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Construction and Use of Small Trap Nets[1]

[1] Contribution from the Michigan Institute for Fisheries Research

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Fisheries workers, particularly those concerned with inland lakes, are constantly faced with the need for more adequate collecting gear. Ideally, one type of net could be used to secure samples of all sizes and kinds of fish from all habitats. One needs only a minimum of netting experience to realize that such efficient gear is probably non-existent. The present paper describes the construction and use of a type of small trap net which has proven a very useful supplement to the gear used by the Michigan Institute for Fisheries Research.

Some years ago the Institute employed a commercial fisherman who, with his own equipment, was to make population studies in various inland lakes of the state. It was at once evident that his gear, while heavy and cumbersome was highly efficient, and that commercial nets, primarily designed for use in the Great Lakes, could be used advantageously in smaller waters. The major difficulties encountered in using such gear

were those associated with the sheer manual labor involved in handling the nets. Also, because of their bulk, the operation of the nets was very difficult until the operator had acquired some proficiency in their use. Transporting the nets from one lake to another and getting them laid out ashore for drying was a major undertaking. Once the nets were set, however, they could be operated with ease. Nets of this type could be considered practical only when an extensive netting program was being conducted on a single body of water, and when it was desirable to catch fish in large numbers. They required the use of a heavy boat, and a large truck was needed to move them from one lake to another. Later in the program another commercial fisherman was employed. His equipment was considerably lighter and more portable than that of his predecessor and certain construction details made his nets easier to handle. The major difference was that his nets were constructed with a single pot or crib, and that the back bridle was fastened to all four corners of the unit, thereby dispensing with a spreader----the notched stick used at the back of the net to keep the top and bottom brails separated when the net is in the water. His nets apparently took fish as well as those first used. The problem of bulk and weight remained, but to a lesser degree. It was felt that if the size of the nets could be reduced sufficiently to permit the use of smaller floats and leads, and lighter webbing and rope, the total weight might be reduced to the point where lighter anchors could be used, thus greatly reducing the weight and bulk of the entire gear. This saving in weight and bulk would of course result in much improved portability and ease of handling. The descriptions and figures given below deal with nets incorporating these modifications.

Figure 1 depicts the essential features of the trap nets now being used by the Institute. The basic design is that of the submarine trap net used extensively in the Great Lakes region. The type with the double pot has been illustrated. Fish striking the leader follow it into the entrance and gradually work their way to the back of the net. When the gear is lifted only the back end is raised, and fish are removed from the pot through lace holes in the top. The few fish remaining in other parts of the net may be removed or allowed to remain and work their way to the back of the net.

Trap nets have been found to display many advantages in population study work. They are generally less selective than gill nets at any particular depth or habitat, and they capture most species of warm-water fish readily. Since the fish are impounded, unwanted specimens may be released unharmed, and removed much more rapidly than from gill nets. Nets of this type will capture both largemouth and smallmouth black bass in mid-summer, a function gill nets assuredly will not perform consistently. The nets have the further mechanical advantage of not being easily torn, snagged, or entangled. They may be dried in any reasonably clear area ashore, and due to their seine-twine construction they are relatively durable. For the capture of cold-water species, such as trout, whitefish, and herring they have not been very reliable, except under special circumstances. However, even for trout they have performed well on occasion.

The first small trap net was made and used in 1947. It had a pot 2 feet deep, 2 feet wide, and 6 feet long, and a 200-foot leader, 2 feet in depth. This net performed reasonably well as compared with the experimental gill nets used previously, but in comparison with the larger traps it was disappointing. However, it was light and very easily handled, and

its use for a season showed how later models might be improved. Incorporation of desirable modifications has now resulted in a unit which is considered quite satisfactory. These modifications entailed altering dimensions of the leader to 100 feet by 4 feet and adding a small umbrella of netting to extend across the opening between the wings where the 4-foot leader tapers down to join the 2-foot mouth of the net. The Institute has had 5 additional trap nets constructed. These nets are 3 and 4 feet deep, with 100-foot leaders. Total weight of each unit, with anchors and anchor lines, is approximately 100 pounds. This weight can be distributed in two or three packages, for in laying the nets out for drying, or in moving them, the leader and the trap usually will be handled separately.

The nets do have certain physical limitations. Generally, they cannot be operated efficiently in water deeper than 35 feet. A firm bottom with a gradual slope facilitates their use, for the nets should be taut, and in a soft bottom the anchors will not hold. This difficulty can usually be solved by the operator's ingenuity. For example, it has been found that tying a board about 6 inches wide between the points of the anchors or lengthening the anchor lines often will hold the net firmly in such bottom.

Figure 2 is a working drawing showing construction details. Dimensions can be adjusted to meet specific applications; but if the nets are to be moved frequently, and bulk and weight are to be kept low, the net illustrated is close to the maximum size which might be termed a "small trap." Certain details of the construction which are not illustrated need to be mentioned. The twine in the pot is #12 thread seine twine; that in the remainder of the net is #9 thread seine twine. The float line is #6 thread Manila, and the lead line is #9 thread Manila. We have used aluminum gill net floats, 4-1/2" x 1-1/2", throughout the unit. For weights, we have used 5-oz. split gill net leads, which can be pinched directly on to the lead line. The head

anchor line should be not less than 100 feet long, and a longer line is generally preferable, especially when operating in deeper water. Lines to the side anchors have usually been 50 or 75 feet long. The heavier twine in the pot is desirable for it is the pot which is subjected to the greatest amount of wear by being pulled over the gunwale of the boat. The ends of all bridles are fastened around a thimble which permits ropes to travel freely through and acts as a pully.

The nets should be treated with preservative. Even though there are other materials which are pleasanter to use and handle, the Institute has found tar-treated nets very satisfactory, and commerical fishermen generally consider the black color desirable.

When operating nets of this type, certain items of equipment are essential or desirable. The following suggestions are given, for the items listed have been found satisfactory, but any operator will soon learn which items he finds needful. Boat: Nets of this size may be set from almost any rowboat, but a thoroughly reliable work boat is a blessing. The ordinary resort rowboat is frequently unstable, and since the operator needs to stand when handling and setting the nets the boat should be large enough to allow the operators free movement and to permit net storage without undue crowding. While the various types of car-top boats will serve they cannot be recommended as a work boat if many nets of this type are to be handled. Good results have been obtained with a boat 15 feet 6 inches long, with a 24-inch freeboard and a 56-inch beam. The gunwales should be free of obstructions so the operator may pull nets and lines over the side or stern without fear of snags. Also, the gunwales should be of hardwood, for lines to which tension has been applied will quickly wear away softer woods. A gunwale stringer, inboard from the ribs, strengthens the boat and provides

a convenient place for tying lines temporarily. The single seat should be set well forward, leaving the after part of the boat clear as a work space. A refinement which has proved worthwhile is to construct the boat with a square bow as well as a square stern, so that the operators may use an outboard motor attached to either end of the boat. Gear: Extra Manila line should be carried to replace broken anchor ropes, or to lengthen anchor lines in case the anchors slip. A coil of 100 feet or so of 8-thread maitre cord equipped with a sounding lead is also very useful. It may be used to ascertain the approximate depths in the area where the net is to be set. Extra buoys are also often useful. A bobbin filled with #12 thread seine twine for minor net repairs is essential, as all holes in the sides and top of the pot must be mended promptly. Holes in the other parts of the net are not quite so important, but since small holes are very easily mended it is well to keep the nets in a good state of repair at all times. A sharp pocket knife is indispensable. A long-handled, sturdy dip net should be carried to use in removing fish from the nets.

The nets are not difficult to set, and when their operation has been mastered they can be handled in quite rough water, or even set under the ice. When the net is once set, the net itself or the buoys attached to it may be used to hold the boat at the point of operation. To the novice, however, the operation of the nets may appear complicated. Procedures in setting and lifting the nets may, of course, vary. Usually the nets are set over the stern of the boat, and perpendicular to shore. The nets need not be set perpendicular to shore. Also, we have had good results from attaching a trap to each end of a leader. Such modifications of procedure will be developed according to circumstances, and the operators inclinations. The

steps in setting the net are as follows: (1) After the site for the intended set has been selected and the net has been loaded into the boat in such a sequence that the portion stowed last is the one that will be needed first, the first three anchors, with floats and lines attached, are placed on the bottom of the boat. Since the anchor lines must run free and not foul each other it is suggested that each line be pulled into the boat separately, starting with the end attached to the anchor and piling the line on itself so that the free end will be on top. These ends are then tied to the gunwale stringer for convenience in locating them promptly. The head anchor with line attached should be placed in the middle of the boat, and the side anchors on each side, somewhat forward of the head anchor. (2) When the anchors are in place the trap part of the net may be placed in the boat. It should be folded or piled in such a manner that the thimble on the back bridle is exposed and facing forward. The wing bridles should also be in an immediately available and exposed position, even though they may have part of the net resting on them. In other words they should be exposed at each side of the bundle made by the trap. Also, a light float with 20 to 30 feet of line should be attached to each side thimble (these are termed "setting buoys" and are removed when the net is set). The short pieces of line to which the leader will be attached should also be clearly visible and facing aft. (3) The leader may then be placed in the boat. One end of it should be attached to the trap, after which it should be piled on top of the bundle made by the rest of the net. Some care should be exercised in stowing the leader into the boat, for it must run out freely. After all of the leader has been piled into the boat its bridle may be attached to the fourth anchor. Place this anchor on top of the whole pile and the net is ready for setting. (4) When the proposed netting site has been reached the oarsman should back the boat fairly close to shore, line himself up with some object ashore so that he can follow a

reasonably straight course, and row away from shore. It is the duty of the other man, in the stern, to drop the anchor overboard, making sure that it falls in a position where it will hold (i.e., with the points down) and pay out the leader until its point of attachment to the trap is reached. (5) At this point the floats attached to the wings may be thrown overboard, one to each side and well away from the boat, as far as their attached lines will permit. (6) Next, the rest of the trap may be pushed off the stern, after having attached the head anchor line to the back bridle. (7) The oarsman again pulls away from the net and the man in the stern pays out the anchor line until the anchor is reached. The boat should now be approximately in line with the anchor which was dropped nearest the shore. Drop the head anchor overboard. (8) Next, the net should be partially tightened by the following procedure. The operators should return to the lifting buoy, pull up the bridle and untie the anchor line from the thimble, but leave it running through the thimble. The free end, having passed through the thimble (which acts as a pully), is grasped while the line leading from the anchor to the thimble is pinched against the gunwale of the boat. Now, by pulling on the line, slack in the net and anchor line may be taken up. The photograph illustrates the tightening process. When most of the slack has been taken out of the net the free end of the line is secured to the anchor line by a midshipman's hitch, and the boat pushed out from under the bridle. The net should not finally be tightened until the wings have been set. (9) The spreading of the wings is perhaps the most difficult part of the procedure. The oarsman must approach one of the setting buoys (preferably the up-wind one) in such a position that the man in the stern can grasp the buoy while the boat is headed on the course indicated by the dotted line (Figure 4a). When the thimble in the side bridle has been secured, attach one of the side anchor lines. The wing should make

an angle of approximately 45° with the line of the leader. The boat may then proceed along the course (indicated by dotted line) while the man in the stern pays out the anchor line. When the end of the line is reached the anchor is dropped overboard and the process repeated with the other wing. (10) The operators should then return to one or the other of the wing buoys, and tighten the wings sufficiently to remove slack. The method used in tightening the wings is the same as has already been described for the lead anchor. (11) After the wings have been somewhat tightened, it is necessary to return to the lifting buoy and again tighten the net. If the anchors are holding properly, the net may now be pulled taut. Generally, it is best to pull the nets as tight as possible, for a tight net fishes better than a loose one. Also, it is obvious that in deep water the net will slacken somewhat when dropped back into the water. (12) Lifting the net to remove the fish is a simple procedure. It will usually pay to approach the lifting buoy with the boat headed into the wind. The boat is shoved under the pot gridle, (Figure 4b, 4c, 4d). The net is pulled over the side far enough to permit the operators to brail the fish through the lace holes with a dip net. When the pot is full of fish, they may be held in the water at the side of the boat. To reset the net, merely lace up the lace-holes and slide the boat out from under the net. It is seldom necessary to loosen the net to remove fish, or reset it. (13) To take the net out of water to change its location, or to dry it, is a relatively simple procedure. The head and two side anchors are brought into the boat first, after having been untied from their respective bridles. Then the operators return to the lifting buoy and haul the net into the boat, starting with the trap and finishing with the leader.

Concerning the cost of the net, no very accurate figures can be given. Labor will run about 55 percent of the cost, and materials about 45 percent. Any of the regular net and twine manufacturers could deliver the net complete; or they may be built by a competent commercial fisherman. Anchors can be made locally. Roughly, the net illustrated can be built for about $200.00. Larger nets may be built relatively more economically, for the labor involved on a larger net is not much greater than for a small unit. The nets, if kept in a reasonably good state of repair, are very durable and can be used for a period of 8 to 10 years. They should be dipped in preservative at least every other year, and should always be patched as the need arises. Also, when in use they should be washed and dried periodically.

INSTITUTE FOR FISHERIES RESEARCH

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(Legends for figures: To be used either below or on opposite page.)

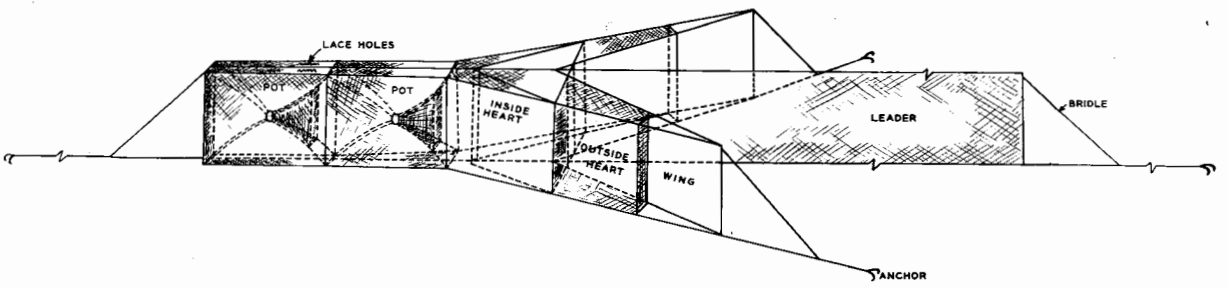
Figure 1. Diagrammatic view of trap net, in position, and illustrating general features.

Figure 2. Scale drawing of small trap net. Mesh sizes are also given.

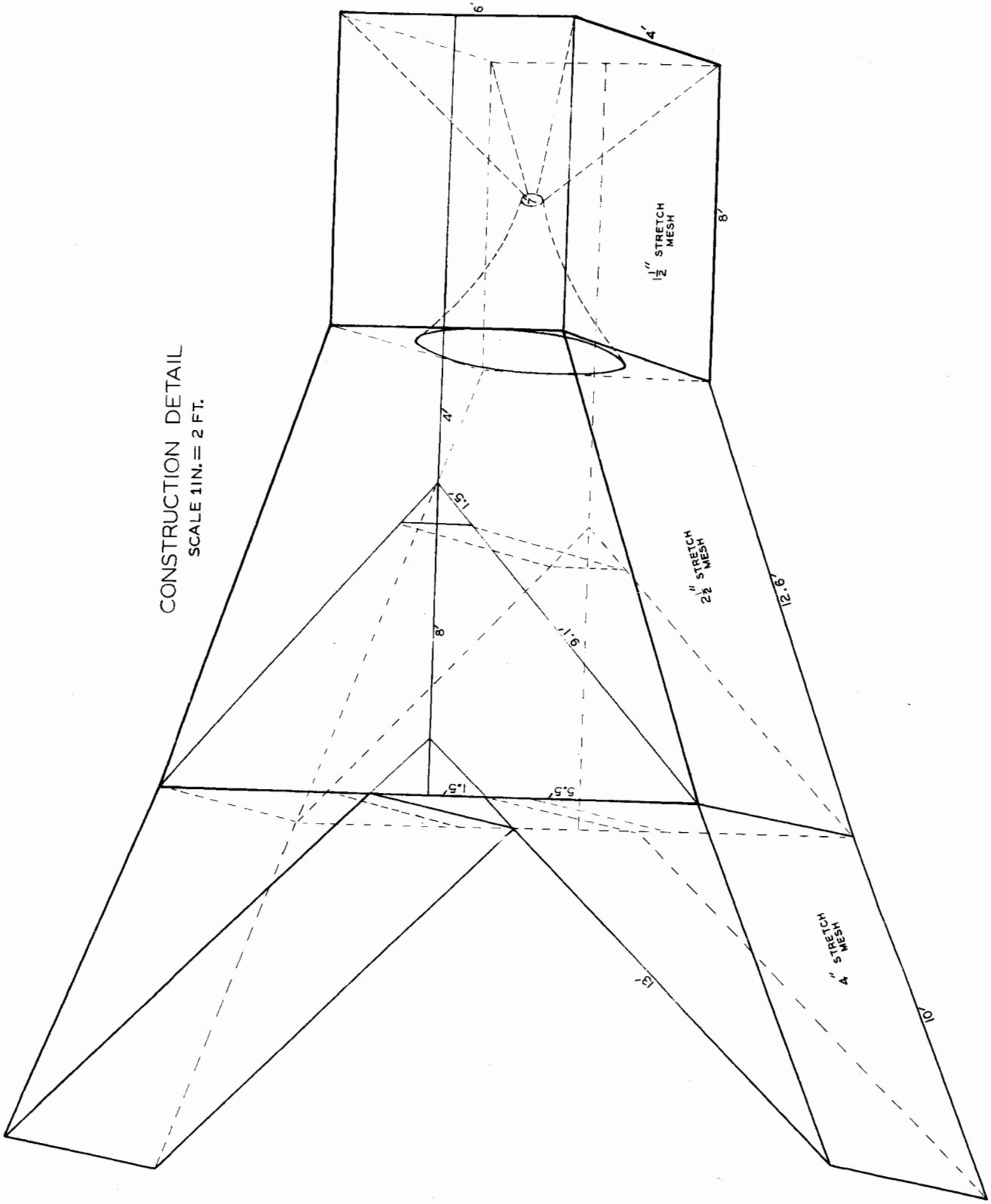
Figure 3. Perspective views of small trap net. a. Front view showing entrance to trap and point of attachment for leader. b. Detail of leader showing bridle to shore anchor. c. Back end of trap showing brail and pipe construction. d. Detail of anchor. e. Detail of bridle to head anchor line. f. Perspective of net viewed through back end, showing funnel and bridles. g. Funnel entrance.

Figure 4. Diagrammatic illustration of method used in setting and lifting net. a. Setting the wings. b. Net in position on bottom of lake. c. and d. Net lifted and resting across boat.

Figure 1



Diagrammatic view of trap net in position.



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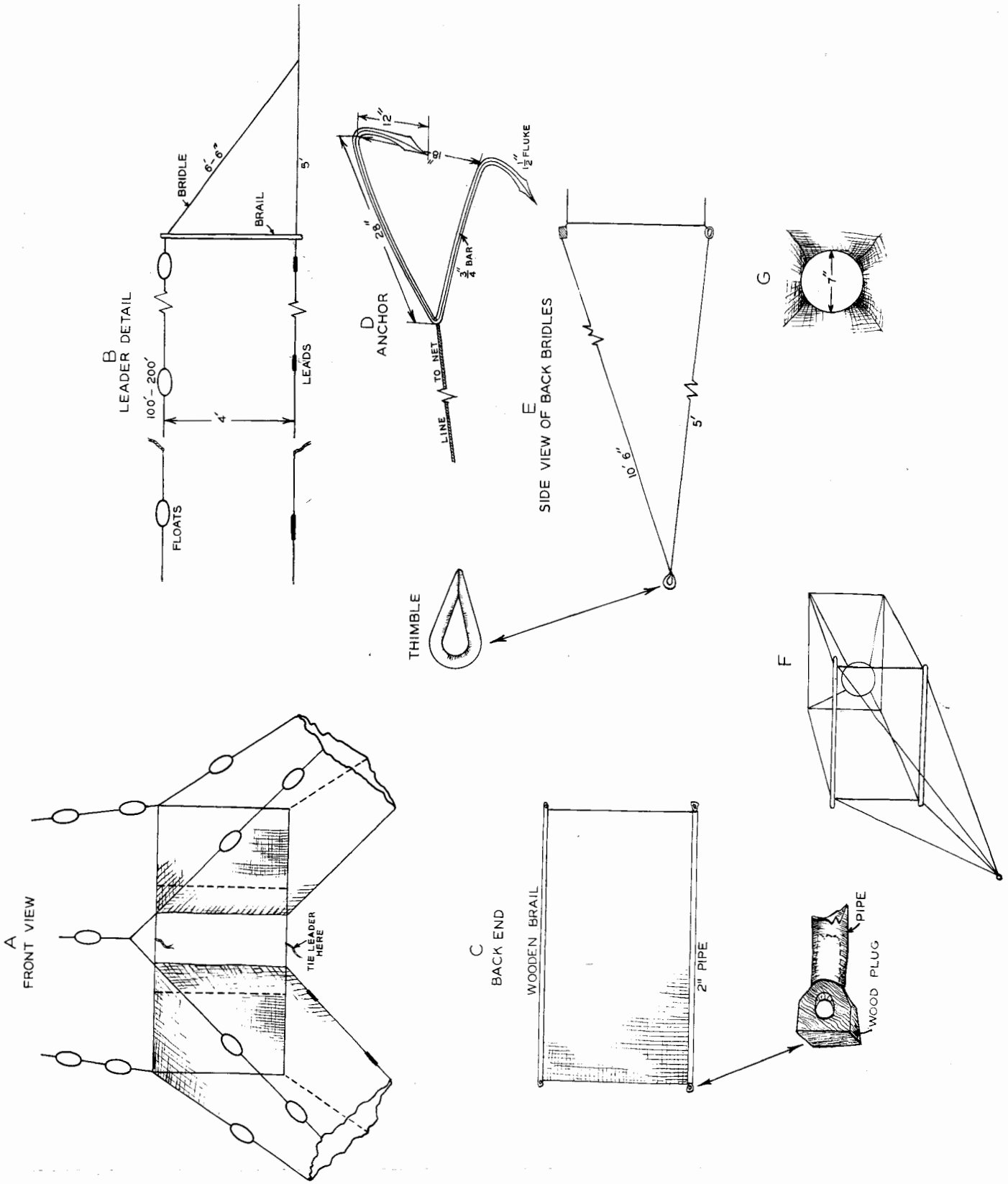

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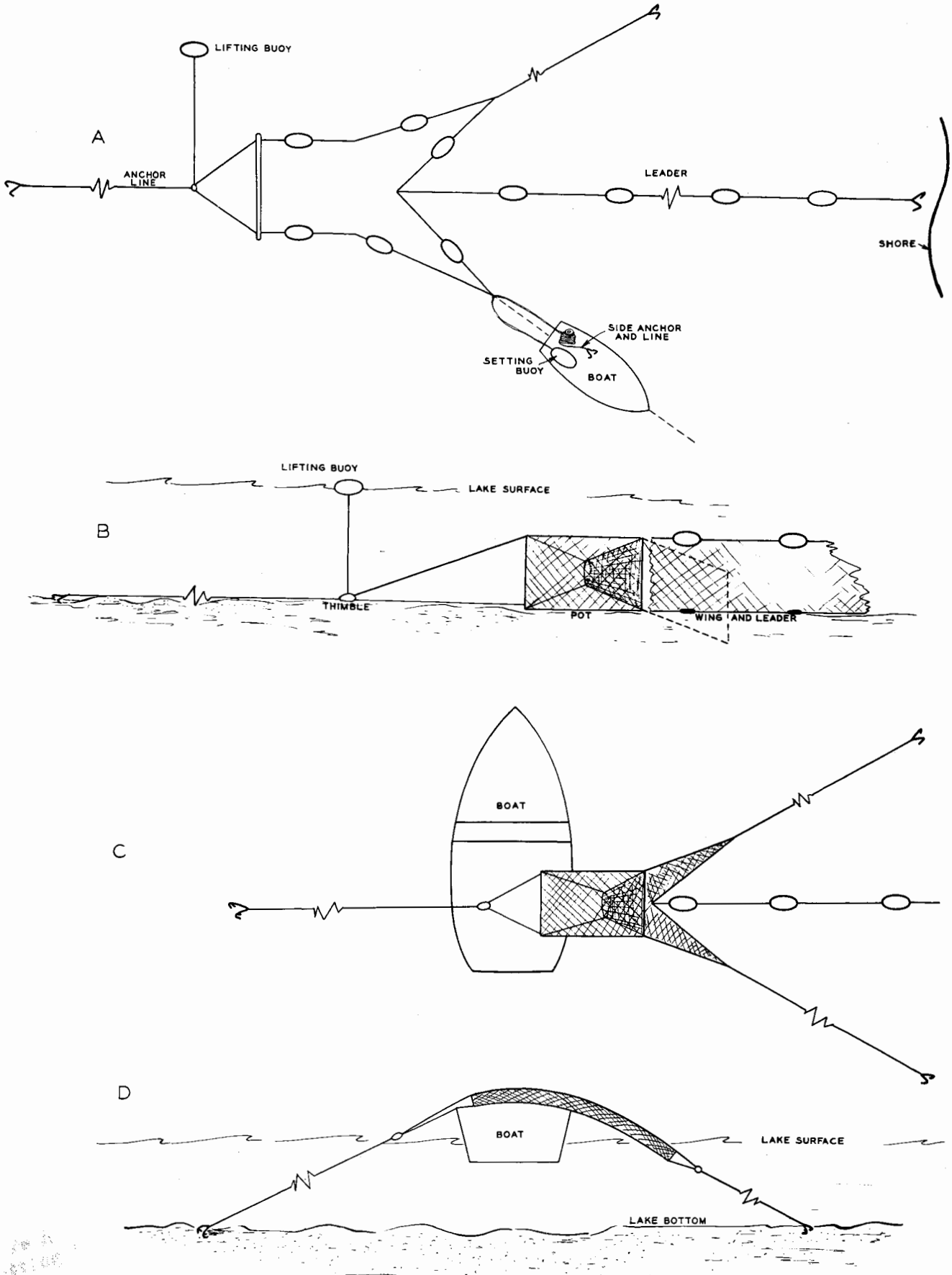

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