Casting (Pouring) Jigs

Andy Martin[1]

Objectives

Participating young people and adults will:

1. **Practice safety with molten metals and jig casting procedures**
2. **Practice mold preparation for casting metals**
3. **Practice jig casting procedures**
4. **Explain safety precautions when using lead**
5. **Practice preparing jig heads for painting**
6. **Have fun while learning.**

Youth Development Objectives

Participating young people will:

1. **Enhance health and safety awareness**
2. **Practice the use of safety equipment**
3. **Enhance communication skills**
4. **Enhance planning and execution of plans**
5. **Enhance hand-eye coordination**

Roles for Teen and Junior Leaders

1. **Assist in set up and break down of teaching space**
2. **Assist members as needed with casting process**
3. **Suggest means of solving casting problems**
4. **Demonstrate safety gear and procedures**
5. **Demonstrate preparing molds**
6. **Demonstrate casting processes**

Potential Parental Involvement

Best Location: Dry outdoor area or well ventilated garage or shop area

Time Required: 2 to 4 hours

Equipment/materials

lead, tin or other alloy bottom pour furnace
old coffee can jig or sinker molds
long (6"+) needle nose pliers
hot pads or heavy gloves jig hooks
weed guard material (if making weedless jigs)
mask or respirator mask slotted screw driver
piece of heavy dowel old spoon
ingot molds assorted containers
machine oil candle
matches latex rubber gloves

Safety considerations:

Never eat or drink while working with lead or other molten metals
Do not smoke
Wear goggles and a respirator mask
Wear heavy gloves for handling hot molds
Wear long shirt and pants to protect skin from possible splattering by molten metal
Always work on a sturdy counter top or table

References:

Modern Tackle Craft. Boyd Pfeiffer
Anglers Guide to Jigs and Jigging. Kenn Oberrecht.

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[1] Future Fisherman Foundation, American Sportfishing Association,

1. See "Roles for Teen and Junior Leaders" above
2. Arrange for or provide teaching space
3. Arrange for or provide materials needed
4. Arrange for or provide transportation
5. Arrange for or provide refreshments

Safety Considerations: Lead is toxic and must be handled carefully. Avoid breathing vapors, wear a mask, and keep lead casting activities away from areas where food may be prepared or consumed. Do not eat or drink anything until thoroughly washing hands and face.

Evaluation Suggestions

1. Observe and enforce proper use of safety equipment. Observe and evaluate casting technique
3. Note discussion and questions asked about the casting techniques and processes
4. Critically evaluate quality of castings and suggest ways to improve or to solve problems

Lesson Plan

Presentation	Application
I. Setting up for casting jigs or sinkers A. Work environment and tools 1. Sturdy, clean table a. Protected from rain or wind b. Close to adequate electrical supply c. Not used for eating or food preparation 2. Set up furnace a. Hot pads for furnace and molds b. Ingot mold to catch any drippings c. Lead supply d. Adjustment tools 1) Slotted screwdriver 2) Needle-nose pliers 3. Slag or dross control a. Coffee can or similar container b. Old spoon c. Flux (e.g. beeswax) 4. Molds and hooks required	**LAY OUT** the equipment needed for the lesson on a good work surface in a suitable location. **NOTE** that water in the lead can be extremely dangerous because it causes steam explosions that can scatter molten lead in all directions. **EMPHASIZE** the need for adequate electrical supplies to handle the load for the furnace. **PROTECT** the table or bench surface with a hot pad or insulating layer**,** and **PLACE** all equipment and materials where access is good for the processes at hand. **DEMONSTRATE** the use of a screwdriver to adjust the tapered rod that cuts off the lead flow. **REINFORCE** the notion that nothing used in casting lead or its by-products should be used in handling food or drink.
B. Protective gear 1. Goggles or safety glasses 2. Mask or respirator mask 3. Gloves or other protective gear	**PASS OUT** and **DEMONSTRATE** the use of safety equipment to be used in molding the lures. **NOTE** that the respirator-type masks are much better than other types because they filter out lead vapors. **REMIND** the participants that the lead remains very **HOT** for a while after the casting is finished.
II. Getting started A. Put on safety equipment 1. Goggles 2. Mask 3. Gloves	**DEMONSTRATE** the casting sequence from start to finish, starting with putting on your safety equipment.
B. Start lead melting 1. Turn furnace on (setting of 6 or 7) 2. Place small pieces of lead in furnace 3. Add larger pieces as they melt	**NOTE** that the jig or sinker maker should follow the directions of the manufacturer in setting the temperature of the furnace, and that moderate temperatures are preferred for best casting performance. **WARN** participants that toxic gases may be produced at excessive temperatures, particularly where lead with traces of tin is being used.

C. Smoke the mold 1. Use candle flame
2. Hold in middle of flame
3. Coat cavities until "black with soot"

USE a candle flame to prepare the mold for casting while the lead is getting up to temperature. **CONTINUE** to smoke the mold until the cavities are well covered with soot.

D. Flux and skim impurities from lead
1. Skim dross and slag with a spoon

USE a commercial flux or a tiny piece of beeswax to aid in getting the oxidized lead and other impurities collected at the top of the molten lead. **PLACE** the slag or dross in a metal container that can be sealed for later disposal.

2. Deposit slag in a can for disposal

E. Pre-heat mold
1. Cast without hooks 2-4 times
2. Cast heating cavities if present
3. Return lead to pot to re-melt
a. Handle with extreme care
b. Use tools to handle

EMPHASIZE the importance of pre-heating the mold, particularly for small or intricate castings. **DEMONSTRATE** how to pre-heat the mold by casting jigs without hooks or filling the heat cavities in some molds.

III. Making jigs

A. Placing hooks or inserts in molds
1. Caution: molds are hot!
a. Gloves
b. Needle nosed pliers, tweezers or hemostat

CAUTION participants to exercise care when placing hooks in the molds and **RECOMMEND** the use of a tool to do so. **EMPHASIZE** putting being precise with the placement of the hooks or wires in the areas designed for them.

2. Follow mold maker's instructions
a. Hook sizes
b. Hook styles
1) Wire size
a) Heavy hooks
b) Wire hooks
2) Shapes
a) 90E angle on eye
b) 60E angle on eye
c) Bent shank
d) Kinked shank
e) Wire forms or combinations
3) Hook material and finish
a) Bronzed
b) Gold plated
c) Tinned or nickel plated
d) Stainless steel

NOTE that the molds are made for a specific type, size, and style of hook and that departures from those recommendations can result in poorly formed or useless castings.

SHOW examples of the types and sizes of hooks being used in the session.

DISCUSS the advantages and disadvantages of the various types and finishes on hooks.

3. Lay mold flat on table to load hooks
4. Check hook seating before closing mold

NOTE that placing the mold flat on the bench makes insertion of the hooks much easier. **CAUTION** participants to close the mold carefully to avoid getting hooks out of location and causing sloppy casts.

B. Pour lead into mold cavities
1. Pour heat cavities first if present

NOTE that molds with heating cavities should have those cavities filled first, particularly if very small jigs are being cast.

2. Fill cavities in succession
a. Handle to hinge
b. Fill into sprue cavity
c. Work quickly and carefully
3. Complete filling essential

EMPHASIZE using an organized approach to pouring the molds full. **NOTE** that the sprue cavity should be filled as well, making sure that an excess of material is present to fill the mold cavities. **STRESS** working quickly and carefully.

C. Remove jigs from mold
1. Open mold after lead hardens
2. Turn to allow jigs to fall out
a. Soft, heat resistent surface

EXPLAIN that the jigs are ready to remove when the lead on the surface of the sprue hardens. **NOTE** that molds should be opened over a soft, heat resistant surface since they may fall out of the

b. If needed, grasp sprue with needle-nose pliers and lift jigs from mold

3. Inspect cast jigs for quality
   a. Set aside or re-melt imperfect castings
   b. Correct the problem if needed

D. Allow jigs to cool
   a. Soft, heat resistant surface
   b. About 5-10 minutes for smaller jigs
   c. Touch with caution!

E. Refill molds and repeat
   1. Work quickly
   2. Remember the mold is HOT!
   3. Continue until desired numbers reached

F. Finish jigs
   1. Remove sprue from casting
      a. Grasp with pliers and bend back and forth
      b. Cut with gate cutters
   2. File smooth if desired
      a. Push strokes with file
      b. Card file to remove lead filings
   3. Paint or prime jigs (see lesson)

IV. Cleaning up after the session

A. Drain lead or alloy from furnace
   1. Pour into ingot molds
   2. Allow ingots to cool

B. Shut down furnace
   1. Turn heat knob to zero setting
   2. Unplug furnace
   3. Allow to cool completely before storing

C. Collect all spatters, sprues and filings
   1. If necessary, allow to cool completely
   2. Store in suitable containers
   3. Excellent for starting the next time

D. Put hooks away
   1. Gather any unused hooks
   2. Store by size and type
   3. Use original containers if possible

E. Inspect molds
   1. Carefully remove any misplaced lead
   2. Allow to cool completely
   3. Oil hinge before putting away

F. Store jig making supplies and equipment
   1. Store in an organized fashion
   2. Use sealable plastic containers if possible
   3. Store in a cool, dry place

mold when it is opened. If necessary they may be removed by grasping the sprue with a pair of needle nosed pliers and lifting them from the mold.

EMPHASIZE the need to inspect each jig to see that the casting conforms to the design of the mold. **TROUBLESHOOT** any problems that exist to help members improve their technique.

STRESS the importance of allowing the jigs to cool adequately before handling them.

NOTE that quickly refilling the mold and pouring a successive batch of jigs assists in getting good castings by keeping the mold hot. **CAUTION** the members to avoid getting burned on the mold or the jigs.

DEMONSTRATE methods of removing the sprue from the castings and **LEAD** the youngsters in completing the molding and smoothing elements of the jig casting process.

DEMONSTRATE the proper way to use a file.

NOTE that no better time exists to either prime the jigs or apply powder paint (See lesson on powder paint).

DEMONSTRATE and have participants **ASSIST** in the clean up process and the preparation for the next use of the jig casting equipment.

CAUTION the participants to have the entire furnace cool to the touch before storing it.

NOTE that careful storage of sprues, lead filings, etc. is required both for future casting and for containment of the elemental lead. **SUGGEST** that using sealable polyethylene containers is an excellent way to manage the lead.

Have participants **GATHER**, **MATCH** and **PUT AWAY** the leftover hooks.

EMPHASIZE proper care of the molds now for better use in later casting sessions.
NOTE the importance of using an organized storage approach in locating equipment and using it the next time.

Lesson Narrative

Initial Preparations

Start by getting your work area properly set up. Lay down 2 - 3 heat pads on a sturdy work table or bench. Set your bottom-pour furnace on one of the pads and place an ingot mold on the base of the furnace directly underneath the pour spout. The ingot mold is important during the casting process to catch drips. Place a screwdriver, needle nose pliers, and coffee can with an old spoon within easy reach. Lay out the jig mold

and hooks you are going use and add solid metal to the furnace. Make sure you are wearing long sleeves and long pants and sock and shoes. It's also a good idea to wear a cap of some sort. Any time molten metals are being used, be sure to wear safety glasses (goggles are better) and a mask or respirator mask.

To aid in proper casting of jigs, the jig mold should be smoked prior to use. Soot from a candle flame coated on the surface of each jig cavity allows molten metal to flow more quickly and smoothly into the jig cavity. Pass the surface of the jig mold back and forth over the flame until each jig cavity is black with soot.

Plug in the furnace and turn the heat knob to 6 or 7. After the metal has melted, flux it with a commercial flux or a small piece of beeswax. Use the spoon to skim off any slag or surface dross from the surface of the molten metal. Discard the slag in an old coffee can. After removing the slag, the surface of the molten metal will be smooth and golden in color.

Its now time to pre-heat the jig mold. Like the smoking process, pre-heating allows the molten metal to flow more quickly and smoothly into the jig cavity. Pre-heat the jig mold by pouring molten metal into each jig cavity. Remove the lead or alloy with needle nose pliers and return it to the furnace. Repeat this 2 - 3 times. If a heating cavity is located in the bottom of the mold, as in most very small jigs, be sure to fill it, too. Smoking and preheating the mold is the best way to avoid incomplete castings.

Making the Jigs
Lay the mold on table and place jigs hooks in slots of each jig cavity. Make sure the hooks are the proper size and style specified by the manufacturer. Close the mold so it shuts completely. Any gaps indicate something is wrong. If you have hooks placed in each jig cavity of the mold, start pouring into the cavity nearest to handle and progress outward. Allow molten metal to fill each cavity and the sprue hole. Allow the metal to cool for a second or two (it sets up quickly), then open the mold. Often the jigs will simply fall out of the mold. If they do not, simply grasp the sprue with needle nose pliers and remove the jigs from the mold. Place the jigs on the hot pad, sacrificial piece of soft wood, or a similar surface to allow them to cool. Most jigs under 1 ounce will be cool to touch in about 5 minutes. Repeat the process, being careful not to touch the hot mold or jigs with your bare fingers until you have cast all the jigs you intend to cast in this session. If the furnace begins to drip between pours, use the screw driver to adjust the pour spout stopper. Simply insert the screwdriver in the slot at the top of the spout stopper and rotate it until the flow stops. Usually the problem is a minor misalignment of the stopper and the spout. If the spout fails to permit good flow, it is usually caused by a bit of slag or dross getting into the spout opening. Keeping the furnace full and clean will eliminate the problem. Fixing it during a pouring session calls for careful adult attention.

Turning off the Furnace
If you have cast all the jigs you want for this session, drain the rest of metal from furnace into the ingot mold, turn the heat knob of the furnace back to zero and unplug it. Leave it on the work bench or table until it has cooled completely before putting it away in a safe place.

Finishing the Jigs
Once the jigs you have made are sufficiently cool, remove the sprues from the molded jigs. Grasp the hook in one hand, and using the needle nose pliers, clamp down on the sprue. Use the pliers to work the sprue in a side to side motion until it breaks free from the jig. Many jig makers use gate cutters for this process also. If you desire, you can further refine your jig by filing the sprue scar using a file. Save the sprues and any filings for your next casting session. If the jigs are to be painted, this is the best time to begin that process, by putting at least the base coat on the freshly poured lead.

Clean up
Do not attempt to put away the furnace until it is cool to the touch. Clean up lead or alloy splatters and sprues and place them in a sealable container. You can re-melt these scraps and use them to make more jigs during your next session. Put away any loose hooks, making sure you get them in the proper boxes. Place a few drops of machine oil on the hinge of your molds before storing them.

Store your jig making supplies and unused lead or alloy in sealable plastic containers. They come in a variety of sizes are convenient for storage.