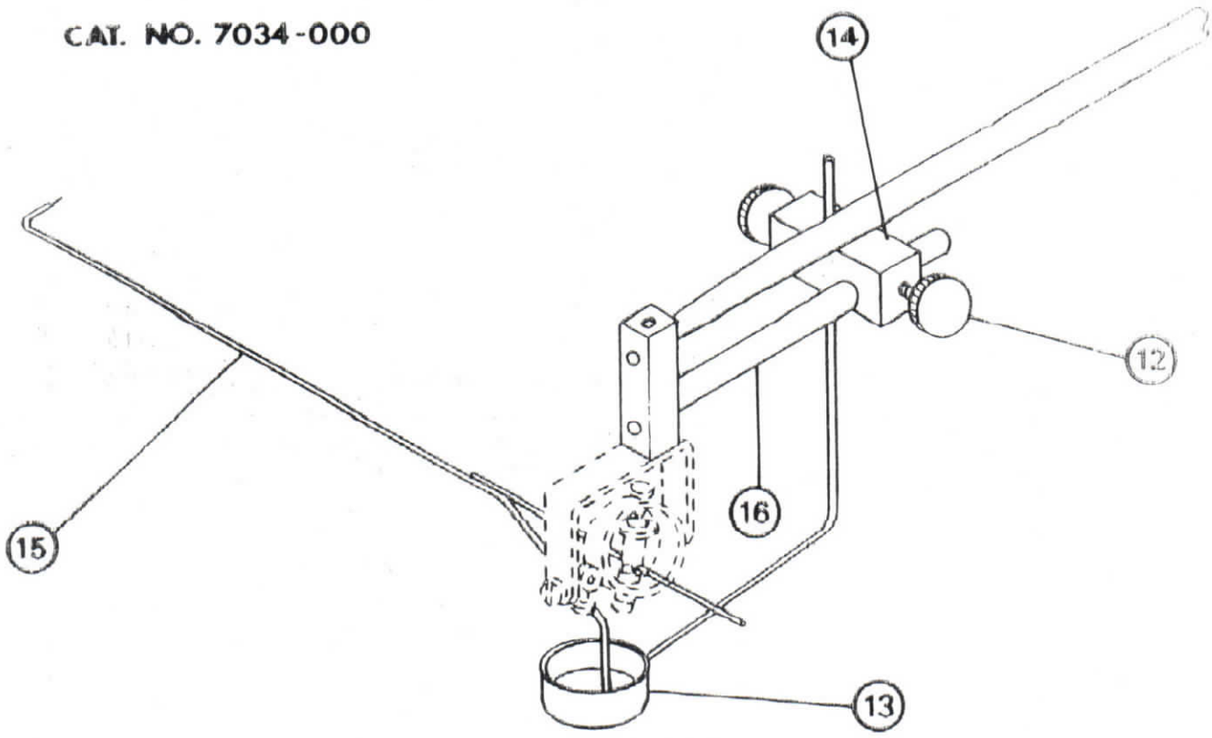


FIG. 3

12. Thumb Screw
13. Inkwell
14. Inkwell Support
15. Pen
16. Inkwell Clamp Rod

ASSEMBLY AND OPERATING INSTRUCTIONS FOR THE 7030-000 HEART LEVER (SMOKE WRITING)

ASSEMBLY

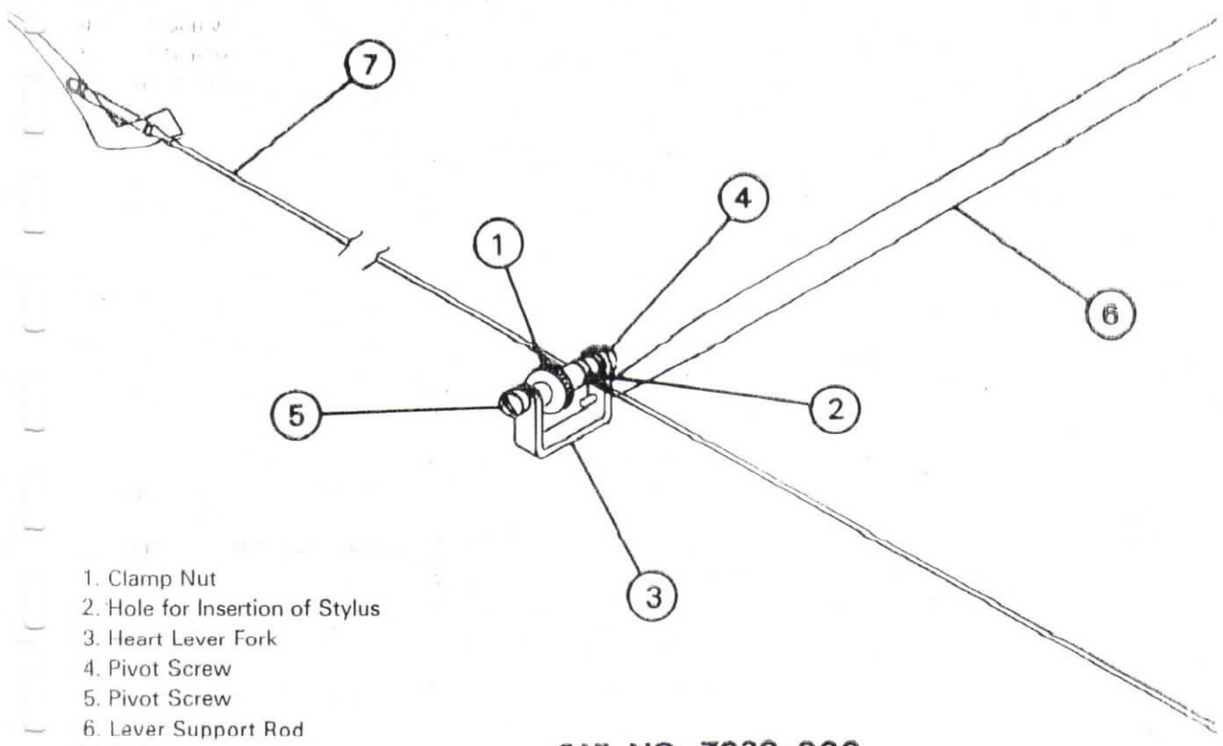
The numbered references in the directions below correspond to the numbered parts in Fig. 4 of this manual

Using a double right angle clamp (7026-000), fasten the heart lever arm (6) to a suitable support rod (7011-000 or 7012-000) so that the arm (6) is in a horizontal position with respect to the laboratory bench top.

The "U" shaped heart lever fork (3) should be in the upright position as shown in Fig. 4.

Unscrew the clamp nut (1) to expose the stylus hole (2) in the swivel clamp assembly. Insert the shaft of the stylus (7) into this hole to the desired length and retighten the clamp nut (1).

Attach one end of a thread to the stylus shank (7) near the heart lever fork-clamp nut assembly, and opposite the stylus writing side. The other end of the thread is to be attached to the apex of the animal heart by means of a small fish hook or bent insect pin.



1. Clamp Nut
2. Hole for Insertion of Stylus
3. Heart Lever Fork
4. Pivot Screw
5. Pivot Screw
6. Lever Support Rod
7. Stylus

CAT. NO. 7030-000

FIG. 4

ADJUSTMENT AND OPERATING NOTES

(All Numbers below refer to Fig. 4)

FULCRUM - PIVOT SCREW ASSEMBLY - Adjust the pivot screws (4 & 5) to allow the swivel clamp assembly to swing freely.

STYLUS POSITIONING AND BALANCE - The major portion of the stylus shank (7) should be on the stylus writing side of the fulcrum (swivel clamp assembly). The stylus should be balanced so that only a moderate amount of tension is applied to the heart tissue when the stylus shank (7) is in the horizontal positon (parallel to the laboratory bench top). Balancing can be achieved by applying a suitable counter-weight to the writing side of the stylus shank (7). The application of modeling clay to the writing side of the stylus shank is the material and technique of choice to achieve this balance.

POSITIONING OF TOTAL ASSEMBLY - Move the completely set up heart lever-support rod to a position relative to the kymograph drum so that the writing point of the stylus rests lightly against the smoked paper. When properly set up, the stylus shank (7) should be parallel to the laboratory bench top, with the string applying only moderate tension to the heart tissue. Make final adjustments to the system as needed to keep the string at the desired tension with the stylus shank in the horizontal position by changing the amount and/or position of the modeling clay counter-weight, and/or by altering the respective lengths of the lever and stylus shank in relation to the fulcrum.

Experiment 1 — Recording Heart Beat

Purpose:
(1) To record the auricular and ventricular contractions of the heart and (2) to note the sequence and magnitude of the auricular and ventricular beats.
Assembly of equipment:

Teams of students as selected should first set up the Kymograph and attach the Support Rod (A). Three Double Right Angle Clamps (B) are attached to the support rod as shown in the illustration. Next attach an Ink-Writing Heart Lever (C), with pen 7035-000 attached thru the gimbal ring of the lever, to both the top and middle clamps (B). Attach a Signal Magnet (D) to bottom clamp. Adjust the Signal Magnet so the pen contacts the Kymograph drum (E) about 1" to 1¼" above the botton edge of the drum. The two heart lever pens should be adjusted to contact the drum above the Signal Magnet so there is enough space between that the recordings will not lap on the drum. The three recording pens must be lined up in a verticle plane on the drum.
With Hook up wire connect the dry cell Battery (F) and Time Marking Clock (G) to the Signal Magnet(D).
Prepare a frog by pithing. Secure with clips, the pithed animal, entral side up, to a Frog Board (H). Make necessary incisions as described for exposing the frog heart. Bend insect pins to a hook at one end and form a loop at the other end. Tie a thread to the loop of the bent pin and push the pin into the left ventricle, bring thread up and tie it to the Operating Lever on the upper Heart Lever. Hook a second bent pin into the tip of the ventricle, tie thread to the loop, and tie this thread to the operating lever on the lower Heart Lever.

Counterbalance the Levers (with beeswax or clay) and adjust Levers for slight tension to apply to the Cardiac tissue. Record, for five or ten minutes, the beating heart.

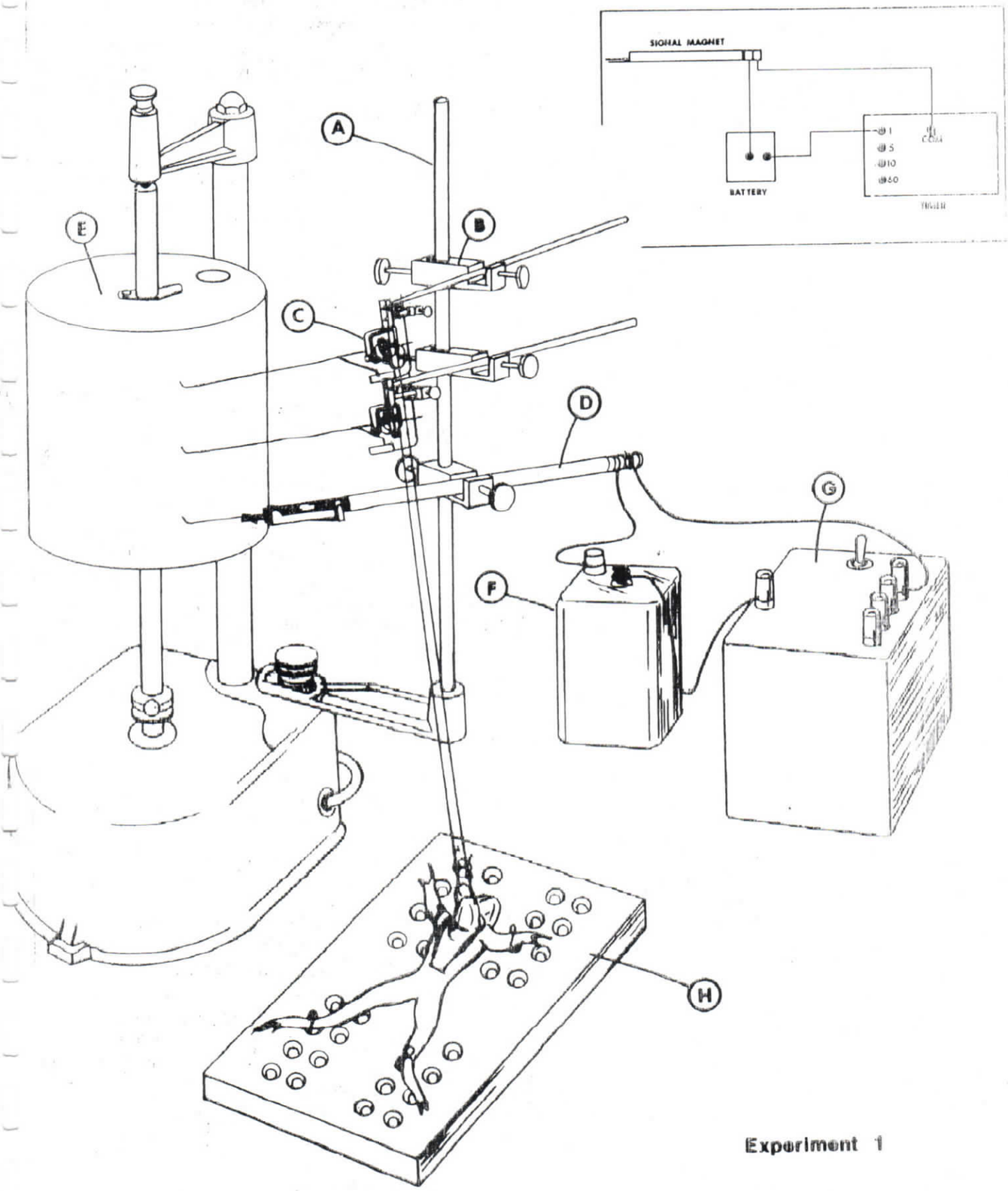
Make sure that the students, when attaching the threads to the Operating Levers on the heart pens, attach these threads the same distance behind the lever fulcrum on both the upper and lower heart levers. The counterbalance should be the same on both levers.

Have the student analyze the Kymograph record and determine the sequence of auricular versus ventricular contraction. Suggest that they explain on a physiological-anatomical basis, why they contract in the particular sequence they do. From their record, also have them determine whether ventricular or auricular contraction is greatest. Why?

To determine the time of (1) auricular and ventricular contractions and (2) the intervals between systole and diastole, a timing magnet driven by an automatic timing device (one or five seconds) is helpful.

EQUIPMENT NECESSARY: (per team)

Item	Catalog No.
Kymograph	7006-000
Rod Support	7011-000
Kymograph Paper	7019-000
3 Double Right Angle Clamps	7026-000
Signal Magnet, Ink Writing	7081-001
2 Heart Levers, Ink Writing	7034-000
Timer Clock	7110-000
Frog Board & Clips	1402-000
Dry Cell (1½ volt battery)	----------
Hook Up Wire	----------
Thread	----------
Bent Pins	----------
Dissecting Set	3029-000
Red Ink	7020-000
(Alternate Equipment for Smoke-Writing)	
Smoking Stand & Burner (one per class)	7013-701
Fixative Solution (one per class)	7021-200
Signal Magnet, Smoke Writing	7079-001
2 Heart Levers, Smoke Writing	7030-000



Experiment 1

Experiment 2 — All or None Response

Purpose: To observe the response of Cardiac tissue to variations in stimuli intensity.

Procedure:

Student teams should be selected and the apparatus set up as shown in illustration. The Kymograph is set up with a Support Rod (A) attached. Four Double Right Angle Clamps (B) are needed. Attach the first clamp to the support rod about even with the bottom edge of the Kymograph drum (C). A Femur Clamp (D) is attached to this clamp. Attach a second clamp to the support rod just over the Femur Clamp. To this clamp attach the Electrodes (E) furnished with the Kymograph Kit. Attach two more Clamps (B) to Support Rod. To the lower Clamp attach an Ink-Writing Signal Magnet (F). To the top Clamp attach an Ink Writing Heart Lever (G). Keep sufficient distance between Heart Lever and Signal Magnet so the recordings will not overlap on the drum. Adjust the Heart Lever and Signal Magnet so the pens contact the Kymograph Drum at the proper angle for recording. Set up a Dry Cell battery (H), a Student Inductorium (J) and a Simple Key (K). With hook up wire connect the Battery to the Signal Magnet - The Signal Magnet connects to the Inductorium. Connect the Electrodes to the Inductorium and connect a Simple Key to the Battery and the Inductorium. (Check the Wiring Diagram)

Before recording on the Kymograph the student must adjust the heart pen and signal magnet so the pen tips exactly line up in the same verticle plane on the Kymograph drum.

Obtain strips of Ventricle tissue by removing the heart from a freshly-pithed frog. With the aid of a sharp razor blade - the instructor will cut the lower two thirds of the ventricle into 3 to 5 strips. Place strips in a small dish of amphibian ringer until ready for use. Remind the student to apply, at frequent intervals, a drop or two of ringer to their suspended tissue.

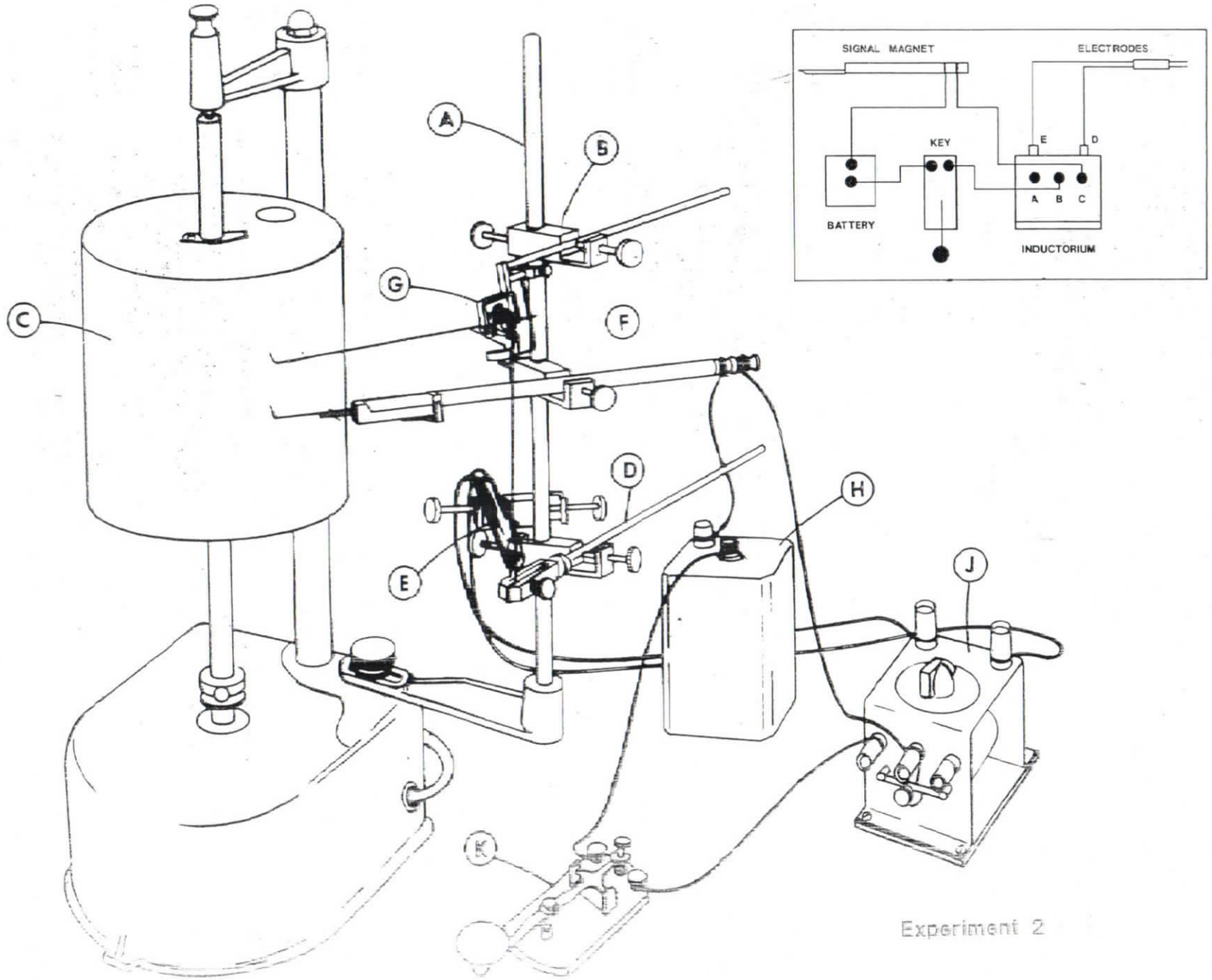
When the strips of ventricle have been prepared, take a strip of ventricle, hook a bent pin thru one end and clamp the pin in the femur clamp. The other end of the piece of ventricle is hooked with a bent pin and string is tied thru the loop of this pin. Bring the string to the heart lever and tie on the operating lever just behind the fulcrum of the lever.

A small piece of beeswax (or clay) may be squeezed over the thread knot to hold it in place. Bring the Electodes up behind the piece of ventricle and adjust so the electrodes touch the ventricle.

To start the experiment the muscle is stimulated with single shocks. First with a subthreshold stimulus and then gradually increase the voltage until a stimulus of five times the threshold stimulus has been reached. The test of the experiment is whether there is a corresponding increase in muscle response as the stimulus is increased.

EQUIPMENT NECESSARY: (Per team)

Item	Catalog No.
Kymograph	7006-000
Rod Support	7011-000
Kymograph Paper	7019-000
4 ea. Double Right Angle Clamps	7026-000
Signal Magnet, Ink Writing	7081-001
1 ea. Heart Lever, Ink Writing	7034-000
Frog Board & Clips	1402-000
Dry Cell (1½ volt battery)	----------
Hook Up Wire	----------
Thread	----------
Bent Pins	----------
Dissecting Set	3020-000
Inductorium	7092-2000
Simple Key	7123-201
Femur Clamp	7025-000
Electrode	7115-204
Red Ink	7020-000
(Alternate Equipment For Smoke-Writing)	
Smoking Stand & Burner (one per class)	7013-701
Fixative Solution (one per class)	7021-200
Signal Magnet, Smoke-Writing	7079-001
2 Heart Levers, Smoke-Writing	7030-000



Experiment 2

REPLACEMENT PARTS AND PRICE LIST FOR 7032-000 and 7034-000

The parts numbers listed below correspond to the numbered parts in Fig. 1, Fig. 2, and Fig. 3 of this manual.

ITEM NO.	CAT. NO.	DESCRIPTION
2, 6	SP9	Pivot Screw (Medium)
5	433X	Heart Lever Fork
7	SP12	Knurled Screw
8	10.804	Heart Lever Support Rod
9	7033-000	Stylus, Smoke Writing
10	10.802	Operating Lever
11	10.803	Block
12	SP24	Thumb Screw
13	SP16	Inkwell
15	7035-000	Pen & Ink Reservoir
	28.200	Gimbal Assembly (Includes Nos. 1, 2, 3, and 4)

REPLACEMENT PARTS AND PRICE LIST FOR 7030-000

The part numbers listed below correspond to numbered parts in Fig. 4 of this manual.

ITEM NO.	CAT. NO.	DESCRIPTION
1, 2	SP8A/B	Swivel Clamp Assembly (Includes 1 and 2)
3	427X	Heart Lever Fork
4	SP13	Pivot Screw (Short)
5	SP9	Pivot Screw (Medium)
6	SP10	Heart Lever Support Rod
7	7031-000	Stylus, Smoke Writing For replacement in No. 7030-000 Lever

ACCESSORIES FOR 7030-000, 7032-000 and 7034-000

CAT NO.	DESCRIPTION
7025-400	Clamp, Gaskell
7026-000	Clamp, Double, Right Angle
7028-000	Pen Starter, Syringe Type
7029-000	Pen Cleaner, Only
7021-000	Ink, Blue, 4 ounce
7011-000	Rod, Support, Only, Stainless Steel
7005-406	A Physiology Manual for the Biology Teacher (Chaet)
— —	Heart Lever Manual
1402-000	Frog Board

NOTICE: Drawings, parts list, and prices are current as of the printing of this manual and are subject to change without prior notice.