

BROOK FYKE; DROP FYKE; "PIKE NET." DELAWARE RIVER.

## 6.—THE FYKE NETS AND FYKE-NET FISHERIES OF THE UNITED STATES, WITH NOTES ON THE FYKE NETS OF OTHER COUNTRIES.

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### DEFINITION OF THE FYKE NET.

The inquirer who goes to the standard books of reference with a view to learn the distinguishing features of the fyke net will be disappointed at the meager definitions given by the few authorities who make any mention of it. Although the fyke net is one of the most important forms of fishing apparatus employed in the United States and is used in a more or less modified form in nearly every country in the world, no reference is made to it in the Encyclopedia Britannica, Chamber's Encyclopedia, Appleton's (American) Encyclopedia, or in any other similar works to which the writer has had access. The dictionary of Worcester, under the word "fyke," says: "A bow net for catching shad. [Local, U. S.]" Aside from the facts that the name is anything but local in the United States and that the net is used in the capture of a hundred aquatic animals besides shad, the name bow net is seldom, if ever, applied to it and should be restricted to other forms of nets that are properly and commonly so called. The definition of "bow net" in the same work—"a net made of twigs bowed"—indicates that the nature of the fyke net was not understood. In Webster's dictionary a somewhat better, though far from exact or complete, idea of the net is given: "A long bag net distended by hoops, into which a fish can pass easily, without being able to return." The fullest account of a fyke net which has been met with is contained in the Century dictionary; it is as follows:

A kind of fish trap, consisting of a bag net distended by hoops; a bow net. The trap is set in water about 10 feet deep at high tide. The fish coming from either direction are led to the trap by a leader running from the shore. The outer openings are formed on a hoop from 3 to 6 feet in diameter; they have two or three funnels, similar to those of an eel or lobster pot, and gradually decrease in size. The whole trap is about 10 feet long. It is largely used in New York and Connecticut waters.

This definition, if not incorrect, is, considering the recognized authority of its source, disappointing. So far as it may be intended to apply to one special form of fyke net it is satisfactory, but there are dozens of types to which it would have no application. In the first place; there is no reasonable limit to the depth of water in which fykes may be set. Some, operated like lobster pots, are dropped from the side of a vessel or boat into 20 or 50 feet of water; others are set in water only a few feet deep. It is not every fyke that fish may enter from either direction, many being so constructed that the entrance of fish is possible from only one point. The leader is an unessential part of a fyke, and there are many types of such a net having no leader. Some fykes

are provided with one or two wings, which may be used with or without leaders. When a leader is used it very often does not extend from the shore. The reference to "outer openings" in the definition quoted is not clear; a typical fyke net has only one outer opening, and the hoop on which it is formed may be from 1 to 15 feet in diameter. There is no limit to the number of funnels, from one to five often being used. All the hoops may be of the same size.

As a result of the researches made by the writer and a study of the forms of fyke nets used in this and other countries, the conclusion has been reached that the designation fyke net should be reserved for that form of fish trap characterized by a bag-shaped inclosure, made of netting, distended at its mouth by a hoop, the opening into which consists of a funnel-shaped aperture; that all other features are secondary and do not determine whether a given apparatus is or is not a fyke net, although a style so simple as that defined is rare.

The forms of apparatus to which the fyke net is related are various. On the one hand are some types of lobster and eel pots, baskets, and other similar traps provided with a funnel-shaped entrance, but usually made of laths, splints, or casks and having no accessory leader or wings, and on the other hand are varieties of trawl nets, bag nets, and similar closed nets that may be distended by means of one or more hoops but have no funnel-like aperture. An examination of any of these nets will usually show the essential features by which they are distinguished from the fyke. The intergradations, however, between fyke nets and some types of pots and traps are such that it is not always possible to properly characterize some of the more aberrant forms. In the present paper it has been considered desirable to class as fykes certain nets that are ordinarily designated pots.

#### NAMES OF THE FYKE NET.

This net is generally known throughout the United States as the fyke or fyke net. The name appears to have arisen from the Dutch word *fuik*, and was doubtless introduced by colonists from the Netherlands, where it is or was applied to a form of net constructed of hoops or of bowed twigs. The usual spelling of the word in early writings is "fike."

The name "hoop net" is also used in parts of this country—most frequently in the Great Lake region. In Great Britain this is the designation generally employed. "Stationary hoop net" also appears to have had a local usage in New York in the early part of this century, but has not recently been met with.

In the Hudson, Delaware, Potomac, and other rivers of the East Coast fishermen often refer to the fyke as a "pike net." Although the pike (*Lucius reticulatus*) is often caught in this way, it seems probable that the name is a corruption.

A number of other names with a more or less circumscribed habitat have been met with, and there are doubtless others that have not been recorded. "Buckdart" and "sink net" are heard in certain parts of Chesapeake Bay. In Saginaw River, Michigan, fyke nets are known as "gobblers." Nets that resemble pound nets in having leaders and curved wings are in parts of Virginia called "funnel-mouthed pounds."

The name bow net, of which fyke net is said in the dictionaries to be a synonym, has not been met with in this country, although it may nevertheless be used. The name bow net, as employed in the fisheries of the United States, is, so far as known, applied only to the dip net and the skim net.

Various qualifying names are applied to fykes in different localities, depending on peculiarities of construction, the fish and other products caught, etc., as "pound fyke," "drop fyke," "shad fyke," "eel fyke," "terrapin fyke," and other designations which will be referred to under each State.

This net is usually known as the hoop net in Upper Canada and as the fyke net in Lower Canada; by the French inhabitants of Canada it is called the *verveux*.

In the countries of northern continental Europe the name applied to the fyke net is the equivalent of the English word *rush*, and refers to the material of which this or similar nets were originally constructed. The word can evidently be traced to the Goths, in whose language it appeared as *raus*, while in Anglo-Saxon it was *risk*, and in modern times it exists as *reuse* and *fischreuse* in German, *rüse* in Low German, *ruse* in Danish and Norwegian, *rysja* in Swedish, *rysä* or *ryssä* in Finnish, and *versha* in Russian. These names are used alone or in connection with other descriptive words. In Prussia the name *fischsack* is applied to a typical fyke net having wings.

In the fisheries of the Adriatic sea the fyke net is known as the *cogolo*, and forms an essential part of a number of fishing devices, some operated like seines or beam trawls and others stationary.

The Portuguese name for fyke net is *botirão*. A form of fyke resembling an eel pot is called a *mazuar*.

Fykes in France are known by a number of names. The most commonly used designation is *verveux* or *vervier*, equivalent to the English hoop net; *guideau* is a modified fyke; among other local names are *loup*, *renard*, *quinqueporte*, *queue*, *manche*, *sac*, and *cache*.

#### THE PRINCIPLE OF THE FYKE NET.

The fyke net, as used in this country, is a passive form of apparatus of capture, the principle of whose action depends on the funnel-shaped entrance. The fish, led to the mouth of the net by various devices, pass through the funnel into the body of the net, and are usually unable to escape, owing to the narrowness and position of the aperture. In the efforts to escape, the fish go through the remaining funnel or funnels and ultimately congregate in the last pocket, from which they are taken at intervals.

The fyke net has been aptly compared in its action with one of the common mouse or rat traps in which the animals caught are retained alive. The principle has a wide application and at the present time is extensively employed in nets used for the capture of various animals. In the fisheries it is seen in the pound net, lobster pot, eel pot, trap net, some forms of weirs, etc. It finds a varied representation in the fishing devices of many countries, particularly in China, where it is applied to a great variety of nets, some constructed of twine, others of bamboo splints.

The action of the fyke net is facilitated by the well-known habits of most fishes when in a confined space—an apparent aversion to make a sharp turn and a tendency to wander around with their heads closely applied to the netting, by which they are led into the succeeding funnels and seldom brought near the only possible way of escape suspended in the middle of the compartment.



## CLASSIFICATION AND DESCRIPTION OF FYKE NETS.

There is perhaps no type of fishery apparatus employed in the United States that presents more varied shapes and peculiarities than the fyke net; and a collection of fyke nets drawn from the various countries of the world would perhaps be the most heterogeneous aggregation of related fishing appliances that could be brought together. The differences in form arise from variations in the shape of the individual parts and in the arrangement of the parts with reference to each other. Among the principal causes which have produced the widely divergent styles the following may be mentioned:

(1) The nature of the fishing-ground, the depth of the water, the character of the bottom, the direction of the tide or current, and the contour or structure of the shore are modifying influences.

(2) The kinds of fish or other animals sought. A net adapted to the capture of one fish is often of little service in taking another species.

(3) The idiosyncrasy of the fishermen. Being a comparatively cheap and uncomplicated form of apparatus, the ingenuity and inventive genius of the fishermen have an opportunity to assert themselves and are no doubt to be credited with many of the peculiar types in local use.

In the accompanying descriptions, the following parts of fyke nets will be mentioned, which may here be briefly defined:

*The net proper.*—This includes all the essential parts of a fyke, and is referred to in contradistinction to the accessory parts, such as the leader, wings, lines, anchors, etc. It is variously known as the bag, pocket, bowl, and pot. The names pot and bowl are sometimes restricted to the final apartment of the fyke in which the fish usually congregate and from which they are taken; this is also called the tail. It is usually closed by means of a cord known as the purse string or puckering string.

*The hoops.*—These constitute the framework of the bag. They are usually made of flat wooden strips, but are sometimes of iron. They are generally round, but are sometimes elliptical; in some forms of nets one or more semicircular hoops are used, and in a rare style of fyke the part which corresponds with the first hoop is rectangular. The number of hoops used in this country varies from 2 to 15, the most common numbers being 3 to 6. The first hoop is usually larger than the others, but in some nets all are of the same size. There is a great variation in the sizes, the extremes being 8 inches and 15 feet; a large majority, however, are from 2 to 6 feet in diameter. They are held in place by being included within the meshes of the bag.

*The funnels.*—These, known also as throats or valves, are the characteristic parts of a fyke. They consist simply of cones of netting, one end of which is attached to the hoops while the other end is suspended from them. The size of the funnels bears a close relation to that of the hoops; the entrance into the funnel is usually the same size as the hoop; the small end of the funnel varies from a few inches to a foot in diameter, depending on the kinds of products taken as well as on the general size of the net. The number of funnels varies; some fykes have a funnel to each hoop; in some there is a funnel for every alternate hoop, while a single funnel is found in a few nets. The purpose of the funnel is to prevent the escape of the fish, and the greater the number of funnels the less the chances are that an animal will find its way out of the net. The length of the funnels usually corresponds with the distance which the hoops are apart; in some types, however, the funnels extend through 3 to 5 hoops.

*The leader.*—The leader, hedging, or fence, as it is variously called, is employed for the purpose of intercepting the passage of fish and of directing them into the net. It is generally constructed of netting, but is sometimes made of brush, stakes, slats, or wire. When of netting, the mesh is larger than that used in the pocket. The length of the leader varies with circumstances, and may be from 10 to 500 feet. It usually extends, in a straight line from a point on or near the shore, at right angles to the supposed direction taken by the fish.

When the leader is constructed of netting it is usually provided with floats and sinkers to keep it in an upright position, and is further supported by being attached to one or more poles, the number depending on the length of the leader. The leader may terminate before reaching the fyke proper; in nets provided with wings, this is generally the case. It may also be attached to the top and bottom of the first hoop. In some nets, for instance those used in Germany, the leader extends a considerable distance within the cavity of the net.

*The wings.*—The wings are usually two in number, but in some nets there is only a single wing. They are attached to the first hoop, each wing being fastened to half the circumference of the hoop. In some cases the wings are joined together at the top and bottom for a short distance in front of the bag, forming a kind of cylindrical entrance. When used alone they serve the same purpose as the leader; when employed in connection with the latter, their action is supplemental to it. They are similar to a leader in construction. Their shape varies; straight, angular, curved, and irregular shapes exist.

A clearer idea of the variations in the styles of fyke nets employed in the United States is conveyed by the accompanying plates than could be imparted by text descriptions. Nevertheless, mention of certain details of construction, cost, etc., is necessary in order to properly cover the subject, and a number of forms not figured are described.

For the purposes of this paper, fyke nets may be classified into (1) nets having no leader or wings, (2) nets having only a leader, (3) nets having only wings, (4) nets having both leader and wings, and (5) double nets and irregular forms.

#### FYKE NETS WITHOUT LEADER OR WINGS.

The simplest form of fyke which would be covered by the definition given is the Chinese net illustrated in fig. 1, plate xci. It consists only of a bag, a single hoop, and a funnel. No fyke so simple as this has been met with in this country. Fyke nets not provided with a leader or wings are not widely used in the United States; in fact, they seem to be almost restricted to the Middle Atlantic States, where they are known as drop fykes, brook fykes, or pike nets, and are extensively used in the upper waters of the principal rivers. In this class are also to be included certain pot-like fykes, mostly intended for eels, and fished in various parts of the country, but mostly in the New England and Middle States.

A form of brook or drop fyke used in the Delaware River has 11 to 14 hoops, varying from 14 to 18 inches in diameter and placed in the bag at intervals of 6 to 8 inches. It is provided with two long funnels, one extending from the first hoop to the fourth or sixth hoop, the other beginning where the first ends and running through about half or two-thirds of the remaining hoops. The funnels do not terminate in round apertures, but in four points, from which as many strings pass through the

remaining part of the net and are collected and held taut outside the last pocket. The fish are taken from the nets by first unfastening the funnel lines at the end of the net and then raising the fyke perpendicularly, when the funnels will be reversed and the fish will fall out. This net is inexpensive, costing only from \$3 to \$5. It is fished singly or in strings containing 25 or more nets, which are placed at distances of 6 to 40 feet. Plate LXXIII, fig. 1, gives an idea of one of these nets and the method of weighting it with stones.

Another drop fyke, or "pike net," as it is locally called, fished in the Delaware River, has a semicircular entrance instead of a circular one; in other respects it is similar to those already described. One form has only one funnel, or "throat," however. The bar forming the bottom of the first hoop projects a few inches on either side for the reception of a stone, by which the net is kept upright, after being braced at the small end. The value is the same as the others, viz, \$3 to \$5. Plate LXXII is a representation of this net. The specimen from which the drawing was made came from Burlington County, N. J., and is now in the possession of the writer. It has 8 hoops and 2 funnels. The first funnel extends from the second hoop a short distance within the third hoop, where it terminates in four points which are kept open by means of double strings running to the fifth hoop. The second funnel extends from the fifth hoop into the space between the sixth and seventh hoops; it ends in the same way, and the four cords which hold the mouth of the funnel open are brought together outside the pocket. The net presents the following additional features:

Extreme length .....	inches..	62
Height of entrance.....	do....	17
Width of entrance at base .....	do....	36
Diameter of second hoop .....	do....	11
Diameter of last (eighth) hoop .....	do....	9½
Size of mesh between first and second hoops .....	do....	1
Size of mesh in bag and funnels .....	do....	½
Diameter of mouth of first funnel .....	do....	4
Diameter of mouth of second funnel .....	do....	2½
Weight of net.....	pounds..	2

Large fykes of this class are reported to be used in the rivers, creeks, and bayous of the southwestern States for buffalo-fish. These fish have regular "runs," and the nets are placed so as to intercept them in their movements.

One of the most novel forms of fyke nets of this class which has been met with is a device patented in 1844. It is shown in plate LXXIII, fig. 3. It consists of 17 hoops and 4 funnels, and has two small suspended compartments in which live bait is placed to lure the fish. It is not known that the net was ever employed for commercial fishing, and it seems to have been more of a curiosity than a practical device. The description furnished by the inventors is as follows:

The nature of our invention consists in dividing a cylindrical net into different compartments and furnishing each with a bait bag, the bait being suited to the different kinds of fish, and the large fish being prevented from entering the compartment of the smaller ones.

Its construction is as follows: A cylindrical net is formed in the ordinary way and of the required length. The first compartment, *A*, is formed of large meshes. It is distended with a series of circular hoops, *aa*, the first one, *a*<sup>1</sup>, being a *D*-shaped one for the entrance into the net, within the mouth of which, from the second hoop backward, there is a funnel-shaped gorge, *b*, which gradually contracts toward the inner end conically, where it terminates in a small aperture, which is kept distended by cords, *c*. Within this there is a similar-shaped entrance, *d*, and at the termination of the first division there is a division, *e*, stretched across, of the same large-size meshes as those of the net, and attached to the hoop, *a*<sup>2</sup>. Between the second funnel, *d*, and the division, *e*, there is a small cylin-

dricul net, *f*, distended with hoops and having very small meshes. This is closed at both ends and is fastened in the center of the large net. It is for the purpose of containing bait, which can be kept alive therein. From the partition, *e*, the net is continued on, and kept distended similar to the first compartment, forming another compartment, *B*, which, after reaching the first hoop, *a*<sup>3</sup>, is made with smaller meshes. At this point it has a funnel, *g*, similar to those in the first compartment, and behind it is a second bait bag, *h*, in all respects like the first.

The compartment, *B*, is terminated by a partition, *i*. The same-sized mesh, or larger, is continued on to another hoop, *a*<sup>4</sup>, from which the meshes are fine enough to hold small fish for bait, and this part, *C*, is furnished with the usual funnel-shaped mouth, *k*, and its end is terminated by a cord, *l*.

A net constructed after the above plan will serve to catch salmon, etc., in the first compartment, from which eels and smaller fish will be driven out; but they have free access to the next compartment, where they are caught, while bait fish enough to supply the two first may be obtained by the last compartment, in which something may be placed to attract them.

Having thus fully described our improvement, what we claim therein as new and desire to secure by letters patent, is—

1. The combination of a series of compartments in the manner and for the purpose described.
2. The combination therewith of the bait bags, as herein specified.\*

Several forms of small cone-shaped nets, used chiefly for eels, are to be classed with the foregoing fykes.

Plate LXXIV, fig. 1, represents an eel fyke employed on the Atlantic coast. It is constructed partly of wire and seems to be a simple fyke of this class. The body is made of fine wire, supported by two broad flat wooden hoops at either end of the net. A twine funnel guards the mouth of the net, and another one begins about the middle of the barrel; four stout cords proceed from the ends of the funnels to the sides of the net, the place of their insertion being reinforced by an extra wire. The end of the trap from which the catch is taken also consists of netting provided with a pursing string. This fyke is 3 feet long and 10 inches wide. It is known as an "eel bait pot," in allusion to the fact that it is baited for the purpose of attracting the eels.

Several forms of nets of this character not provided with leader or wings have been ascertained to exist in other countries. They will be referred to in some detail in the chapter on foreign fyke nets and need only be briefly mentioned in this place. One style of pot-like fyke has 3 hoops of equal size and a straight funnel extending from each end occupying about three-fourths of the length of each half of the net. The specimen figured (plate LXXXIX, fig. 2) represents such a net used in Prussia, where it is called a *bollreuse* (round fyke). A somewhat similar trap used in France, with the funnels extending obliquely into the bag and reaching beyond the middle of the net, is shown in plate LXXXIV, fig. 2. A Portuguese net, with 5 hoops supporting a bag of the shape of a truncated cone, having a single funnel at the entrance and terminating in a door, through which the fish are extracted, is exhibited in plate LXXXIX, fig. 3. Similar nets of this class that partake more of the typical nature of a fyke are employed in Portugal and France.

#### FYKE NETS WITH LEADER.

Very few fyke nets having only leaders are used in this country. The form is much less efficient than that provided with wings alone, or with both leader and wings, and probably this fact, as much as anything else, accounts for the scarcity of this style, both in number and variety.

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\* Invented by John Carr, Jackson Shannon, and William Carr, of Sunbury, Pa. Letters patent No. 3741, dated September 14, 1844.

Fyke nets with leaders and without wings are usually set in pairs at the ends of a common leader, the entrances to the nets facing each other. Such an arrangement has been met with in the James and York rivers, Virginia, and is considered very satisfactory in the capture of striped bass. The nets are usually placed parallel with the shore, often off the mouth of a creek or cove. The nets observed have three hoops, the first of which is 4 to 6 feet in diameter, the last  $1\frac{1}{2}$  feet in width; there are two funnels. The length of each bag is about 12 feet. The bag and funnels are made of netting with a 1-inch mesh. The leader is from 25 to 40 fathoms in length. A set of two nets, with the intervening leader, is worth from \$30 to \$50.

Two nets of this class employed in Europe are figured (plate XC, fig. 1, and plate LXXXIX, fig. 1). One, used in Portugal, consists of a simple bag, with one hoop and one funnel weighted and buoyed; the leader is relatively short and extends from an abrupt wall. The other, a Norwegian net, resembles the form already mentioned set in the United States, consisting of a net at each end of a common leader; it has 3 iron hoops of uniform size ( $2\frac{1}{2}$  feet in diameter) and 2 funnels provided with wire apertures. Similar nets, with 5 wooden hoops of unequal sizes and 2 funnels arising from the first and third hoops, are also met with in Norway. The leader in examples inspected is about 50 feet long and is provided with cork floats and earthenware sinkers; it projects for a short distance within the cavity of the first funnel.

#### FYKE NETS WITH WINGS.

Fykes provided only with wings are somewhat common in certain parts of the country. This is the form usually supplied by the net companies, and, according to Mr. W. S. Shepard, of the American Net and Twine Company, Boston, Mass., is sold ready-made in a great variety of sizes, the diameter of the first hoop varying from 1 to 8 feet. The following table of descriptions and prices of nets having one and two funnels is extracted from the catalogue of the net company named; the prices include two 12-foot wings. Mr. Shepard, who has courteously furnished some interesting notes and sketches of fyke nets, remarks of those under consideration that "they are used in taking all kinds of fresh-water fish in rivers and fresh-water ponds and lakes, and are also largely used in shore fishing both on the Atlantic and Pacific coasts for fish that follow along close to the shore."

Single-throat fykes.					Double-throat fykes.				
Diameter of large hoop	Length of net.	Size of mesh.	Size of twine.	Price complete.	Diameter of large hoop	Length of net.	Size of mesh.	Size of twine.	Price complete.
Feet.	Feet.	Inches.	Thread.		Feet.	Feet.	Inches.	Thread.	
$2\frac{1}{2}$	$4\frac{1}{2}$	1	9	\$6.00	$2\frac{1}{2}$	6	1	9	\$7.00
3	$5\frac{1}{2}$	1	9	6.50	3	7	1	9	8.00
$2\frac{1}{2}$	$4\frac{1}{2}$	$1\frac{1}{2}$	9	4.00	$2\frac{1}{2}$	6	$1\frac{1}{2}$	9	5.00
3	$5\frac{1}{2}$	$1\frac{1}{2}$	9	4.50	3	7	$1\frac{1}{2}$	9	5.50
$2\frac{1}{2}$	$4\frac{1}{2}$	2	9	3.00	$2\frac{1}{2}$	6	2	9	4.00
3	$5\frac{1}{2}$	2	9	3.50	3	7	2	9	5.00
$3\frac{1}{2}$	$6\frac{1}{2}$	2	9	4.00	$3\frac{1}{2}$	9	2	9	5.50
4	$7\frac{1}{2}$	2	12	6.00	4	$10\frac{1}{2}$	2	12	8.00
5	9	2	15	8.00	5	$13\frac{1}{2}$	2	15	10.00
6	11	2	15	10.00	6	$16\frac{1}{2}$	2	15	12.00

A winged fyke, used in considerable numbers for taking eels, especially in Massachusetts, is illustrated in plate LXXIV, fig. 2. The barrel of the net is about 18 inches in diameter at its mouth and is set at the bottom of the junction of two diverging wings which are 6 to 8 feet deep.

An extensively used winged flounder fyke is peculiar in having elliptical hoops, four in number, with a single funnel. The long diameter of the first hoop is usually 36 inches and the short diameter 18 inches.

A fyke net of this class, used on the eastern shore of Maryland and elsewhere in Chesapeake Bay, is known by various names, and applied to the capture of various products. A common form, in use in Dorchester County, Md., and fished for terrapin, striped bass, and perch, consists of a bag 18 feet long, distended by three hoops, 6 feet apart; the first hoop being 8 feet in diameter, the second 6 feet, and the third 4 feet. Funnels proceed from the first and second hoops. The wings (locally called leaders or hedgings) are 30 to 60 feet long. A similar type, with wings 18 feet long, is known as a "sink net," on the Nanticoke River and elsewhere, and is set under the ice for striped bass and perch. Another style, with three funnels, shown in plate LXXIII, fig. 2, is called a "buckdart," in Fishing Bay, Md., and is there employed exclusively for terrapin. A fyke net with three semicircular hoops and two funnels and two short wings, known as a drop or brook fyke, is reported to have been recently used in the Delaware River, in shallow water. It had a value of \$5 to \$10.

FYKE NETS WITH LEADER AND WINGS.

Fykes of this class are among the most numerous, varied, elaborate, and efficient nets employed in our fisheries.

The simplest fyke of this style has an ordinary leader and two straight wings, as shown in plate LXXV, fig. 2. It is a common net in many places, and in certain parts of the Chesapeake Bay is the predominant one. The example figured, from Queen Anne County, Md., may be described as follows: The length of the net proper is 12 feet. There are five hoops, with two funnels extending from the first and third hoops; the first hoop is from 5 to 8 feet in diameter. The wings are 36 feet long, and the hedging is 40 yards long. The value of such a net is \$8 to \$15, depending on the newness of the materials used. Similar nets in the same region are 14 to 18 feet long, with leader from 40 to 100 yards in length. Rarely the hedging is constructed of laths nailed on crosspieces supported by uprights. These nets are adapted to the capture of striped bass, yellow perch, catfish, alewives, pike, and terrapin.

Numerous fykes of this class are employed in the Hudson River and on Long Island. They have rather short leaders (called "fences") and wings, and from two to four hoops. They are designated two-hoop, three-hoop, and four-hoop fykes. They are adapted to the capture of all kinds of river and shore fish. The approximate measurements and cost of the various kinds are as follows:

Kind of net.	Length of leader.	Length of wings.	Diameter of hoops.				Cost.
			First.	Second.	Third.	Fourth.	
	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Dollars.</i>
Two-hoop fyke .....	10 to 15	4 to 6	2 to 3	1½ to 2	.....	.....	5 to 10
Three-hoop fyke.....	10 to 25	6 to 8	3	2 to 2½	1½ to 2	.....	15 to 20
Four-hoop fyke.....	15 to 50	8 to 10	4	3½	3	2½	25 to 30

A modification in the shape of the wings leads to the type of net usually designated as the "pound fyke," in which the wings are so disposed as to form a compartment answering the purposes of the "forebay" of a pound net. In some nets the wings are evenly curved, in others they are angular. Two of these nets are exhibited in plate LXXVI.



A fyke net with curved wings like those of a pound is used in Queen Anne and other counties on the eastern shore of Chesapeake Bay, and is illustrated in plate LXXVI, fig. 2. A net thus constructed is often considerably larger than the kind with straight wings used in the same region. The hoops, four or five in number, have two funnels. The entrance hoop is 4 to 9 feet in diameter. The bag or pocket is 15 to 20 feet long. The hedging is from 40 to 100 yards in length. The "forebays" are from 5 to 30 yards long. The average value of such nets is about \$15, although many, constructed of old twine and set in shallow water, cost only \$8 or \$10. In some localities, as, for instance, the Chester River, nearly all the fykes employed are of this class.

The fyke net illustrated in plate LXXVI, fig. 1, characterized by angular wings, is the form commonly in use in the Great Lake region, where various sizes are employed. The length of the fyke proper, here called the "bowl" or "pot," varies from 10 to 20 feet; the first hoop is from 3 to 8 feet in diameter; the leader, with a mesh of 2 or 2½ inches, bar measure, is 150 to 400 feet long; the wings or hearts contain from 20 to 90 feet of netting with a 1½- or 2-inch mesh; the value is from \$15 to \$50. Such nets are often fished under the ice. All the fish common to the lake waters are caught. In Saginaw Bay and River, Michigan, where a large number of these nets are fished, they are known as "gobblers."

A modification of this fyke is used at Sandusky and elsewhere in the Great Lakes. The plan and elevation are shown in plate LXXVII, figs. 1 and 2. Between the bowl or pound part of the net and the fyke proper there is a section known as the tunnel, which comes to the surface at the point where it joins the bowl. The net is usually set in 12 to 15 feet of water. The barrel of the net is square, and its size is usually 4 by 15 feet. The dimensions of this style of net are given in the figure.

The largest and most elaborate of the "pound" fykes, which is represented in plate LXXVIII, is, so far as known, confined to Monmouth County, N. J., where it is used in the Raritan River, Sandy Hook Bay at Port Monmouth, and elsewhere within Sandy Hook. Briefly described, it is a modern pound net, having leader and hearts, with an ordinary five-hoop fyke taking the place of the pocket. The style shown in the figure is used at Port Monmouth, and presents the following features:

The leader is 170 feet long, and is supported by stakes driven at distances of 10 feet. The outer heart has gently curving sides, 52 feet long, with stakes at intervals of 10 feet, except at the ends, where there are two poles 6 feet apart. A supplementary piece of netting 10 feet long, on either side of the entrance of the outer heart, serves the purpose of a wing. The distance between the end of the leader and the first pole of the heart on either side is 5 feet. The outer heart projects a distance of 6 feet into the inclosure of the inner, an interval of 2 feet being left between the ends of the two sides. The inner heart is formed by the projecting ends of the outer compartment and two 10-foot pieces of netting on either side, joining each other at right angles, the inner section on each side being connected with the first hoop of the fyke by means of a special piece of netting 6 feet long, known as an apron. The first hoop is 4½ feet in diameter; the others, four in number, are 4 feet wide. An interval of 2½ feet separates the first and second and the second and third hoops, while the third and fourth and the fourth and fifth hoops are 4 feet apart. The final segment, called the tail, is about 3 feet long, and is attached by a rope to a stake by means of which the net is kept extended. A funnel extends from the first to the third hoop and is attached to the latter by means of radiating cords; a second funnel passes from the fourth to the fifth hoop.

The variations in this kind of fyke consist in an elongation or shortening of the leader and sides of the hearts, in modifications of the shape of the hearts, and in a narrowing or widening of the entrances into the latter. The value varies from \$20 to \$50, depending on the newness of the twine and other materials employed; the average value is about \$40. This style of net is set in salt and fresh water and takes all the forms of fish occurring in the region, including shad, alewives, striped bass, squeteague, flounders, etc.

#### DOUBLE AND IRREGULAR FORMS OF FYKE NETS.

The nets included in this division are, for the most part, elaborated combinations and variations of the forms already described. They constitute a numerous and important class of fykes, employed chiefly in the Middle Atlantic region, where, in some places, they are the principal kinds in use. For convenience they may be considered under the head of double or symmetrical fykes and unilateral or irregular forms.

The double nets, as here regarded, consist of two simple fykes placed opposite each other, with a common leader, with or without wings, and connected on one side by a short piece of netting. The fykes are, in most types, set at right angles to the leader, but in some cases they diverge, forming an obtuse angle with the leader.

An example of a simple form of double net is shown in plate LXXIX, fig. 1; it is used in the Nanticoke River and elsewhere in Chesapeake Bay, and is there usually called a "set of fykes." It consists of two bags set facing each other, connected on one side by a curved piece of netting; from the other side a leader extends from the shore to a point opposite the entrances of the nets. The bags are 18 feet long and are separated from each other by a distance of 10 or 12 feet. There are 5 or 6 hoops and 2 or 3 funnels. The first hoop is 5 or  $5\frac{1}{2}$  feet in diameter, and each succeeding hoop is smaller by about 3 inches. The leader, or hedging, is 75 to 120 feet long, and consists of netting with a  $3\frac{1}{2}$ -inch mesh.

The improvements made in this style of fyke consist in the addition of wings of various shapes and sizes, some of which are illustrated in plates LXXIX, LXXX and LXXXI. The form of net represented in plate LXXX, fig. 1, is a type of several similar styles employed in northern New Jersey, in Monmouth and Hudson counties, and used chiefly in the capture of shad. It is generally known as a shad fyke. Such nets are often set in strings containing three, four, or more nets. They are separated by leaders from 15 to 40 feet in length. The leaders are usually made wholly of twine, but in places where a long line of nets would interfere with navigation that part of the leader which joins the back of a net is often made of brush, over which vessels and boats may sail without having their course impeded and without damaging the net. A set of three nets thus placed is exhibited in plate LXXXII. These fykes have a bag 15 to 20 feet long, with 5 hoops and with 2 funnels proceeding from the first and third hoops. A similar fyke, constructed on a smaller scale, is employed in the same region for striped bass.

In Baltimore County, Md., a net of this class is in use, which is locally called a hedging fyke. The pocket is 5 to 10 feet long and has hoops from  $3\frac{1}{2}$  to 6 feet in diameter; as many as 9 hoops are sometimes inserted, but the usual number is less. The mouth of the bag is sometimes square. It is represented in plate LXXX, fig. 2.

One of the most noteworthy of these double forms is shown in plate LXXIX, fig. 2. It is used in Wicomico, Dorchester, Caroline, Talbot, and other counties in Maryland, and is designated a "set of fykes." It is the prevalent form in Wicomico County. Striped bass, perch, alewives, catfish, eels, pike, terrapins, and snapping turtles are caught. The fykes proper, here called pockets, are from 12 to 18 feet long, with a 2½- or 3-inch mesh. The hoops number 5 or 6; the largest is 5½ or 6 feet wide, and each succeeding hoop drops about 3 inches. There are usually two funnels, which proceed from the first and third hoops. The leader, called the hedging, is from 50 to 75 yards long and has a 3½-inch mesh. The wings are of variable length, but are usually from 20 to 50 feet; they are straight and form an angle of about 45 degrees with the leader.

A double fyke, in which the pockets are placed obliquely with reference to the leader, is employed in Hudson County, N. J., and is chiefly fished for striped bass, in the capture of which it is quite efficient. In other respects the net presents no peculiar features. A typical example has pockets 20 feet long, 5 hoops, the largest 5 feet and the smallest 4 feet in diameter, short rectangular wings, the long side of which is 10 feet long and the short side 3 feet, and a leader 75 feet in length. The average cost is \$20. Plate LXXXI, fig. 1, is an illustration of this style of fyke.

Each of the double nets figured in plate LXXX, figs. 1 and 2, plate LXXXI, fig. 1, and plate LXXXII, has its prototype in unilateral nets fished in the same place, two of which are shown in plate LXXXI, fig. 2, and plate LXXXIII.

#### THE FYKE NET IN LAW.

From a very early date the use of the fyke net in the United States has been subject to legal restrictions. Its effectiveness was early recognized, and the possibility of much damage resulting from its unrestrained employment was appreciated in many of the coast States. Except in a few cases this net has not seemed to require special legislation—that is, it has not been liable to regulations that were not directed to other forms of apparatus, but has usually been included with seines, gill nets, pound nets, etc., in legislative enactments.

Whatever injurious results may attend the employment of the net, it is evident that these will be more pronounced the more circumscribed the body of water in which the fishing is done. Hence fyke-net fishing on the coast and in large rivers has been less subject to legal regulation than similar fishing in lakes and smaller streams or in the upper courses of rivers.

The restrictions that have been placed on the fyke have consisted for the most part of a limitation of the size of the mesh that may be used, the prohibition of its employment at certain seasons, and the determination of the waters in which it may be set.

The following enactment of the New Jersey legislature in 1870 (chapter 262), restricting the use of fykes (and weirs) on oyster beds, is perhaps the only case in which the existence of private oyster-grounds has been permitted to affect the capture of fish:

It shall not be lawful for any person to erect stakes or any other artificial means for the purpose of using wares or fike nets (*sic*) for the taking of fish upon the bottom of North Shrewsbury River, where oysters are planted by any person or persons, without first obtaining permission in writing of the person or persons so occupying the same.

## GEOGRAPHICAL REVIEW OF THE FYKE-NET FISHERIES OF THE UNITED STATES.

## GENERAL IMPORTANCE AND EXTENT.

The fyke net is one of the most important means of capture employed in the fisheries of the United States. It is more or less extensively used in nearly every coast and lake State, and a very large part of the food-fish consumed in the country is caught in this form of net. In point of productiveness it is of less importance than such passive kinds of apparatus as the pound net and weir, but in proportion to the cost of construction and operation it compares favorably with these forms.

The fyke net is used in greatest numbers in the Middle Atlantic region and on the Great Lakes. It is not extensively employed in New England, except in Connecticut; it is only sparingly used in the South Atlantic States; it is entirely absent from the coastal regions of the Gulf States, and on the Pacific coast it is found only in California, where there is an unimportant fishery. The State having the largest number of fyke nets is Maryland, but the most important fishery is in New York, after which come Maryland, Ohio, Michigan, Wisconsin, and New Jersey.

The magnitude of the fyke-net fisheries of the United States is perhaps not fully appreciated, nor is their importance as a source of food supply fully understood. The following tables will therefore prove instructive; they show, for each State, the number of fyke-net fishermen, the number and value of fyke nets and boats employed, and the quantity and value of products taken. It will of course be understood that all of the fishermen shown do not depend on fyke-net fishing for a livelihood; many of them operate fyke nets in connection with other fisheries; with many fishing of any kind is only a secondary consideration, and only a few may be regarded as professional fyke-net fishermen. The same applies to the boats, which bear about the same relation to the fishery that the fishermen do. The figures relate to the years 1891 or 1892, except in the New England States, statistics for which are not available for a later year than 1889. The information contained in the tables is based on personal inquiries conducted by the field agents of the U. S. Commission of Fish and Fisheries.

The first table shows that in the year named 2,304 persons were engaged in fyke-net fishing in 16 coast and lake States; of these, 1,699 were on the Atlantic coast, 32 on the Pacific coast, and 573 on the Great Lakes.

From the second table it is seen that 25,715 fyke nets, valued at \$224,300, and 1,774 boats, valued at \$60,552, were employed, the total capital devoted to the industry being \$284,852; of the nets, 22,698 were set on the Atlantic seaboard, 49 in the waters of the Pacific coast, and 2,968 in the Great Lakes.

The catch, as given in the third table, amounted to 12,268,975 pounds, for which the fishermen received \$302,441; of this quantity, 5,827,432 pounds, valued at \$176,919, were caught on the Atlantic coast, 194,647 pounds, worth \$5,116, on the Pacific coast, and 6,246,896 pounds, having a value of \$120,406, in the lake region.

*Fishermen employed in the fyke-net fisheries of the United States.*

States.	Number.	States.	Number.
Atlantic coast:		Pacific coast:	
Maine .....	44	California .....	32
Massachusetts .....	6		
Rhode Island .....	43	Great Lakes:	
Connecticut .....	52	New York .....	74
New York .....	577	Ohio .....	156
New Jersey .....	160	Michigan .....	231
Pennsylvania .....	60	Wisconsin .....	112
Delaware .....	27		
Maryland .....	595	Total .....	573
Virginia .....	98		
North Carolina .....	27	Grand total .....	2,304
Georgia .....	10		
Total .....	1,699		

*Nets and boats employed in the fyke-net fisheries of the United States.*

States.	Fyke nets.		Boats.		Total investment.
	No.	Value.	No.	Value.	
Atlantic Coast:					
Maine .....	134	\$550	42	\$1,810	\$2,360
Massachusetts .....	15	100	6	200	300
Rhode Island .....	376	2,080	21	595	3,275
Connecticut .....	440	2,230	51	1,530	3,760
New York .....	6,246	55,465	502	10,002	71,467
New Jersey .....	1,562	14,191	137	4,155	18,346
Pennsylvania .....	2,534	5,264	59	1,604	6,868
Delaware .....	567	1,261	25	425	1,686
Maryland .....	10,398	38,114	460	7,171	45,285
Virginia .....	379	5,930	73	1,330	7,260
North Carolina .....	36	384	4	60	444
Georgia .....	11	285	5	70	355
Total .....	22,698	126,454	1,385	34,952	161,406
Pacific coast:					
California .....	49	980	16	1,050	2,030
Great Lakes:					
New York .....	684	9,822	66	2,318	12,140
Ohio .....	1,110	63,650	139	14,045	77,695
Michigan .....	446	12,030	102	2,257	14,287
Wisconsin .....	728	11,364	66	5,930	17,294
Total .....	2,968	96,866	373	24,550	121,416
Grand total .....	25,715	224,300	1,774	60,552	284,852

*Products of the fyke-net fisheries of the United States.*

States.	Pounds.	Value.	States.	Pounds.	Value.
Atlantic Coast:			Pacific coast:		
Maine .....	111,000	\$1,380	California .....	194,647	\$5,116
Massachusetts .....	44,655	1,400			
Rhode Island .....	114,250	3,045	Great Lakes:		
Connecticut .....	458,307	10,039	New York .....	899,527	22,561
New York .....	2,382,882	48,899	Ohio .....	2,420,650	40,373
New Jersey .....	591,684	25,750	Michigan .....	1,605,474	31,271
Pennsylvania .....	146,695	8,059	Wisconsin .....	1,321,245	26,201
Delaware .....	45,091	2,591			
Maryland .....	1,552,432	62,115	Total .....	6,246,896	120,406
Virginia .....	835,361	13,627			
North Carolina .....	24,885	716	Grand total .....	12,268,975	302,441
Georgia .....	20,190	898			
Total .....	5,827,432	176,919			

Considering the entire country, it appears that the average number of nets in each of the States named is 1,601; the average value of the nets is about \$9; the average number of nets to a man is 11; the average number of pounds of fish to a net is 477; the average stock per net is \$12; the average stock per man is \$131, and the average price of the products is 2½ cents per pound.

The fyke net is adapted to the capture of almost every free-swimming aquatic animal found on the coasts, in the rivers, or in the lakes of the United States. The following table exhibits the quantities and values of all the principal fishes represented in the fyke-net catch. Among the numerous economic species the most valuable are the flounders and catfishes, each of which yielded products worth over \$42,000. Other specially important fishes are pike, pike perch, yellow perch, flounders, eels, striped bass, suckers, and shad. On the Atlantic coast the flatfishes are the first in importance, in the Pacific region catfish are the most valuable products, while in the Great Lakes the pike and pike perch take first rank, followed by the yellow perch. Owing to the misapplication of names on the part of the lake fishermen, satisfactory separate figures for the pike and pike perch can not be furnished.

*Quantity and value of the principal products constituting the fyke-net catch of the United States.*

Species.	Pounds.	Value.	Species.	Pounds.	Value.
<b>Atlantic coast:</b>			<b>Pacific coast:</b>		
Alewives.....	391,245	\$3,144	Carp.....	42,115	\$1,374
Bass.....	1,675	208	Catfish.....	114,575	2,870
Bluefish.....	29,350	1,184	Other fish.....	37,957	872
Butter-fish.....	48,850	880			
Carp.....	5,800	359	<b>Total.....</b>	<b>194,647</b>	<b>5,116</b>
Catfish.....	567,982	23,133			
Eels.....	351,040	17,534	<b>Great Lakes:</b>		
Flounders and flatfish.....	1,744,830	42,211	Bass.....	183,481	8,188
Frostfish or tomcod.....	77,100	1,842	Catfish.....	789,023	18,536
Perch, white.....	246,558	13,763	Eels.....	56,336	2,177
Perch, yellow.....	278,232	11,165	Herring.....	333,650	4,446
Pike.....	108,744	7,418	Perch.....	1,716,311	25,679
Menhaden.....	743,667	1,238	Pike and pike perch.....	1,075,085	37,161
Scup.....	72,065	1,759	Suckers.....	779,285	11,994
Shad.....	244,453	10,296	Trout.....	15,480	645
Spots and croakers.....	53,705	2,090	Whitefish.....	9,685	465
Squeteague.....	209,789	6,672	Other fish.....	1,262,255	10,601
Striped bass.....	183,757	15,160	Turtles.....	25,705	514
Suckers.....	138,217	6,120			
Tautog and cunners.....	33,665	1,549	<b>Total.....</b>	<b>6,246,896</b>	<b>120,406</b>
Other fish.....	107,108	5,981			
Refuse fish.....	97,200	243	<b>Grand total.....</b>	<b>12,208,975</b>	<b>302,441</b>
King crabs.....	20,000	125			
Terrapins.....	12,420	2,845			
<b>Total.....</b>	<b>5,827,432</b>	<b>176,919</b>			

The typical fresh-water fishes constitute much more than half the product of the fyke-net fishery; of these 8,006,013 pounds, valued at \$195,898, are given in the preceding table. Of the salt-water products, 3,119,849 pounds, valued at \$62,338, were obtained. Anadromous fishes yielded 1,143,113 pounds, valued at \$44,205.



The following table is a classification of the products of this industry, based on the nature of the water in which caught. The table is not entirely satisfactory, however, owing to the fact that the catfish and eels, which are classed as fresh-water fishes, are in small part taken in salt and brackish water, but can not be separately shown.

*Classification of the products of the fyke-net fisheries.*

Species.	Pounds.	Value.	Species.	Pounds.	Value.
<b>Salt-water products:</b>			<b>Fresh-water products:</b>		
Bluefish .....	29,350	\$1,184	Bass .....	112,803	\$6,551
Butter-fish .....	48,850	880	Carp .....	47,015	1,733
Flounders and flatfish ..	1,744,830	42,211	Catfish .....	1,472,180	44,539
Menhaden .....	743,667	1,238	Eels .....	407,376	19,711
Scup .....	72,065	1,759	Herring (lake) .....	333,650	4,446
Spots and croakers .....	53,705	2,090	Perch, yellow .....	1,994,543	36,844
Squeteague .....	209,789	6,672	Pike and pike perch ..	1,183,829	44,579
Tautog and cunners .....	33,665	1,549	Suckers .....	917,502	18,114
Other fish .....	54,328	1,542	Trout (lake) .....	15,480	645
Refuse fish .....	97,200	243	Whitefish .....	9,685	465
King crabs .....	20,000	125	Other fish .....	1,485,345	17,757
Terrapins .....	12,420	2,845	Turtles .....	25,705	514
<b>Total .....</b>	<b>3,119,849</b>	<b>62,338</b>	<b>Total .....</b>	<b>8,006,013</b>	<b>195,898</b>
<b>Anadromous fish:</b>			<b>Grand total .....</b>		
Alewives .....	391,245	3,144		12,268,975	302,441
Frostfish or tomcod .....	77,100	1,842			
Perch, white .....	246,558	13,763			
Shad .....	244,453	10,296			
Striped bass .....	183,757	15,160			
<b>Total .....</b>	<b>1,143,113</b>	<b>44,205</b>			

#### FISHING SEASON, METHODS, MARKETS, ETC.

The fishing season for fyke nets varies somewhat with the locality and with the fish taken, but in most places it continues throughout the spring, summer, and fall months. In the Great Lakes, Maine, Rhode Island, Chesapeake Bay, and elsewhere, considerable fishing is also done under the ice.

Fyke nets are usually tended in boats, but in a few localities the physical features are such that the fishermen can wade out to their nets and lift them. In some places the nets are lifted daily, in others only two or three times a week, the frequency depending on the abundance of fish, the state of the weather, the condition of the market, and, to a certain extent, on the kinds of fish taken. Most fykes are so constructed as to provide for the removal of the fish from the final compartment, the end of which is closed by means of a purse string. The end of the net, being detached from the stake or anchor which holds it in position, is drawn into the boat and the contents are taken out without the necessity of loosening the entire net. Small nets, however, like the drop fykes in the Middle Atlantic States, are drawn bodily into the boat. When fykes are set under the ice, the pocket is reached and the fish are extracted through a hole in the ice, the body of the net remaining undisturbed, as in ordinary fishing.

Nothing of special application can be said regarding the methods of handling the fish caught in fyke nets, the lines of distribution, the markets, etc. These vary with the locality and do not differ from the cases of other fisheries in the same regions. Fykes are often employed in conjunction with other apparatus, the catch in the different nets being shipped together.

THE NEW ENGLAND STATES.

The fyke-net fishery of the New England States is not of great importance and is completely overshadowed by many other fisheries. Nets are found in all the States except New Hampshire, are most numerous in Connecticut, and least so in Massachusetts, and the fishery increases in value from north to south. The nets are inexpensive, having an average value of less than \$6; they are cheapest in Maine and have the highest value in Rhode Island. Only a few kinds of fish are caught, and only flounders are taken in any considerable quantities and in every State; the other fish obtained are frostfish, butter-fish, tautog, cunners, menhaden, scup, striped bass, and smelt.

The following condensed table shows the condition of the fyke-net fisheries of the New England States. More detailed figures for the products will appear in the discussion for each State.

*Summary of the fyke-net fishery of the New England States.*

States.	No. of fisher-men.	Fyke nets.		Boats.		Products.	
		No.	Value.	No.	Value.	Pounds.	Value.
Maine .....	44	134	\$550	42	\$1,810	111,000	\$1,380
Massachusetts .....	6	15	100	6	200	44,655	1,400
Rhode Island .....	43	376	2,680	21	595	114,250	3,045
Connecticut .....	52	440	2,230	51	1,530	455,250	8,759
Total .....	145	965	5,560	120	4,135	725,155	14,584

MAINE.

The fyke net is not very popular in this State, and the fishery with this apparatus is almost lost sight of in comparison with other very extensive river fisheries. It is probable that fyke nets in addition to those shown in the tables are used in the interior or more remote coastal sections; inquiries carried on by the Fish Commission, however, covered all fyke-net fishing of importance in the coast rivers.

The employment of fyke nets as an economic pursuit is to be noted in only three coastal counties, namely Lincoln, Sagadahoc, and Cumberland, the last-named having the most important interests; of the 134 nets used in 1889, 101 were credited to this county, although fewer men and boats are employed than in Lincoln County, owing to differences in methods. Three species comprise all the marketable fish taken; these are flounders, frostfish or tomcod, and smelt. The flounders are by far the most important, as shown in the following table. The aggregate catch in Cumberland County is much larger than in the two other counties combined, amounting to 82,000 pounds, valued at \$1,050 and comprising practically only flounders, while in Lincoln County the yield was 25,000 pounds of flounders, valued at \$230, and in Sagadahoc the output consisted of 4,000 pounds of frostfish and smelt, with a value of \$100.

*Products of the fyke-net fishery of Maine.*

Species.	Pounds.	Value.
Flounders .....	107,000	\$1,280
Frostfish .....	2,500	10
Smelt .....	1,500	90
Total .....	111,000	1,380

Mr. C. G. Atkins, of the U. S. Fish Commission, in a report\* on the river fisheries of Maine, speaks of the fyke nets used in the smelt fishery as "double bag nets, the large open-mouthed net in front leading by a narrow opening at its apex into a smaller one, termed the 'pocket,' from which, as from a weir, fish escape with difficulty. The fish are taken out by drawing up the 'pocket,' through a separate hole in the ice, and unlacing an opening at the bottom, the main part of the fyke remaining under water for weeks or months." Mr. Atkins further says that "the fyke has been used in various parts of the State, but does not appear to have given entire satisfaction. There is complaint of its being more difficult to clean of rubbish, anchor ice, etc., than the plain bag net, which has in some cases superseded it."

In the Wescongus or Pleasant River it was reported in 1880 that most of the smelt nets were fykes. "They are set by attaching them to poles, which are planted through the ice into mud in a location where the water is 8 feet deep at low tide. The nets are set both on the flood and ebb tide, and hauled at both high and low water. Fishing begins as soon as the ice will bear, which is generally about December 10 or 15, and continues till near April 1, the limit fixed by law."

In the Kennebec River, the introduction of small fykes was accomplished in 1851. They were used in the river for many years, but the fykes have gradually been supplanted by the bag nets, introduced at the same time.

#### MASSACHUSETTS.

Fyke nets are used for commercial fishing in Essex, Barnstable, and Bristol counties, in this State. They are most numerous and important in the last-named county, but, considering the entire State, are among the least productive of the forms of fishing apparatus there used. Only six persons were engaged in tending these nets in the last year covered by the inquiries of the Fish Commission, only fifteen typical nets were employed, and the product was less than 45,000 pounds. The fishes entering into the catch are chiefly scup, flounders, butter-fish, and cunners, of which the scup are the most important. The catch consisted of 44,655 pounds, valued at \$1,400, of which 39,165 pounds, worth \$1,098, were taken in Bristol County. The quantities of each species were as follows:

*Products of the fyke-net fishery of Massachusetts.*

Species.	Pounds.	Value.
Butter-fish.....	2,650	\$82
Cunners.....	2,340	210
Flounders.....	10,200	264
Scup.....	29,465	844
Total.....	44,655	1,400

It may be stated that there are also used in parts of Massachusetts numbers of pot-like nets, as represented in plate LXXIV, fig. 1, which have been regarded as forms of fykes by the writer but were classed as pots in the canvass of the fisheries by the agents of the Fish Commission.

\*The Fisheries and Fishery Industries of the United States, section v, vol. i. History and Methods, p. 692.

## RHODE ISLAND.

Considering the length of its coast line, Rhode Island has a rather extensive fyke-net fishery compared with the other States of this region. Nets are set in three coast counties, between 100 and 200 nets being operated in each county. The nets employed in Rhode Island present the same general features of construction and shape as those in New York, although some types peculiar to the State are used. The fykes are most valuable in Washington County, most numerous and productive in Kent County, and relatively the most important in Newport County. The 43 fishermen have on an average 9 nets each, with a boat to each 18 nets and each 2 men. The average catch to a net is about 305 pounds, worth \$8. The fishery at the present time is essentially a flounder fishery, flounders being the only commercial fish taken. Of the 114,250 pounds secured, about 50,000 pounds, valued at \$1,200, were caught in Kent County; 35,000 pounds, worth \$1,050, in Newport County, and 29,250 pounds, valued at \$795, in Washington County. Most of the fishing is done in winter under the ice.

Compared with 1880, the fyke-net fishery of Rhode Island has undergone a noticeable decline as well a marked change in methods and in the fish taken. In that year, 865 nets, valued at \$7,530, were set in the waters of the State. Of Little Narragansett Bay and Pawcatuck River it was stated:

There are fully fifty fyke nets employed. They are set thus: At the center of one side of the heart of a pound net a hoop fyke is attached, opening into the heart; when the net is lifted, instead of "bunting" the net toward the further end of the bowl and then bailing the fish out, as is usually done, they are driven into one of the hearts, and thence into the fyke; the end of this is lifted into a boat into which the fish are emptied. The mesh in these fykes is very fine. Fyke-nets are also set all along the shore in shallow water, and catch chiefly bass, flounders, and perch.\*

The most numerous and generally distributed fyke net now employed in the State has two diverging wings and a leader, as represented in plate LXXV, fig. 2. The wings are 18 to 20 feet long, and the leader is 50 to 100 feet long, depending on the nature of the locality in which the net is set. About 5 stakes are usually required to support the leader, which is 3 to 4 feet deep. The wings are kept in position by a single stake at their outer ends, the inner end being attached to the first hoop. The bag is about 15 feet long or less and is distended by 3 or 4 hoops, the first being  $3\frac{1}{2}$  to 4 feet in diameter, each succeeding hoop decreasing in size by 6 or 8 inches. Some nets have 1 funnel and some 2 funnels. The net is kept in place by a painter or stayline attached to the end of the pocket and made fast by a half hitch to a stake driven in the bottom. The cost of such a net is \$6 to \$10. The manner of rigging the nets is often varied somewhat by different fishermen. In Little Narragansett Bay, for instance, a fyke has recently been used with a square entrance and a prism-shaped funnel leading into the cavity of the net. This feature the fishermen think is an advantage over the ordinary circular entrance in the case of large fykes set in comparatively deep water.

The nets are usually set in shoal water. In some localities tautog, in addition to flatfish, are now caught. The fishing season is fall and winter. Fishing under the ice is considered more profitable than in the open water and is the customary method pursued, owing to the fact that the products then command a much higher price than during the season of open water.

A peculiar form of apparatus used at Apponaug during the past three years for taking flatfish resembles in some respects both the fyke net and the pot, but seems more

\* Fisheries and Fishery Industries of the United States, section II, p. 310.

nearly related to the former and is regarded by fishermen as a type of fyke. The apparatus consists of ten or more individual traps set in one line and connected by leaders. Each trap is composed of two bowed pieces of wood, forming the ends, over which the netting is placed. It is flat on the bottom, and is 3 feet long, 18 inches deep, and 2 feet wide at the base. A funnel is placed in one end of the trap. Two such nets are set facing each other at the ends of a leader 15 feet in length, and four or more with their entrances in the same direction as the first net are added to each end, with short leaders intervening. The entire string is kept in position by being anchored at the two ends with stone weights. Such nets are usually set in shallow water, but a buoy is used to mark their position. They are reputed to be very effective in the capture of flatfish. A series of ten nets when new is worth \$15.

The principal reason assigned for the decrease in the number of fykes used in this State in recent years is the scarcity of the fish sought. As the fishery entails considerable exposure to cold and inclement weather, there is little inducement to continue the business if fish are not reasonably abundant. The scarcity of ice for a number of years prior to 1892-93 was also unfavorable to the development of this fishery. The increase in pound nets, which has been marked, has also tended to diminish fishing with related forms of apparatus.

## CONNECTICUT.

As already shown, the fyke-net fishery of Connecticut is more important than that of any other New England State. Compared with 1880, the fishery seems to have about doubled in extent, judging by the number of nets used, although there are no data for 1880 on which to base a comparison of the catch and stock. The average value of the nets, however, seems to have decreased. In 1880, the number of fykes reported for the State was 255, valued at \$2,480; in 1889 the number was 440, worth \$2,230.

Fyke-net fishing is carried on along most parts of the coast of this State. All the prominent towns have more or less fishing of this kind. The largest number of nets is found in Stonington, Quiambog, Mystic, Noank, and New London. The distribution of the fykes in 1889 was as follows:

Towns.	No. of nets.	Towns.	No. of nets.
Stonington .....	64	Branford .....	7
Quiambog .....	110	Milford .....	10
Mystic .....	32	Stratford .....	20
Noank .....	68	Southport .....	1
Poquonoc .....	21	Norwalk .....	5
New London .....	54	Darien .....	7
Niantic .....	15	Stamford .....	5
Saybrook .....	21		

The fish now taken in the fyke nets of Connecticut are principally flounders, frostfish, tautog, menhaden, and striped bass. In a few places terrapin are taken, and in Stratford these are much more valuable than the remaining part of the catch. In 1880 the species reported to be caught in fyke nets were sea bass, cod, bluefish, eels, weakfish, flounders, herring, shad, and occasionally sturgeon. At Mystic the nets are set about February 1 and taken up about March 31; they are again set about October 1 and remain down until December 31. Flatfish and frostfish are taken. At Noank, the nets are fished from the first of February to the last of April, and

from the first of October to the middle of December. The principal fishing, however, is done in the spring. The nets are placed in water 6 to 15 feet deep. In Groton the fykes are operated at the mouths of the rivers during June and July, and within the rivers during the rest of the year; flounders and frostfish are secured. The largest catch is made in Quiambog, where the greatest number of nets is used. Here nearly 140,000 pounds of flounders, frostfish, and tautog, valued at \$2,550, were obtained in 1889. Seven nets at Branford were fished for menhaden; about 100,000 fish were taken in the year named.

The fyke-net fishery of Connecticut in 1889 resulted in the capture of 455,250 pounds of fish, valued at \$8,759, and 1,019 terrapin, worth \$1,280. The quantities of the different fishes were as follows:

*Products of the fyke-net fishery of Connecticut.*

Species	Pounds.	Value.
Flounders .....	347,400	\$6,899
Frostfish .....	26,000	660
Menhaden .....	66,500	375
Striped bass .....	7,350	475
Tautog .....	8,000	350
Total .....	455,250	8,759

THE MIDDLE ATLANTIC STATES.

The Middle Atlantic region, as here considered, includes the States of New York, New Jersey, Pennsylvania, Delaware, Maryland, and Virginia. From every point of view this is the most important fyke-net section of the country. More persons are here employed in fishing fykes, more nets are set, more products are taken, and more money accrues to the fishermen than in any other region.

The statistics of this fishery in 1891, specified by States, are exhibited in the following table. It appears that 1,517 persons were engaged in tending fykes, that 21,686 nets, valued at \$120,225, were used, and that 5,056,145 pounds of fish and other products, valued at \$159,341, were taken. The fishermen and nets are most numerous and the value of the fishery is greatest in Maryland; the amount invested in fykes and boats, the number of boats, and the quantity of fish taken are greatest in New York. Pennsylvania and Delaware have the least important fisheries.

*Fyke-net fishing of the Middle Atlantic States.*

States.	Number of fishermen.	Fyke nets.		Boats.		Products.	
		Number.	Value.	Number.	Value.	Pounds.	Value.
New York.....	577	6,246	\$55,465	502	\$16,002	2,382,882	\$48,890
New Jersey.....	160	1,562	14,191	137	4,155	593,684	25,450
Pennsylvania.....	60	2,534	5,204	59	1,604	146,695	6,659
Delaware.....	27	587	1,261	25	425	45,091	2,591
Maryland.....	595	10,398	38,114	460	7,171	1,552,432	62,115
Virginia.....	98	379	5,930	73	1,330	335,361	13,627
Total.....	1,517	21,686	120,225	1,256	30,687	5,056,145	159,341



## NEW YORK.

In the value of its fyke-net fishery, New York ranks before any other State, surpassing Maryland, the next important State, by about ten thousand dollars' worth of products. In the waters of the State tributary to the Atlantic Ocean, however, the extent of the fishery is less than in Maryland.

The physical features of this State naturally fall for discussion under three general heads: Long Island, Staten Island, and the Hudson River. Consideration of the fyke-net fishery in the Great Lakes on which the State has a frontage will be taken up in the chapter on the lake region. The extent of this fishery in each of these regions in 1891 was as follows:

Sections.	Fisher- men.	No. of nets.	Value of catch.
Staten Island.....	18	215	\$1,450
Long Island*.....	483	4,883	42,459
Hudson River.....	76	1,148	4,990
Total.....	577	6,246	48,899

\* Including part of Westchester County bordering on Long Island Sound.

The principal fishes taken in the Long Island region are flounders and flatfishes, so called; these constitute two-thirds of the value of the catch and are particularly important in Suffolk County. Other fish which have some prominence are squeeteague, bluefish, shad, butter-fish, tomcod, and menhaden. This is one of the sections in which terrapins have been taken in fykes, although the present scarcity of these animals, as compared with earlier times, reduces the importance of the fishery to a minimum, and in the last year for which statistics are available it would seem that no terrapin were caught in this way. In 1889, however, in parts of Queens County small numbers were taken. At Bayville these were caught by means of fykes set across a stream, and resting on the bottom. The season began about July 20 and closed September 1. The fykes were set well up the stream and only remained about forty-eight hours, when they were changed to another stream. There were only about one-half as many terrapin caught as there were ten years ago. In 1872, in one night, four fykes caught 212 terrapin. After they were caught, the practice was to keep them in a pen until prospects were favorable for a good market. When in confinement they were fed on "fiddlers" up to within 10 days of the time of marketing them, when they were given corn meal. One man with the aid of a boy could make \$8 per day at this fishery. These terrapin brought from 15 cents to \$1.25 apiece, averaging about 80 cents.

On the northern shore of Long Island Sound, in Westchester County, from thirty to fifty fykes have been set annually during recent years. They have an average value of \$25, and catch mostly tomcod, flounders, striped bass, and tautog or blackfish. A fyke (plate LXXV, fig.1) used at New Rochelle and elsewhere along this shore consists of the ordinary 5-hooped bag, with two funnels and two asymmetrical wings. One of the wings, made of seven pieces of netting each 9 feet long, extends from the shore in the form of a bow and joins the side of the first hoop; the other consists of three short sections, 12, 5, and 4 feet long, respectively, the longest arm extending from the net toward the shore and joining the middle piece, which runs parallel with the

shore and makes an acute angle with the free end, which projects toward the mouth of the net, the whole forming a pocket from which the fish are led into the net.

A few interesting early references to fyke-net fishing on the shores of Staten Island have been met with. In a paper on "Agriculture in Richmond County," contained in the New York State Agricultural Report for 1842, the following statement occurs under the head of "spring and fall fyke fishing":

There are also other inhabitants of the ocean frequenting the southern shores of the island which divert attention from farming. In the cool weather of spring and autumn small fikes are set, extending but a short distance into the water, for taking the smaller kinds of fish which run with the tides close along shore, and furnish a domestic supply. Among them, however, are sometimes fish of a larger size, and such as are taken with the hook and line in deeper waters. In these fikes are taken: Blackfish (*Labrus tautoga*), striped bass (*Perca mitchilli*), weakfish (*Labrus squeteague*), kingfish (*Sciæna nebulosa*), tomcod or frostfish (*Gadus tomcodus*), flounder (*Pleuronectes planus*), the scientific names being from Mitchill's New York Fishes.

The same paper has this additional reference to fyke nets:

On Staten Island the seine or draw net is sometimes employed in taking shad, but the fyke or stationary hoop net is principally used to capture them. Along the southern and eastern shore of the island, every person who has a farm fronting on the water where the shad run, has his fyke or fikes prepared in due season, and set at a proper distance from the shore. The fyke is lifted at every low tide and the fish taken out. If the proprietor takes more than is required for his own consumption, the surplus is sent to the New York market. Occasionally, in some situations, the fishery is more productive than the farm. But in the memory of the writer the run of shad has very much diminished.

At the present time the principal species taken in this region are alewives, catfish, eels, white perch, shad, and striped bass, the most valuable being catfish, eels, and shad.

In ten counties on the Hudson River fyke nets are employed in greater or less quantities. They are most numerous and important in Albany, Rensselaer, Orange, and Rockland counties. They are mostly simple two-hoop, three-hoop, and four-hoop nets, with short wings and leader, such as are referred to on page 307. In the lower part of the river they are set in water 40 to 50 feet deep, but in the upper course of the stream they are mostly placed in 10 to 20 feet of water. The chief fishes taken are catfish, perch, striped bass, and suckers.

From the following tables the extent of the fyke-net fishery in each county can be seen. After Suffolk County, which has the most important fishery, the principal counties are Kings, Queens, and Westchester, in each of which the value of the products is more than \$2,000.

Fishermen.

Counties.	Number.
Albany .....	5
Columbia .....	10
Dutchess .....	5
Greene .....	4
Kings .....	23
Orange .....	7
Putnam .....	2
Queens .....	25
Rensselaer .....	8
Richmond .....	18
Rockland .....	17
Suffolk .....	424
Ulster .....	5
Westchester .....	24
Total .....	577

Nets and boats.

Counties.	Fyke nets.		Boats.	
	No.	Value.	No.	Value.
Albany.....	295	\$1,565	5	\$460
Columbia.....	71	495	10	185
Dutchess.....	136	840	6	115
Greene.....	52	290	4	65
Kings.....	205	1,860	26	720
Orange.....	156	933	8	155
Putnam.....	17	102	2	40
Queens.....	213	2,340	26	1,235
Rensselaer.....	161	885	5	95
Richmond.....	215	2,150	25	500
Rockland.....	125	1,525	30	1,150
Suffolk.....	4,430	40,515	324	9,882
Ulster.....	72	400	5	80
Westchester.....	98	1,565	26	1,320
Total.....	6,246	55,465	502	16,002

Products.

Species.	Albany.		Columbia.		Dutchess.		Greene.		Kings.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Catfish.....	6,530	\$327	6,280	\$299	3,600	\$180	2,750	\$138	9,300	\$360
Eels.....									10,857	570
Flounders and flatfish.....									10,240	280
Perch, white.....	1,550	124	2,850	232	1,375	110	1,125	90	2,950	110
Shad.....									23,360	1,460
Squeteague.....									4,970	240
Striped bass.....	125	15	255	31	65	8	75	9	4,000	520
Suckers.....	3,360	168	1,618	89	1,800	100	780	38		
Other fish.....	160	8	320	16	85	5	100	6	5,818	160
Total.....	11,725	642	11,323	667	6,925	403	4,830	281	71,495	3,700

Species.	Orange.		Putnam.		Queens.		Rensselaer.		Richmond.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Alewives.....									6,400	\$80
Catfish.....	4,820	\$241	2,050	\$102	7,835	\$260	6,000	\$289	5,980	235
Eels.....					9,143	480			5,330	280
Flounders and flatfish.....					57,240	1,431				
Perch, white.....	1,775	142	525	42			1,750	140	1,980	80
Shad.....									7,080	495
Striped bass.....	95	13	75	9	520	64	85	10	1,525	183
Suckers.....	1,350	76	500	28			2,475	142		
Other fish.....	150	8	85	5	5,086	150	75	4	3,235	97
Total.....	8,190	480	3,235	186	79,824	2,385	10,385	585	31,530	1,450

Species.	Rockland.		Suffolk.		Ulster.		Westchester.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Alewives.....			25,920	\$324					32,320	\$404
Bluefish.....			28,350	1,134					28,350	1,134
Butter-fish.....			43,200	648					43,200	648
Catfish.....	3,600	\$180	12,150	243	4,600	\$221	2,450	\$123	77,945	3,198
Eels.....			6,090	320					31,420	1,650
Flounders and flatfish.....			986,700	24,277			10,000	500	1,064,180	26,488
Kingfish.....			265	40					265	40
Menhaden.....			648,000	810					648,000	810
Perch, white.....	1,775	142			1,850	148	1,050	84	20,555	1,444
Scup.....			40,500	810					40,500	810
Sea bass.....			8,100	405					8,100	405
Shad.....	1,550	78					800	40	32,790	2,073
Squeteague.....			108,000	3,240					112,970	3,480
Striped bass.....	1,650	196	1,650	209	85	10	6,100	732	16,305	2,000
Sturgeon.....	1,050	42					650	26	1,700	68
Suckers.....	1,875	110			1,050	68	1,900	78	16,708	895
Tautog.....			10,125	405			8,000	400	18,125	805
Tomcod.....			40,600	772			8,000	400	48,600	1,172
Other fish.....	750	45	27,360	603	150	9	275	16	43,649	1,132
Refuse fish.....			97,200	243					97,200	243
Total.....	12,250	793	2,084,210	34,474	7,735	456	39,225	2,397	2,382,882	48,899

NEW JERSEY.

This State holds the third place in this region as regards the extent of its fyke-net fishery. It has a large variety of localities adapted to the use of this apparatus; two important rivers, the Hudson and Delaware, as well as many smaller streams, afford an abundance of anadromous and fresh-water fish, and the numerous large and small bays on the coast yield salt-water and also anadromous species in great quantities. In few other States is a greater variety of fyke nets found nor are more expensive forms in use. The most elaborate style that has been met with, shown in plate LXXVIII, is here employed.

The largest numbers of nets are used in the Delaware River, but the most expensive and efficient forms are fished in that part of the State within Sandy Hook; only a few nets are operated on the outer shore, although some of these are of large size and catch considerable quantities of fish.

In Hudson County and some other parts of northern New Jersey, the principal fish taken in fyke nets is the shad, in the capture of which special types of nets are employed known as shad fykes; these have already been described and are figured in plates LXXX, fig. 1, LXXXII, and LXXXIII. The shad fykes are set doubly or singly, according to the locality, conditions of the shore and bottom, and the whim of the fishermen. When set singly, shad fykes in Hudson County are always so placed that the mouth of the net faces the outgoing tide; a net so set is called a "flood fyke." When placed double, one net faces the incoming tide and is termed an "ebb fyke." The fishing season is usually from April 1 to May 20, during which time small quantities of white perch, alewives, and eels, in addition to shad, are caught. In late years, a few salmon (*Salmo salar*) have also been taken. The nets are tended in sail and row boats, and about ten nets are set by each man. These fykes, complete with leaders, cost \$15 to \$20 each.

The shad fykes in that part of Hudson County between Jersey City and Bergen Point took the following quantities of shad in each of the years named:

Years.	Pounds.	Value.
1889 .....	184,000	\$5,520
1890 .....	166,000	6,225
1891 .....	124,000	4,960
1892 .....	130,000	5,850

*Evolution of the fyke net in Monmouth County.*—Prior to the spring of 1870 all of the fyke nets employed in the vicinity of Port Monmouth were similar in construction to the style indicated in plate LXXV, fig. 2, that is, they were provided with a leader and two wings. In the year mentioned improvements were inaugurated by two parties of fishermen. One company advocated and adopted a form of double fyke net (plate LXXX, fig. 1), with a common leader, a wing to each net, and a back piece of netting extending between the first hoops, and was opposed to the more elaborate type (plate LXXVIII), introduced and operated by Mr. Martin C. Lohsen, consisting of a leader, wings, and two hearts, like a modern pound net. A fair trial showed that the latter form was so much more successful that it gradually displaced the others and is now the only kind used at Port Monmouth. While the simpler fyke nets took only or principally floun-

ders, the improved style catches shad, striped bass, weakfish, eels, and other fish in large quantities. This type of fyke net, designated a "pound fyke," has been described. It is set singly, in pairs, or in strings containing from three to six nets, and has a value of \$30. The "pound fyke" is used at various other places in northern New Jersey. It is always essentially similar to the Port Monmouth type, the variations in construction being of minor importance.

The restrictions which in recent years have been placed on fyke nets in the Delaware River have considerably reduced the visible or apparent extent of the fishery and made difficult the study of the subject. Practically all of the fishing is done at night, at the risk of fine, imprisonment, and the confiscation of apparatus. The darker the night and the more stormy the weather the better it suits the fishermen.

The principal forms of fykes used in the Delaware are the "drop fykes" or "brook fykes," sometimes locally called "pike nets." These are usually set in shallow water. Sometimes twenty to twenty-five nets are fastened together, the small end of one net being attached by a line to the bottom of the first hoop of the next net. A line with a buoy is fastened to the small end of the first net. Sometimes the buoy line is carried to the shore and tied to a twig in an inconspicuous place in order to avoid the watchful eye of the fish warden, who often sails directly over a long string of nets without knowing of their presence. In some instances the strings of nets are set without buoy lines or shore lines; "marks" or "ranges" are then taken by one man on shore while the other is setting the nets. A long pole or boathook is then required to haul up the nets. When set singly, as the brook fykes often are, they are placed as shown in plates LXXII and LXXIII, fig. 1, that is, they are kept in position by means of stones.

The extent of this fishery in 1891 was as follows, the figures being shown by counties:

*Fishermen.*

Counties.	No.
Atlantic.....	1
Burlington.....	58
Cape May.....	2
Hudson.....	21
Middlesex.....	4
Monmouth.....	53
Ocean.....	21
<b>Total.....</b>	<b>160</b>

*Nets and boats.*

Counties.	Fyke nets.		Boats.	
	No.	Value.	No.	Value.
Atlantic.....	12	\$36	1	\$25
Burlington.....	1,055	3,755	49	980
Cape May.....	3	150	1	50
Hudson.....	210	3,750	16	1,450
Middlesex.....	22	990	2	225
Monmouth.....	213	4,430	52	1,131
Ocean.....	47	1,080	16	294
<b>Total.....</b>	<b>1,562</b>	<b>14,191</b>	<b>137</b>	<b>4,155</b>

Products.

Species.	Atlantic.		Burlington.		Cape May.		Hudson.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Alewives .....			96,550	\$483			800	\$12
Black bass .....			1,000	140				
Carp .....			2,000	100				
Catfish .....			21,340	1,707				
Eels .....			13,855	970	3,750	\$250	1,000	50
Shad .....			3,750	188			124,000	4,960
Striped bass .....			4,785	670	1,000	70	2,700	135
Suckers .....			27,675	2,214				
Sunfish .....			6,475	518				
Weakfish .....					6,000	180		
White perch .....			13,050	1,044	600	30	2,459	49
Yellow perch .....			11,680	934				
Miscellaneous fish .....			2,200	154				
Terrapin .....	1,000	\$80						
Total .....	1,000	80	204,300	9,182	11,350	530	130,959	5,206

Species.	Middlesex.		Monmouth.		Ocean.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Alewives .....							97,350	\$495
Black bass .....							1,000	140
Bluefish .....			1,000	\$50			1,000	50
Butter-fish .....			3,000	150			3,000	150
Carp .....							2,000	100
Catfish .....							21,340	1,707
Eels .....			43,150	2,797	4,500	\$300	60,255	4,367
Flounders .....	1,500	\$60	29,900	1,247	54,500	2,180	85,900	3,487
Menhaden .....			29,167	53			29,167	53
Scup .....			2,100	105			2,100	105
Sea bass .....			1,100	3			1,100	3
Shad .....	12,500	543	4,000	240			144,250	5,981
Spots .....			6,500	265			6,500	265
Striped bass .....	2,400	192	2,550	274	1,500	300	14,935	1,041
Suckers .....							27,675	2,214
Sunfish .....							6,475	518
Tautog .....			2,900	115	2,300	69	5,200	184
Weakfish .....	500	30	6,000	305			12,500	515
White perch .....			4,900	319	5,000	430	20,009	1,872
Yellow perch .....							11,680	934
Miscellaneous fish .....	500	25	300	15	1,400	42	4,400	236
King crabs .....			20,000	125			20,000	125
Terrapin .....			848	318			1,848	393
Total .....	17,400	850	157,415	6,381	69,200	3,321	591,684	25,550

PENNSYLVANIA.

This State abuts on two important rivers tributary to Delaware and Chesapeake bays, respectively, and on one of the Great Lakes, and fishing with fyke nets is or has been prosecuted in each of these three bodies of water. The river fishery will be considered in this place, and the lake fishery in the chapter relating to the Great Lake basin. Pennsylvania ranks fifth among the States of this region as regards the extent of its fyke-net fishery; although a large number of nets are used, they are mostly of small size and the average catch per net is low. The fishery in the Delaware River is much more important than that in the Susquehanna; more men are employed, more nets are operated, and more fish are caught. In the Susquehanna, however, the nets are more costly and the average yield is greater.

The principal kind of fyke used in this State, in the Delaware River, is the drop fyke, which has already been described. It is particularly numerous in Philadelphia County, where the fishery is more important than that in any other county. The fykes are usually set from skiffs carrying one or two men, and are generally placed, about 16 feet apart, in strings. The outfit of a boat is from 10 to 100 nets. Almost the



entire catch consists of catfish, which are sold dressed at 8 cents a pound. The fish lose about half their weight in dressing: The season extends from May 1 to October 20, during which time the nets are lifted once, twice, three times, or more frequently each week. Many of the fishermen lift only once a week. The average stock to a net in Philadelphia County is about \$1.84. The fishery in the vicinity of Philadelphia owes its importance to the fact that the numerous vessels plying on the river would prevent the use of seines and gill nets.

In the falls of the Delaware River, below Lambertville, N. J., about a dozen fykes, each provided with a pair of long wings built of stones, were fished some years ago by four fishermen from New Hope, Pa. Catfish was the principal species taken.

In the Susquehanna River this fishery is much less important than it was some years ago. In 1880, 3,000 fyke nets were reported to be fished in summer, in the Susquehanna River between Havre de Grace and Columbia, for perch, rock, and catfish, but at the present time, owing to legal restrictions, the number fished commercially is less than 100, and the principal fish taken are carp, eels, and suckers.

The extent of the fyke-net fishery of Pennsylvania in 1891 is shown by counties in the following tables:

*Fishermen.*

Counties.	Number.
Bucks .....	23
Delaware .....	3
Lancaster .....	7
Philadelphia .....	24
York .....	3
Total .....	60

*Nets and boats.*

Counties.	Fyke nets.		Boats.	
	No.	Value.	No.	Value.
Bucks .....	380	\$1,330	25	\$585
Delaware .....	70	140	3	60
Lancaster .....	43	260	7	84
Philadelphia .....	2,026	3,444	21	840
York .....	15	90	3	35
Total .....	2,534	5,264	59	1,604

*Products.*

Species.	Bucks.		Delaware.		Lancaster.		Philadelphia.		York.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Allowives .....	5,075	\$26									5,075	\$26
Carp .....	300	24			2,625	\$131			875	\$44	3,800	199
Catfish .....	5,025	352	5,000	\$250			72,000	\$2,880			82,025	3,482
Eels .....	3,100	218	1,000	55	3,225	194	19,000	855	1,075	64	27,400	1,388
Black bass .....	675	68									675	68
Shad .....	475	25									475	25
Suckers .....	12,750	811			5,025	125			1,675	42	19,450	978
Striped bass .....	970	96									970	96
Sunfish .....	1,625	98									1,625	98
White perch .....	2,225	135									2,225	135
Yellow perch .....	2,125	122									2,125	122
Other fish .....	850	44									850	44
Total .....	35,195	2,019	6,000	305	10,875	450	91,000	3,735	3,625	150	146,695	6,659

DELAWARE.

In proportion to the extent of the general fisheries, the fyke-net fishery of Delaware is of considerable importance, although very small as compared with that of adjoining States. It is carried on from the Delaware Bay and ocean sides of the State and also from that part drained by streams flowing into Chesapeake Bay.

The nets employed are generally of small size, of the style already designated as drop fykes; the average value is only a little over \$2. The fish taken in greatest numbers are catfish, white and yellow perch, and eels. The average catch to a net is only about 80 pounds, and the average stock is only \$4, many of the nets being used irregularly and for a short period each year. Drop fykes, with a large bow-shaped mouth, are fished at some places from September 1 to June 1, chiefly for catfish, which are sold mostly in Philadelphia and are usually dressed before shipment.

A few years ago, at Bombay Hook, 15 fykes, with an entrance 15 feet wide, were fished by two men for snapping turtles. The annual stock was \$200, which represented 2,000 pounds of turtles. The latter weighed from 4 to 80 pounds, having an average weight of 12 pounds. They were sold in Philadelphia. In the Nanticoke River, in Sussex County, fykes 12 feet long, with the first hoop 6 feet in diameter and with 3 or 4 funnels, are used for shad, herring, perch, suckers, pike, and striped bass.

In the Indian River, which drains into the Atlantic south of Cape Henlopen, a number of fykes are used during the colder months, when they are lifted three times a week. The catch consists largely of perch.

In 1891 the fyke-net fishery of Delaware had the following extent:

*Fishermen.*

Counties.	Number.
Kent.....	8
Newcastle.....	11
Sussex.....	8
Total.....	27

*Nets and boats.*

Counties.	Fyke nets.		Boats.	
	No.	Value.	No.	Value.
Kent.....	112	\$259	8	\$120
Newcastle.....	400	800	9	225
Sussex.....	55	202	8	80
Total.....	567	1,261	25	425

*Products.*

Species.	Kent.		Newcastle.		Sussex.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Catfish.....	8,500	\$390	13,700	\$822	2,000	\$100	22,200	\$1,312
Eels.....	2,700	162	3,500	175			6,200	337
Shad.....					1,001	61	1,001	61
Striped bass.....	240	32	900	90	300	45	1,440	167
Suckers.....	200	8					200	8
White perch.....	1,700	89	2,500	125	5,000	310	9,200	524
Yellow perch.....					2,47	123	2,470	123
Other fish.....					2,880	59	2,880	59
Total.....	11,340	681	20,600	1,212	13,151	698	45,091	2,591

## MARYLAND.

In the preceding general tables and discussion, the importance of the fyke net in this State has been shown. While New York has a larger aggregate catch on the coast and in Lake Ontario, the extent of the fishery on the Atlantic seaboard and coast rivers is much less than in Maryland. This is the fyke-net State par excellence. More nets are here employed, the nets are more generally used and distributed, and a larger variety of forms is met with than in any other State.

Fykes are found in fourteen counties in this State. They are most extensively employed in Baltimore, Cecil, Dorchester, Harford, and Somerset counties, which have over 1,000 nets each. The catch is most valuable in Kent and Cecil counties, where products worth over \$10,000 are taken with this apparatus. The most prominent species taken are catfish, eels, white perch, yellow perch, pike, and striped bass, but a number of others have considerable importance.

The full extent of this fishery in 1891 is shown in the following series of tables. The figures for the individual counties are shown separately.

*Fishermen.*

Counties.	Number.
Anne Arundel.....	4
Baltimore.....	55
Caroline.....	18
Cecil.....	91
Charles.....	6
Dorchester.....	52
Harford.....	32
Kent.....	88
Prince George.....	4
Queen Anne.....	28
Somerset.....	45
Talbot.....	83
Wicomico.....	73
Worcester.....	16
Total.....	595

*Nets and boats.*

Counties.	Fyke nets.		Boats.	
	No.	Value.	No.	Value.
Anne Arundel.....	22	\$396	3	\$60
Baltimore.....	1,781	0,113	48	648
Caroline.....	239	2,374	15	225
Cecil.....	2,923	5,626	61	915
Charles.....	24	96	3	75
Dorchester.....	1,470	4,153	37	666
Harford.....	1,140	4,010	31	620
Kent.....	211	3,856	66	1,122
Prince George.....	16	64	2	50
Queen Anne.....	74	1,485	21	336
Somerset.....	1,179	3,525	34	680
Talbot.....	579	2,888	69	966
Wicomico.....	708	3,467	61	733
Worcester.....	32	111	9	75
Total.....	10,398	38,114	460	7,171

Products.

Species.	Anne Arundel.		Baltimore.		Caroline.		Cecil.		Charles.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Alowives	12,500	\$50			9,200	\$88	45,800	\$329		
Catfish	3,870	116	35,860	\$1,669	5,500	120	61,125	2,445	1,020	\$41
Eels			9,040	452	6,625	265	66,600	3,280	900	24
Pike	286	20	27,875	1,657	3,200	192	21,228	1,486	1,500	180
Shad					1,313	47	4,361	149		
Striped bass	3,800	980	1,520	128	4,043	325	3,525	282		
Suckers					4,600	138	7,400	222	1,080	43
White perch			37,243	2,039	1,500	90	35,100	1,925	360	54
Yellow perch	3,325	100	58,350	1,627	4,750	90	49,335	1,480	1,440	115
Other fish	2,900	84	8,500	265	1,760	52	10,850	310		
Terrapins									240	50
Total	26,681	750	178,388	7,837	43,091	1,407	304,824	11,908	5,940	507

Species.	Dorchester.		Harford.		Kent.		Prince George.		Queen Anne.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Alowives	23,400	\$117			79,100	\$760			5,600	\$55
Catfish	7,430	200	48,000	\$1,800	40,260	1,208	680	\$27	27,200	854
Eels	29,700	1,188	28,600	1,430	1,100	35	200	16		
Pike	5,400	224	11,286	790	23,300	1,814	1,000	120	4,005	365
Shad	3,220	120			6,041	245				
Spots and croakers					1,550	77				
Striped bass	3,995	280	3,560	320	3,500	210			16,800	1,520
Suckers	9,433	258	5,067	170	2,500	75	720	29		
White perch	1,800	90	14,909	820	27,000	1,650	240	36	22,900	1,144
Yellow perch	6,430	225	14,025	585	66,650	3,568	900	77	26,600	943
Other fish	5,020	150	9,135	274	10,150	413			2,550	110
Terrapins							160	34	6,815	1,020
Total	95,828	2,912	135,782	6,189	261,151	10,055	3,960	339	112,560	6,011

Species.	Somerset.		Talbot.		Wicomico.		Worcester.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Alowives	17,400	\$87	14,300	\$71	32,800	\$159			240,200	\$1,716
Catfish	3,470	173	14,400	360	66,110	2,650			314,925	11,723
Eels	21,500	860	10,200	408	38,700	1,548	7,200	\$288	219,765	9,794
Pike	2,800	168	1,964	108	3,500	210	1,400	84	108,744	7,418
Shad	2,541	87	7,441	255	3,570	120			28,487	1,023
Spots and croakers	1,560	70							3,110	147
Squeteague	2,450	98							2,450	98
Striped bass	3,200	160	17,500	1,050	39,500	2,765			101,633	7,420
Suckers	3,200	94	8,700	250	7,600	190			50,900	1,469
White perch	1,300	52	9,580	393	4,800	240	900	54	157,632	8,577
Yellow perch	4,800	144	6,182	185	9,610	335	1,000	50	254,057	9,524
Other fish	2,400	72	2,065	62	7,684	270	800	40	63,314	2,102
Terrapins									7,215	1,104
Total	66,621	2,065	92,332	3,132	213,974	8,487	11,900	516	1,552,432	62,115

Compared with 1880, the fyke-net fishery of this State seems to have greatly increased. In that year only 4,050 fykes, pots, and baskets, valued at \$6,600, were employed, no separate figures for fykes being available. As has been seen, 10,398 fykes were used in 1891, having a value of \$38,114.

While some forms of nets and methods of fishing are common to almost the entire State, others are more or less peculiar to different sections or counties. In a previous chapter descriptions of some of the fykes used have been given, and illustrations of a number of forms are presented. Some further references to the types of nets employed in this State and to the fishery in some of the important counties will be given.

In many places in Caroline, Dorchester, Talbot, and other counties, the name "fyke" seems to be understood as applying only to each hoop and the netting and funnel connected therewith, and is not generally used, the net being called a "set of fykes." The fyke proper is also known as the "pocket" in some localities—Talbot

County, for instance. When a leader is used it is commonly called "hedging," and the curved wings are usually designated "bays," or "fore bays," in allusion to the corresponding parts of a pound net.

Among the simplest fykes used in Maryland are those called drop fykes, perch fykes, and eel fykes. Drop fykes are named in allusion to the practice of dropping them from the side of a boat and buoying them like a lobster pot, instead of staking them, as is done with the more elaborate nets. Perch and eel fykes are so called because of the principal fish taken in them.

Drop fykes, such as are used in Cecil County, are worth from \$1 to \$2 each; they are 3 feet across the mouth, have 5 hoops and 2 funnels, and take yellow perch (called "yellow neds"), catfish, pike, suckers, eels, and a few flounders. Each net is weighted with a stone, and has a bridle which is buoyed by a cork; it is left down for a day or two and then pulled up by the bridle to be relieved of the fish. The season extends from February 1 to May 30 and from September 15 to December 15.

In Cecil County a form of net called a "perch fyke" is principally set for white perch and yellow perch, but also takes catfish, pike, and eels. It is usually provided with an arched entrance, instead of a circular one, and has a 2-foot opening, 4 or 5 hoops, and 2 or 3 funnels; the length of the net is 5 feet. The value is \$1 to \$3. In some places they are set only at intervals during the year, but in others they are fished the year round, being left under the ice in winter and tended through holes cut in the ice. They are often set in strings containing 25 or 30 nets at intervals of 25 feet; each net is kept in position by a stone weighing about 3 pounds. Perch fykes are also known as "gumbo fykes," or "jumbo fykes."

A form of fyke set especially for eels, and called an "eel fyke," is employed in some numbers in Cecil County. Catfish constitute a prominent part of the catch, for which reason the net is known in places as a "cattie fyke." The net consists of 4 or 5 hoops, usually has 2 funnels, but sometimes 3, and is 2½ to 5 feet long; the mesh is 2¼ inches stretch measure; the material used is No. 9 cotton twine; the entrance, which is bowed, is 12 inches high and 18 inches wide. The eel fyke is fished mostly in spring and fall. It is baited with suckers (called "mullet") and menhaden (called "bugfish").

One of the simplest fykes met with is used in Dorchester and other counties on the eastern shore of Chesapeake Bay. It consists of three hoops, 8, 6, and 4 feet in diameter, with a funnel extending from the first and second hoops. The hoops are about 6 feet apart, so that the fyke proper is about 18 feet long. It is provided with two wings, each from 30 to 60 feet long. Terrapin, striped bass, and perch are taken. A similar net, observed on the Nanticoke River, has wings only 18 feet long and is there called a "sink net"; it is fished under the ice in winter and catches principally striped bass and perch. A form of fyke (plate LXXIII, fig. 2) made on this principle, but with a funnel in each hoop, is used in Fishing Bay, where it is known as a "buckdart," and is set wholly for terrapin. Such nets are valued at \$10 to \$25 each. They are placed in a creek or cove so that the wings reach the shores. The season begins April 1 and ends June 1, and reopens September 1 and continues till November 1. In 1887 13 such fykes set on Taylor Island took \$500 worth of terrapin, which sold for \$20 a dozen. Crabs also are caught, but are usually not saved. Considerable quantities of wild ducks are sometimes secured and add to the income of the fishermen.

Perhaps the most elaborate style of fyke net used in this State is shown in plate LXXIX, fig. 2. It is employed in Dorchester, Wicomico, and other counties and in some

places is the prevalent form. It is usually known as a "set of fykes." It consists of two separate bags arranged with the openings opposite each other and connected on one side by netting, while from the other side wings and leader diverge. Each bag is 18 feet long and has 6 hoops and 2 funnels, the largest hoop being  $5\frac{1}{2}$  feet in diameter, the smallest 4 feet, the gradation between the hoops being about 3 inches. The leader, made of netting with a  $3\frac{1}{2}$ -inch mesh, is 120 feet long; the wings are about half that length or less. Striped bass, perch, shad, herring, catfish, eels, and pike are secured.

In Caroline County a fyke net made of wire bagging and net wings was used some years ago. The nets in this county are mostly the "set of fykes" just described.

The "set of fykes" is also used in Talbot County, where the fykes proper are called "pockets"; they are 12 to 18 feet long, with a  $2\frac{1}{2}$  or 3 inch mesh; there are 5 hoops, from 3 to 6 feet in diameter, and usually two funnels; the hedging is 50 to 75 yards long. In the Wye River region, small single fykes, 8 feet long and 2 feet in diameter, are used for herring.

In Queen Anne County fykes with a leader and straight or curved wings are the commonest form in use. In the Chester River the fykes are almost always set like pound nets, with "forebays" and "hedging." At Centerville a net with straight wings, a leader, and 5 hoops, is called a "set of fykes." The catch in this county consists chiefly of striped bass, yellow perch, catfish, herring, and pike; pike are said to very frequently escape after being caught.

The fykes set in the Potomac River are mostly similar to the ordinary winged nets of the eastern shore of Maryland, which have already been described. They are set in water 4 to 6 feet deep, usually in creeks, with the mouth toward the incoming tide. They are also sometimes set in strings across the bed of a creek or at the mouth of an inlet. Five to 8 nets are arranged side by side in a straight row, with about 25 feet of netting between each adjoining pair, and with a wing from 60 to 120 feet long extending from each end net, forming an obtuse angle with the line of nets and having an inward turn at the end. The nets employed in this river are set during the fall and winter and catch chiefly pike, catfish, eels, yellow perch, white perch, and suckers; terrapin or "sliders" are also caught in small numbers.

#### VIRGINIA.

The close proximity to Maryland, the similar topographical conditions, and the similarity of the fishes taken would seem to insure to Virginia a fyke-net fishery of similar importance and extent to that existing in the adjoining State. Such, however, is not the case; on the contrary, the number of these nets found in Virginia is only one-thirtieth that used in Maryland and the catch is correspondingly less. The principal feature regarding the fykes of Virginia is their relatively high value and large stock as compared with Maryland. While the average value of the nets in the latter State is less than \$4, in the former it is about \$17; and while the average value of the catch in Maryland is only \$6 per net, in Virginia it is nearly \$40.

Fykes are employed in 14 counties in this State bordering on the Chesapeake Bay and the numerous tributary rivers and bays. They are most numerous and most productive in York County, although Gloucester, James City, and Northampton counties have rather important fisheries. The nets used are in great part similar to those found in Maryland, and need not again be described. The prominent species taken are squeteague, striped bass, spots, croakers, shad, white perch, and catfish.

Reference has elsewhere been made to a method followed in this State of setting simple fykes at each end of a leader. Such an arrangement is found in the James and York rivers and elsewhere. In the lower James River fykes thus placed are fished for striped bass in the fall. In the York River they are set from September 1 to May 1, and are taken up three times a week. The leader or hedging varies from 10 to 40 fathoms in length and is 3 to 8 feet deep. The first hoop is 4 to 6 feet in diameter, and the last  $1\frac{1}{2}$  to 3 feet; the number of hoops is 3 to 5. The value of two such nets, with the connecting leader, is \$30 to \$50.

An unique style of trap, apparently peculiar to this State, is illustrated in plate LXXVII, fig. 3; it consists in the substitution of a fyke for the usual form of entrance to the pot of a pound net. Capt. N. Raynor, of Hampton, Va., in a recent personal communication to the writer regarding the fykes employed in that part of the Chesapeake, refers as follows to this form of net:

In addition to the regular fykes, some of the fishermen use what they term a funnel-mouth pound; that is to say, a pound with a square head, but with the regular fyke funnels instead of the perpendicular [square] mouth usual to pounds. This style prevails in Back River. The size is much smaller than the pound net for shad, etc. The fishermen claim it will hold the fish much better. The cost of this trap, "rock" size, is from \$30 to \$50.

The three tables which follow indicate the extent to which the various counties were interested in the fyke-net fishery in 1891:

*Fishermen.*

Counties.	Number.
Acomac .....	2
Elizabeth City .....	2
Essex .....	3
Fairfax .....	8
Gloucester .....	11
Isle of Wight .....	14
James City .....	21
King and Queen .....	3
Nansemond .....	6
New Kent .....	6
Northampton .....	8
Prince William .....	2
Richmond .....	3
York .....	9
<b>Total .....</b>	<b>98</b>

*Nets and boats.*

Counties.	Fyke nets.		Boats.	
	No.	Value.	No.	Value.
Acomac .....	3	\$60	1	\$15
Elizabeth City .....	4	200	2	30
Essex .....	18	270	3	50
Fairfax .....	32	128	4	100
Gloucester .....	38	475	9	100
Isle of Wight .....	28	420	14	195
James City .....	66	675	12	175
King and Queen .....	18	225	3	60
Nansemond .....	8	400	3	75
New Kent .....	10	125	3	60
Northampton .....	16	1,280	7	280
Prince William .....	8	32	1	25
Richmond .....	6	90	3	25
York .....	124	1,550	8	140
<b>Total .....</b>	<b>379</b>	<b>5,930</b>	<b>73</b>	<b>1,330</b>

Products.

Counties.	Alewives.		Catfish.		Flounders.		White perch.		Yellow perch.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Accomac.....					1,500	\$30	3,500	\$105		
Elizabeth City.....							4,500	135		
Essex.....	800	\$8	1,500	\$90	200	8	3,000	150	300	\$9
Fairfax.....			1,200	48			400	60	2,080	166
Gloucester.....			5,400	162	4,200	210	2,900	116		
Isle of Wight.....	3,500	35	4,500	200			2,000	120		
James City.....			5,753	176			8,025	307		
King and Queen.....			7,956	229			3,672	110		
Nansemond.....	4,000	120					800	32		
New Kent.....			4,423	133			2,040	61		
Prince William.....			300	12			100	15	520	42
Richmond.....			8,000	320						
York.....					10,000	500				
Total.....	8,300	163	39,032	1,370	15,900	748	30,937	1,211	2,900	217

Counties.	Shad.		Spots and croakers.		Squeteaguc.		Striped bass.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Accomac.....							500	\$20
Elizabeth City.....			5,500	\$165	5,000	\$150		
Essex.....	1,050	\$27					2,800	196
Gloucester.....	3,500	90	10,500	315	7,500	225	1,650	165
Isle of Wight.....							3,000	300
James City.....			7,995	318	8,199	327	8,559	855
King and Queen.....							1,836	184
Nansemond.....	700	36	10,000	400	10,000	400	6,000	480
New Kent.....							1,019	102
Northampton.....	7,700	330			9,450	283	8,100	405
York.....	24,500	700	10,100	480	38,000	1,120	3,350	335
Total.....	37,450	1,183	44,095	1,678	78,149	2,505	36,814	3,042

Counties.	Suckers.		Other fish.		Terrapin.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Accomac.....	1,000	\$30					6,500	\$185
Elizabeth City.....	3,000	60					18,000	510
Essex.....	1,000	30	700	\$21			11,350	539
Fairfax.....	1,600	64	2,080	237	240	\$50	7,600	625
Gloucester.....							35,650	1,283
Isle of Wight.....			1,500	45			14,500	700
James City.....	1,056	32					39,587	2,015
King and Queen.....	3,168	95					19,632	618
Nansemond.....							31,500	1,468
New Kent.....	1,700	53					9,242	349
Northampton.....			8,600	172			33,850	1,190
Prince William.....	400	16	520	59	60	13	1,900	157
Richmond.....			4,000	200			12,000	520
York.....			11,100	393			97,050	3,468
Total.....	12,984	380	28,500	1,067	300	63	335,361	13,627

THE SOUTH ATLANTIC STATES.

The fyke-net fishery of this region is less important than in any other coast section, except the Gulf States where no fykes are employed. This is especially striking in view of the almost unlimited fishing-grounds to which this apparatus is adapted. In a recent report by the writer on the fisheries of the South Atlantic States attention was directed to the almost complete absence of fyke nets (and pound nets) from these States in the following words:

A consideration of the forms of apparatus employed in the food-fish fisheries of the South Atlantic States shows that the use of seines and gill nets is so much more extensive than that of any other form, except in North Carolina, that all other apparatus is unimportant by comparison, and that some types which in other regions constitute a very prominent means of capture are entirely absent or only sparingly used in the greater part of the South Atlantic region. The pound net, for instance, is



found practically only in one State, and the fyke net is employed only in very small numbers and in isolated localities. The possibility of introducing new forms which will develop the fishing resources, increase the income of the fishermen, and at the same time mitigate their labors, seems worthy of serious attention. Both the pound and fyke nets are adapted to the capture of almost every species of marine, fresh-water, and anadromous fish occurring in the region, and the topography of the shores is extremely favorable to their employment. Their inexpensiveness, as compared with seines, recommends them, and the possibility of employing them in connection with seine, gill-net, and other fisheries without special increase in the working force is an important consideration. (Report on the Fisheries of the South Atlantic States. Bulletin U. S. Fish Commission, xi, 1891.)

Fyke nets are at present found in only two of the South Atlantic States, viz, North Carolina and Georgia. They are more numerous and take larger quantities of fish in the former State, but yield the greater money returns in Georgia, as shown in the following statement of the extent of the fyke-net fisheries of this section in 1890:

*Fyke-net fishery of the South Atlantic States.*

States.	No. of fishermen.	Fyke nets.		Boats.		Products.	
		No.	Value.	No.	Value.	Pounds.	Value.
North Carolina.....	27	36	\$384	4	\$60	24,885	\$716
Georgia.....	10	11	285	5	70	20,190	898
Total.....	37	47	669	9	130	45,075	1,614

#### NORTH CAROLINA.

Fykes are used in this State in only Dare and Sampson counties, and in these in very small numbers. The nets are of simple types and have a value of \$5 to \$25. The forms met with have from 2 to 5 hoops and have wings and leaders, or only wings.

In Dare County the nets are fished from Roanoke Island, and the catch consists chiefly of striped bass, squeteague, and mullet. The nets have an average value of \$17. The fykes proper are from 4 to 7 feet long, have 5 hoops, and usually have leaders about 50 yards long. In Sampson County the nets are set in a branch of the Cape Fear River, and only fresh-water fish are caught. No boats are used, as owing to the shallow water the fishermen are able to set and lift the nets by wading. The nets are cheaper than those used in Dare County, having an average value of only \$5. The yield is made up of perch, suckers, and catfish.

Of the 27 fyke-net fishermen reported in this State in 1890, 19 were in Sampson County, where 19 of the 36 nets were set. The fishery represented an investment of \$444, while the catch was valued at \$716. The quantities and values of the principal species taken were as follows:

*Products of the fyke-net fishery of North Carolina in 1890, specified by species and counties.*

Species.	Dare.		Sampson.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Catfish.....			3,000	\$90	3,000	\$90
Mullet.....	6,300	\$36			6,300	36
Perch.....			5,000	245	5,000	245
Sheepshead.....	275	11			275	11
Squeteague.....	3,700	74			3,700	74
Striped bass.....	1,310	79			1,310	79
Suckers.....			4,000	140	4,000	140
Other fish.....	1,300	41			1,300	41
Total.....	12,885	241	12,000	475	24,885	716

GEORGIA.

Fyke nets are used in this State only in Chatham and Bryan counties, in the Savannah and Ogeechee rivers. Those in Chatham County are provided with leaders and wings, and have an average value of \$34. In Bryan County the nets are smaller, with a value of only \$5. The principal fish taken are alewives, catfish, and striped bass. The 8 nets used in Chatham County in 1890 were valued at \$270, were operated with 4 boats, and were tended by 8 men; the catch was 16,000 pounds, which yielded the fishermen \$743. In Bryan County the 3 nets were worth \$5, and were fished in one boat by 2 men; 4,190 pounds of fish were taken, worth \$155. The table shows the extent to which the several species and the two counties were represented in the catch.

*Fyke-net catch of Georgia in 1890.*

Species.	Chatham.		Bryan.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Alewives .....	8,000	\$340			8,000	\$340
Catfish .....	5,000	163	2,515	\$88	7,515	251
Striped bass .....	3,000	240			3,000	240
Other fish .....			1,675	67	1,675	67
Total .....	16,000	743	4,190	155	20,190	898

THE PACIFIC STATES.

Fyke nets are uncommon on the Pacific coast. They are not used in the fisheries of Washington and Oregon, and in California are restricted to two rivers emptying into San Francisco Bay. The scarcity of these nets in the Pacific States may be explained by the facts, (1) that they are less adapted to the capture of salmon, sturgeon, and other large fish, to the pursuit of which the energies of the fishermen have chiefly been directed, than are the wheels, seines, and gill nets; (2) that the general demand for small fish is as yet so limited that no special apparatus or attention has been devoted to it. With the increase in population in the coastal regions of the Pacific States fyke nets are likely to come into extensive use.

CALIFORNIA.

Fyke nets have been in use in this State for a great many years. The history of their introduction is unknown to the writer, but it would seem that they must have been taken in very soon after, if not coincident with, the advent of the gold-seekers in 1849, for their use is recorded as early as 1852. Twenty years ago more nets were employed, but it is doubtful if the fishery has ever been more productive than at the present time.

Fyke nets are fished only in the San Joaquin and Sacramento rivers; in the latter stream their use dates at least as far back as 1852; as has been noted, but in the former river their advent has apparently been recent. All the nets are operated by fishermen who are engaged in taking fish by other means. The nets are described as having 4 hoops, being provided with wings, and resembling the kind figured in plate LXXIII, fig. 2; their value is about \$20 each. Of the 49 used in 1892, 24 were fished in

the San Joaquin River at or near Jersey Landing, in Contra Costa County, and at Black Diamond, near its mouth, in the same county; the others were set in the Sacramento River, in the vicinity of the city of the same name and elsewhere along the course of the stream. The San Joaquin River fishermen represent three countries—Greece, Italy, and the United States—although the Greeks and one Italian have become citizens of this country; in the Sacramento River the fishermen are all Chinese. Sailboats are used to lift the nets in the San Joaquin River and rowboats in the Sacramento River.

The fishes taken in the fyke nets in the Sacramento and San Joaquin rivers represent a variety of species, among which the following may be mentioned, the common names given being those used by the fishermen: Carp (*Cyprinus carpio*), introduced; catfish (*Ameiurus nebulosus*), introduced; chub (*Mylocheilus caurinus*); hardhead (? *Mylopharodon conocephalus*); perch (*Archoplites interruptus* and *Hystero-carpus traski*); split-tail (*Pogonichthys macrolepidotus*). In addition to the foregoing, the following fish were, a number of years ago, reported to be taken in fyke nets in the Sacramento River: Sacramento pike (*Ptychocheilus oregonensis* and *P. harfordi*); in recent years these may have been returned under the name "chub," which is more appropriate than "pike;" sucker (*Catostomus occidentalis*); sturgeon (*Acipenser transmontanus*); herring (? *Clupea mirabilis*).

The yield of the California fyke nets is relatively large, the average per net being much greater than in most of the other States. In the San Joaquin River the average catch per net is 1,893 pounds, valued at \$55; in the Sacramento it is 5,824 pounds, worth \$150. It is interesting to observe that at the present time about three-fourths of the output of the State consist of two introduced fish, the carp and the catfish, which make up the entire catch in the San Joaquin. Twelve men engaged in this fishery in Contra Costa County and 20 in Sacramento County. They used 16 boats, valued at \$1,050, of which 6, worth \$900, were used in the former county. The 49 nets operated had a value of \$980; 24 of these, worth \$480, were set in Contra Costa County. The aggregate catch amounted to 194,647 pounds, for which the fishermen received \$5,116. The extent to which the different species are represented in each county is as follows:

*Product of the fyke-net fishery of California in 1892, specified by species and counties.*

Species.	Contra Costa.		Sacramento.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Carp.....	19,955	\$529	22,160	\$775	42,115	\$1,374
Catfish.....	29,596	745	84,979	2,125	114,575	2,870
Chub.....			1,054	21	1,054	21
Hardhead.....			17,512	350	17,512	350
Perch.....			2,834	170	2,834	170
Split-tail.....			16,557	331	16,557	331
Total.....	49,551	1,344	145,096	3,772	194,647	5,116

The fyke-net fishery during the past few years shows a small general increase annually. The product has advanced from 146,309 pounds in 1889 to 194,647 pounds in 1892, this increase being made up almost wholly of carp and catfish. The following table exhibits the yearly fluctuations in the catch of the different species:

*Comparative table showing the fyke-net catch of California from 1889 to 1892, inclusive.*

Species.	1889.		1890.		1891.		1892.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Carp .....	31, 614	\$1, 049	34, 722	\$1, 158	35, 662	\$1, 183	42, 115	\$1, 374
Catfish .....	79, 937	2, 015	87, 744	2, 193	97, 399	2, 442	114, 575	2, 870
Chub .....	1, 265	25	996	18	1, 250	25	1, 054	21
Hardhead .....	14, 440	289	16, 160	323	16, 736	335	17, 512	350
Perch .....	1, 941	116	2, 745	165	2, 149	129	2, 834	170
Split-tail .....	17, 112	342	14, 559	291	15, 600	313	16, 557	331
Total .....	146, 309	3, 836	156, 836	4, 148	168, 836	4, 427	194, 647	5, 116

Writing on the fyke-net fishery of the Sacramento River in 1873,\* Mr. Livingstone Stone makes the following remarks, which are interesting in themselves and for the opportunity afforded for comparison with recent years:

The fyke nets have a mesh of 2½ inches. There were in the winter of 1872-73 85 fyke nets on the Sacramento at Rio Vista. They are stationary, of course, and are examined every twenty-four hours. All the kinds of fish that are found in the river are caught in these nets. Mr. John D. Ingersoll, a prominent fyke fisherman of Rio Vista, informed me that the daily catch for 20 nets is now about 75 pounds of fish. They include chubs, herring, perch, viviparous perch, sturgeons, hardheads, split-tails, Sacramento pike, suckers, crabs. Of these the perch, pike, and sturgeon are the best food-fishes, though all the species named are sold in the market.

There has been a vast decrease in the returns of the fyke nets during the last twenty years. In 1852 and 1853 they used to catch 700 or 800 pounds a day in one fyke net. An average of 250 pounds a day for one net at Sacramento City was usually expected in those times. The present catch of 75 pounds a day in 20 nets certainly presents an alarming contrast. The fyke-net fishing is done wholly by white men, I believe, the Chinese fishermen being ruled out by force of public sentiment. The fyke nets are usually visited early in the morning of each day, and the catch is sent down to San Francisco by the noon boat. The fyke-net fishing begins in November and is continued until May. The best fishing is when a rise in the water drives the fish inshore, where the fyke nets are placed. During the summer months the water is warmer, the fish are poor, and the fishing is discontinued.

On the 27th of February, 1873, I went the rounds of Mr. Ingersoll's set of fyke nets with him. We visited 20 nets, but as some of them had not been examined for over twenty-four hours the yield was supposed to be equivalent to one day's fishing for 30 nets. The nets had four hoops each and 14-foot wings. We took out about 120 pounds of fish in all. Hardheads were the most numerous, and the Sacramento pike next. Mr. Ingersoll said that perch used to rank second in abundance in fyke-net fishing, the average for 30 nets being 200 or 300 pounds a day, but the perch were quite insignificant in numbers on this day. We found in the nets 7 small viviparous perch and 2 small sturgeon. I learned also that mink, beaver, and others are sometimes caught in the nets. In 1872 Mr. Ingersoll caught 8 minks, 2 beavers, and 1 otter in his fyke nets.

\*Report of Commissioner of Fish and Fisheries, 1873-74 and 1874-75, pp. 383-384.

## THE GREAT LAKES.

In the States bordering on the Great Lakes the fyke net is one of the most important means of capture, and, taking the entire region into consideration, yields larger quantities of fish than any other geographical section except the Middle Atlantic States. The fishery is most extensive in Ohio, the shores of which State are especially well adapted to the use of fykes; the order of importance of the other States is Michigan, Wisconsin, and New York. Minnesota, Illinois, Indiana, and Pennsylvania have no commercial fisheries carried on with this form of apparatus. The features of the Great Lakes which render the region well adapted to fyke-net fishing and have resulted in the extensive fishery of this kind there prosecuted are an abundance of fish in the shore waters and the existence of numerous coves, bays, creeks, etc., along the borders of the lakes especially suited to fyke nets because of the shallow water and the protection afforded from storms.

The extent of the fyke-net fishery of the Great Lakes specified by States is shown in the following tables relating to the year 1890:

*Fishermen.*

States.	Number.
Michigan .....	231
New York .....	74
Ohio .....	158
Wisconsin .....	112
Total .....	573

*Nets and boats.*

States.	Fyke nets.		Boats.	
	No.	Value.	No.	Value.
Michigan .....	446	\$12,030	102	\$2,257
New York .....	684	9,822	66	2,318
Ohio .....	1,110	63,650	139	14,045
Wisconsin .....	728	11,364	66	5,930
Total .....	2,968	96,866	373	24,550

*Products.*

Species.	Michigan.		New York.		Ohio.		Wisconsin.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Bass .....	11,233	\$949	72,353	\$1,845	82,085	\$4,504	17,810	\$890	183,481	\$8,188
Catfish .....	43,100	1,132	400,273	10,484	346,250	6,920	.....	.....	789,623	18,536
Eels .....	.....	.....	56,336	2,177	.....	.....	.....	.....	56,336	2,177
Herring .....	1,100	12	.....	.....	.....	.....	332,550	4,434	333,650	4,446
Perch .....	843,096	11,490	170,645	3,111	283,670	2,240	418,900	8,838	1,716,311	25,679
Pike and pike perch .....	170,240	8,533	73,770	3,340	676,015	19,045	155,060	6,213	1,075,085	37,161
Suckers .....	367,555	7,051	76,320	1,056	.....	.....	335,410	3,887	779,285	11,994
Trout .....	1,000	40	.....	.....	.....	.....	14,480	605	15,480	645
Whitefish .....	3,400	150	.....	.....	.....	.....	6,285	315	9,685	465
Other fish .....	164,750	1,884	49,830	548	1,006,925	7,150	40,750	1,019	1,262,235	10,601
Turtles .....	.....	.....	.....	.....	25,705	514	.....	.....	25,705	514
Total .....	1,605,474	31,271	899,527	22,561	3,420,650	40,373	1,321,245	26,201	6,246,896	120,406

Owing to the fact that both Michigan and Wisconsin have a frontage on more than one of the Great Lakes, and that the conditions differ somewhat in each lake, a consideration of the subject by lakes presents greater interest than the preceding arrangements, and is, besides, the more natural way in which to discuss the matter.

The fyke-net fishery of Lake Erie is very much more important than that of any of the other lakes; 173 fishermen were here employed in 1890, 1,175 nets were used, 2,507,650 pounds of fish were taken, and \$41,893 resulted from the sale of the fish. The fyke-net fishery of Lake Michigan is second in extent, with 113 fishermen, 731 nets, and 1,311,045 pounds of fish, worth \$25,558. Lake Huron ranks third, and in the year named was ascertained to have 81 fishermen and 221 nets, and to have yielded 1,088,751 pounds of fish, valued at \$23,156. Following Lake Huron is Lake Ontario, with 74 fishermen, 684 nets, and 899,527 pounds of fish, which sold for \$22,561. Lake St. Clair, with the two rivers connected with it, had 124 fishermen and 148 nets, which yielded 415,348 pounds of fish, for which \$6,068 was received. The least important fishery of this kind is found in Lake Superior, which had only 8 fishermen and 9 nets, while the catch was only 24,575 pounds, valued at \$1,170.

The following series of tables shows, by States, the extent of the fyke-net fishery of each lake:

*Fishermen.*

Lakes.	Michigan.	New York.	Ohio.	Wisconsin.	Total.
Superior .....	4			4	8
Michigan .....	5			108	113
Huron .....	81				81
St. Clair .....	124				124
Erie .....	17		156		173
Ontario .....		74			74
Total .....	231	74	156	112	573

*Nets and boats.*

Lakes.	Fyke nets.									
	Michigan.		New York.		Ohio.		Wisconsin.		Total.	
	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.
Superior .....	4	\$80					5	\$333	9	\$413
Michigan .....	8	285					723	11,031	731	11,316
Huron .....	221	6,385							221	6,385
St. Clair .....	148	4,480							148	4,480
Erie .....	65	800			1,110	\$63,650			1,175	64,450
Ontario .....				\$9,822					684	9,822
Total .....	446	12,030	684	9,822	1,110	63,650	728	11,364	2,968	96,866

Lakes.	Boats.										Total investment.
	Michigan.		New York.		Ohio.		Wisconsin.		Total.		
	No.	Value.	No.	Value.	No.	Value.	No.	Value.	No.	Value.	
Superior .....	3	\$250					4	\$180	7	\$430	\$843
Michigan .....	3	70					62	5,750	65	5,820	17,136
Huron .....	62	1,202							62	1,202	7,587
St. Clair .....	24	510							24	510	4,990
Erie .....	10	225			139	\$14,045			149	14,270	78,720
Ontario .....			66	\$2,318					66	2,318	12,140
Total .....	102	2,257	66	2,318	139	14,045	66	5,930	373	24,550	121,416

*Products.*

Lakes.	Michigan.		New York.		Ohio.		Wisconsin.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Superior .....	3,875	\$135	.....	.....	.....	.....	20,700	\$1,035	24,575	\$1,170
Michigan .....	10,500	392	.....	.....	.....	.....	1,300,545	25,166	1,311,045	25,558
Huron .....	1,088,751	23,156	.....	.....	.....	.....	.....	.....	1,088,751	23,156
St. Clair .....	415,348	6,068	.....	.....	.....	.....	.....	.....	415,348	6,068
Erie .....	87,000	1,520	.....	.....	2,420,650	\$40,373	.....	.....	2,507,650	41,893
Ontario .....	.....	.....	899,527	\$22,561	.....	.....	.....	.....	899,527	22,561
Total .....	1,605,474	31,271	899,527	22,561	2,420,650	40,373	1,321,245	26,201	6,246,896	120,406

## LAKE SUPERIOR.

The fyke has never attained any prominence as a means of capture in this lake, and is now the least important form of apparatus there employed. As shown in a previous table, only 9 fyke nets were used in the entire lake in 1890; of these, 5 were set in Ashland County, Wis., and 4 in Houghton and Ontonagon counties, Mich. In 1891 the number of nets employed in Wisconsin was increased to 11, valued at \$710. Fykes have at times been used in other parts of this lake, but their use has never been extensive. In 1883 some nets were experimentally used in Baraga County, Mich., for herring, but they were not effective and the fishery was discontinued. In 1885 a few fykes were fished for wall-eyed pike and pickerel in Keweenaw Bay at the mouth of Portage River, but appear to have been abandoned in recent years. The chief fish now caught in the fykes is the pike perch, which, in 1890, constituted more than half the yield. Trout and whitefish are also taken in small quantities in Wisconsin. The result of this fishery in 1890 was as follows:

*Products of the fyke-net fishery of Lake Superior.*

Species.	Pounds.	Value.
Pike perch .....	13,200	\$660
Trout .....	3,500	175
Whitefish .....	4,000	200
Other fish .....	3,875	135
Total .....	24,575	1,170

## LAKE MICHIGAN.

The fyke-net fishery of Lake Michigan ranks next to that of Lake Erie in importance. The nets are set in small numbers on the eastern side of the lake, but their use there is very limited, and the fishery appears to be decreasing; on the western shore they constitute a prominent means of capture, being especially important in Green Bay and vicinity. Some localities in which fykes were reported in 1885 appear to have given up that method of fishing as a commercial enterprise in 1890, while in others nets have been introduced.

The meager references to this fishery in 1880 found in the report on "The Fisheries and Fishery Industries of the United States" indicate a much less extensive use of fyke nets than in 1885 or 1890. In 1885 there were 362 fyke nets, valued at \$6,105, set in the waters of this lake. These were most numerous in the Green Bay region, where about five-sixths of the number mentioned were employed. What was written regarding the fyke net in this lake in 1885 applies in great part to the present time

and may be appropriately quoted, both for the information conveyed and the opportunity offered for making comparison with present conditions. The "Review of the Fisheries of the Great Lakes" contains the following references to this lake:

Fyke fishing in Lake Michigan is confined largely to the waters at the southern end of Green Bay, in the vicinity of the city of that name, where they are fished extensively in the shoal waters and along the borders of the marshy flats. They are used to a small extent in other localities, but not in sufficient numbers to render the fishery important.

Sixteen of the twenty-seven fykes owned in Oconto County belong at Pensaukee, and the remainder, with two exceptions, at Little Suamico. The kind used has a hoop 5 feet in diameter with wings 82 feet long and a 165-foot leader. They are set in 6 to 10 feet of water in winter and in still shoaler water in summer. They are fished from the late winter to the early summer for perch, suckers, black bass, pike, and pickerel.

The fyke net was first introduced into the fisheries of the region between Suamico and Green Bay City, Brown County, Wis., about twenty years ago, although prior to 1880 it was a rare occurrence for anyone to make a business of fishing with such apparatus. Scores of them are now in use, belonging usually to the gill-net or seine fishermen, though in some cases their owners are persons who do no other fishing. Occasionally single fykes are fished for pleasure or home supply.

Those now used are from 4 to 6 feet in diameter at the mouth and have two funnels. The hearts contain 24 to 30 feet of netting each, and the leaders are 200 feet long, with a 4-inch mesh. Although the cost of a new one is \$30 or \$35, the average value of those actually in use can not be placed higher than \$15 or \$20. A small scow, 15 feet long, with a 4-foot beam, is usually employed in setting and lifting the nets. It is 3 feet wide at the bow and 2½ feet at the stern. It has a centerboard, with a box 3½ feet long, nine knees, a bottom rounding up at stem and stern, and a place to step mast forward. It is worth \$12 or \$15 when new. In those cases in which fykes are owned by pound-net fishermen they are fished from ordinary pound boats. They are set particularly in the mouth of Duck Creek, but also in the Fox River and the intervening sloughs along the bay shore. Each man fishes his own nets, without needing anyone to assist him. If the weather is bad he tends half his nets each day, but otherwise he lifts the whole number, usually about ten. The season extends throughout the entire year, with the exception of July and part of August. In winter the fykes are fished through holes cut in the ice. All the species common to the region are taken. The most successful fisherman obtained in 1884 nearly \$600 worth of fish in twelve fykes.

Between Bay Settlement, in Brown County, and Namur, in Door County, Wis., twenty fyke nets are fished throughout the year, on the shore between Green Bay and Wequiock, by four professional fishermen, each of whom operates five nets. The nets are about 10½ feet long, with three or four hoops from 3 to 8 feet in diameter. The catch consisted of about 30,000 pounds of perch, pike, pickerel, herring, and suckers, valued at \$500.

At Little Sturgeon, in Door County, eight men, who gave their principal attention to the pound-net and gill-net fisheries, fished eighteen fyke nets, worth \$350, from six weeks to two months in the spring, and occasionally in the summer and fall. Most of the nets are 20 feet long, with hoops 3 to 3½ feet in diameter and a 3-inch mesh. They are set close to the shore, the stakes being driven in 6 feet of water. The catch in 1885 consisted of 24,900 pounds of perch, whitefish, suckers, bass, catfish, and pike, valued at \$630.

There were only ten fyke nets owned along the shore of Door County between Death's Door and Sturgeon Bay in 1885, six of which were at Ephraim and four near Egg Harbor. The framework of these nets is composed of two or three iron hoops and a rectangular iron frame called the door. This is covered with netting, which is extended to form two long wings or leaders, one on each side, and there is a tunnel inside the door through which the fish are conducted into the interior. In a specimen from which measurements were taken the dimensions of the door were 5 by 2 feet and the wings were each 83 feet long. There were two hoops about 4 feet in diameter, and one 3½ feet, with a wooden ring 1 foot in diameter at the inner end of the tunnel. The mesh was 4½ inches in the wings and 2½ inches in the body of the trap. The other fyke nets are of different sizes, some smaller than the above and some much larger. The fishery is of very little importance, and in the summer and fall of 1885 no more than four of the nets were used. Two of the fyke-net crews from Little Sturgeon fish during a portion of the year from Hat Island, off Egg Harbor. The catch consisted exclusively of bass and perch and amounted to 1,900 pounds, valued at \$95.

Although formerly of considerable importance in Milwaukee County, Wis., this fishery has of late deteriorated, chiefly on account of the polluted condition of the water flowing from the river, at the



mouth of which the nets were set. In 1885 a few small fykes, with 4-foot hoops, were fished under the ice by men engaged at other times in more profitable fishing. In 1866 an attempt was made to employ a fyke net far out in the lake at the end of a gang of gill nets. The results were unsatisfactory, owing, it is thought, to the fact that the net had no wings. There seems no reason to doubt that fykes provided with wings and properly weighted to maintain the hoops in a vertical position could be profitably employed on all the lakes in connection with the offshore gill-net fisheries.

The fyke-net fishery of this lake in 1890 was carried on by 113 men; 731 nets, valued at \$11,316, were set; 65 boats, worth \$5,820, were used, and products to the value of \$25,558 were obtained. Brown County, Wis., has the most important fishery of this kind in the lake; in the items of persons employed, number of nets used, quantity and value of catch, it surpasses the combined interests of all the remaining counties. The extent of the fishery, specified by counties, is shown in the following table:

*Fyke-net fishery of Lake Michigan.*

States and counties.	No. of fisher-men.	Fykes.		Boats.		Products.	
		No.	Value.	No.	Value.	Pounds.	Value.
Michigan:							
Manistee .....	3	2	\$225	2	\$60	6,200	\$238
Muskegon .....	2	6	60	1	10	4,300	154
Wisconsin:							
Brown .....	58	524	8,060	31	3,125	949,340	18,430
Door .....	31	96	1,340	17	1,810	119,500	2,592
Marquette .....	6	8	116	5	240	16,005	310
Oconto .....	13	95	1,515	9	575	215,700	3,834
Total .....	113	731	11,316	65	5,820	1,311,045	25,558

The principal fish taken in fykes in this lake is the yellow perch, which constitutes about one-third of the yield. Pike, pike perch, herring, and suckers are also prominent factors in the catch. Bass are taken in considerable quantities, and trout and whitefish are secured in small numbers in suitable situations. The output of the different species is as follows:

*Products of the fyke-net fishery of Lake Michigan.*

Species.	Michigan.		Wisconsin.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Bass .....	1,500	\$60	17,810	\$890	19,310	\$950
Herring .....	100	2	332,550	4,434	332,650	4,436
Perch .....	800	24	418,900	8,838	419,700	8,862
Pike and pickerel .....	100	4	141,860	5,553	141,960	5,557
Suckers .....			335,410	3,887	335,410	3,887
Trout .....	1,000	40	10,980	430	11,980	470
Whitefish .....	3,000	120	2,285	115	5,285	235
Other fish .....	4,000	142	40,750	1,019	44,750	1,161
Total .....	10,500	392	1,300,545	25,166	1,311,045	25,558

#### LAKE HURON.

In this lake fyke nets are employed only in Saginaw Bay and River, where they are an important form of apparatus. From an early period the fyke has been used in this locality, and, with the seine, it antedated the pound net by a number of years, the latter net having been introduced in 1860. In 1885, 499 fyke nets, valued at \$22,910, were ascertained to be fished in the bay and river, and in 1890 the number was 221, worth \$6,385. The principal fishing now done in the river is carried on with fykes, called "gobblers." These nets are also set in some numbers in the bay at the mouths

of the several small rivers entering it. The nets are made after the model of the Lake Erie pound net, the difference being that the bowl of the pound is replaced by the pot of the fyke. They are mostly used by men who also have pound nets. The fishing season extends from October 15 to April 15, during the whole of which time greater or less quantities of the different fishes are taken; but the largest catch of perch is made during the winter, while the pickerel and suckers, which are the next important species, occur in greatest abundance in the spring, about the time when navigation is resumed. The other species comprised in the fyke-net catch are black bass, catfish, and pike perch.

Eighty-one men tended the fyke nets used in Lake Huron in 1890; 62 boats, valued at \$1,202, were employed, and the catch consisted of 1,088,751 pounds of fish, valued at \$23,156, apportioned among the various species as follows:

*Products of the fyke-net fishery of Lake Huron.*

Species.	Pounds.	Value.
Black bass .....	7,650	\$765
Catfish .....	5,100	153
Herring .....	1,000	10
Perch .....	558,446	8,021
Pike and pickerel .....	108,000	6,330
Suckers .....	387,555	7,051
Whitefish .....	200	10
Other fish .....	40,800	816
Total .....	1,088,751	23,156

LAKE ST. CLAIR.

This large, shallow dilatation of the St. Clair River, lying between Michigan and Canada, with its extensive grassy flats and its great abundance of small fishes, to the capture of which the fyke net is specially adapted, has a fyke-net fishery whose importance is relatively great in comparison with the size of the lake, the extent of the other fisheries, and the small number of nets used. The lake is no doubt capable of sustaining a much larger fishery of this kind, and in future many more of the cheap but efficient fyke nets will probably be employed.

The fishery in 1890 was less extensive than in 1885. The table which follows shows various phases of its extent in the first-named year, the figures being given separately for the two counties in Michigan in which the fishery is carried on.

*Fyke-net fishery of Lake St. Clair.*

Counties.	No. of fisher-men.	Fykes.		Boats.		Products.	
		No.	Value.	No.	Value.	Pounds.	Value.
Macomb .....	116	133	\$4,010	16	\$350	309,850	\$5,256
St. Clair .....	8	15	470	8	160	45,498	812
Total .....	124	148	4,480	24	510	415,348	6,068

The principal species taken are yellow perch, pike, pike perch, and catfish. More than half the quantity and value of the yield is made up of perch. A small quantity of black bass and whitefish is caught. Other minor species entering into the production are suckers and sunfish.

*Products of the fyke-net fishery of Lake St. Clair.*

Species.	Pounds.	Value.
Black bass.....	1, 583	\$94
Catfish.....	8, 000	229
Perch.....	263, 850	3, 245
Pik and pike perch.....	50, 640	1, 814
Whitefish.....	200	20
Other fish.....	91, 075	666
Total.....	415, 348	6, 068

## LAKE ERIE.

The general shoalness of this lake, especially in the western part, makes the water very well adapted to fyke-net fishing, and is the cause of the prominence which the fyke net has attained as a means of capture. The lake has also an abundance of bottom fishes, such as pike and bullheads, to the capture of which the fyke is well suited. At times the fishery has been prosecuted in all the States bordering on the lake, but at present it is confined to Michigan and Ohio. In 1885 a small fishery was reported in Pennsylvania, and at an earlier period fyke nets were used in New York, but their use has never been extensive in these States. Even in Michigan the fishery is comparatively unimportant, and it is only in Ohio that it is conspicuous among the other fisheries, and, as already stated, is more prominent than in any other lake State.

The fyke-net fishery of this lake in 1890, specified by States and counties, is shown in detail in the following table:

*Fyke-net fishery of Lake Erie.*

States and counties.	No. of fisher-men.	Fyke nets.		Boats.		Products.	
		No.	Value.	No.	Value.	Pounds.	Value.
Michigan:							
Monroe.....	17	65	\$800	10	\$225	87, 000	\$1, 520
Ohio:							
Erie.....	118	915	58, 850	117	13, 570	2, 100, 150	32, 948
Lucas.....	20	50	1, 800	12	325	100, 500	1, 525
Ottawa.....	18	145	3, 000	10	150	220, 000	5, 900
Total.....	173	1, 175	64, 450	149	14, 270	2, 507, 650	41, 893

The most important fish taken in fyke nets in this lake is the pike or pickerel, locally called the grass pike. It finds congenial quarters in the shoal, grassy bays and shores in the western part of the lake and is there taken in larger quantities than in any other lake. The next valuable products in their order are catfish, saugers, black bass, and yellow perch. A large amount of cheap, miscellaneous fish, consisting of suckers, sheepshead, rock bass, etc., is secured, but need not be considered in this connection. Turtles are also taken in Erie County, Ohio.

The following table gives the quantity and value of the principal fishes taken in Lake Erie in 1890:

*Products of the fyke-net fishery of Lake Erie.*

Species.	Michigan.		Ohio.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Black bass.....	500	\$30	82,085	\$4,504	82,585	\$4,534
Catfish.....	30,000	750	346,250	6,920	376,250	7,670
Perch.....	20,000	200	283,670	2,240	303,670	2,440
Pike.....	1,980	99	314,440	15,193	316,420	15,292
Saugers.....	8,000	240	360,855	3,816	368,855	4,056
Wall-eyed pike.....	1,520	76	720	36	2,240	112
Other fish.....	25,000	125	1,006,925	7,150	1,031,925	7,275
Turtles.....			25,705	514	25,705	514
Total.....	87,000	1,520	2,420,650	40,373	2,507,650	41,893

The fyke-net fishery of Lake Erie is more extensive than at any previous time. While no figures exist for making detailed comparisons between its present and past importance, some notes relating to the years 1880 and 1885 can be presented, and for the latter year the number and value of nets can be shown.

Of Maumee Bay it was stated in 1880 that "a few fyke nets are in use for catching 'panfish,' but their products are of no considerable extent." On the shore of Monroe County, in the same year, there were 14 fishermen using 35 fykes. Only 50 nets were reported in the Sandusky region. Between Locust Point and Ottawa 36 nets were in use, and at Huron 20 were noted.

In 1885, when a comprehensive investigation of the methods and statistics of the fisheries of this lake was made by the U. S. Commission of Fish and Fisheries, the number of fyke nets employed was 1,069, valued at \$62,148, distributed as follows:

*Fyke nets employed in Lake Erie in 1885.*

Sections.	No. of nets.
Monroe County, Mich.....	43
Maumee Bay, Ohio.....	39
Locust Point to Port Clinton, Ohio.....	76
Sandusky Bay and the outlying islands, Ohio.....	893
Cuyahoga County, Ohio.....	1
Lake and Ashtabula counties, Ohio.....	12
Erie County, Pa.....	5
Total.....	1,069

Of the 1,021 nets credited to Ohio, 893 were set in Sandusky Bay and around the islands lying off that region. The following notes on the fisheries of the principal regions are taken from the report\* already quoted. Referring to Monroe County, Mich., which occupies the extreme western end of the lake, it was stated that—

Between October 15 and April 15 a number of fyke nets are fished for the same species as are taken in the seines [bullheads, black bass, rock bass, perch, pike perch, grass pike, suckers, and herring]. They are located as follows: Six in Huron River near its mouth, 16 within the mouth of Swan Creek, and 15 in Plum Creek and Pleasant Bay. Each fyke consists of two staked and anchored funnels of netting, each 12 feet long, one opening into the other, and a 190-foot leader. The first funnel has a mouth 4 feet in diameter and an opening at the small end of the diameter of 1½

\* Review of the Fisheries of the Great Lakes.

feet. The second funnel has an aperture of 3 feet at one end, and is closed at the other. Some of the fykes have wings 12 feet long on each side of the mouth, extending at an angle of 45 degrees. The size of mesh in the funnels is  $1\frac{1}{4}$  inches, and in the leader and wings 3 inches. The fish are removed by lifting the small end of the second funnel, which is closed with a puckering string, and taking them out with a dip net. In the winter the nets are set at some distance below the surface, in order that they may not be frozen in.

There are 7 fyke-net fishermen, whose 5 boats are worth \$50, their 43 fykes \$382, and their minor apparatus and accessories \$30. The products amounted to about 85,000 pounds, worth \$2,400.

#### The fishery in Maumee Bay was referred to as follows:

The fyke nets of Maumee Bay are much larger and better than those about Monroe. They are somewhat similar to the small pound nets and are quite as effective. Instead of wings they have a leader and set of hearts. The leader is 30 to 70 fathoms long, the hearts 8 to 14 fathoms long, and the bowl or pocket 12 to 14 feet long. The mesh is 4 to 5 inches in the leader, 3 inches in the hearts, and  $2\frac{1}{4}$  inches in the bowl. Their value ranges from \$25 to \$50 each. The total number in Maumee Bay was 39, worth \$1,710. There is none in the river or along this part of the coast. They are fished in the spring and fall, and occasionally in winter.

It was recorded of the fyke-net fishery of Ottawa County, Ohio, that—

Three dozen fyke nets are fished in the mouth of Toussaint Creek in winter by the fishermen of that vicinity. The fykes proper are 14 feet long, the hearts 27 feet, and the leaders 165 feet. The size of mesh is 3 inches in the leader and hearts, and 2 inches in the fyke or bowl. In Portage River 40 fyke nets are used near the seining beaches, sometimes in winter but usually during the spring and fall, by men who give most of their time to other fisheries.

The following reference was made to the important fishing region embracing Sandusky Bay, the peninsula, and the Bass and other islands:

On the outer shores of the peninsula and of Cedar Point and about the islands the most abundant species are whitefish and herring, but in the bay these do not occur, and the objects of pursuit are principally perch, saugers, bass, bullheads, and other species characteristic of the bays and river mouths. Pound nets are the most popular form of apparatus in the former section, where their number exceeds 300, though thousands of gill nets are fishing in the vicinity of the islands, and eight steam tugs and a large number of sailboats are devoted to this branch of the industry.

All the fishing of the bay, with the exception of a little seining at the western end, is by means of fykes and small pound nets, which dot its shallow waters to the number of nine or ten hundred. Several seines are fished from the peninsula, both on the lake and the bay sides, and the fyke nets so numerous in the bay are also found in considerable numbers on the lake shore, though not used to any extent upon the islands. On the northern part of the peninsula, in the crotch between its two arms, are three marshy inlets with a total area of several thousand acres, which for about fifteen years have supported fyke-net fisheries of some importance. At present 107 nets are fished here by eight fishermen from the beginning of September to the 1st of May. The catch consists principally of bullheads and sunfish in fall, of bass in winter, and of grass pike in spring, with a large mixture of perch at all seasons. The fyke nets of the island region are mostly made of second-hand twine. The fyke proper, or pot, is 20 feet long, the hearts are 48 feet long, and the leaders, from 150 to 300 feet long. The size of the mesh is  $4\frac{1}{4}$  inches in the leader, 4 inches in the hearts, and  $2\frac{1}{4}$  inches in the pot.

#### LAKE ONTARIO.

In proportion to the extent of its general fisheries, there is no lake in which the fyke net is of greater importance than in Lake Ontario. An investigation\* of the fisheries of this lake, conducted by the writer in 1891, disclosed the fact that the products of the entire industry in 1890 amounted to 3,446,448 pounds, valued at \$124,786, while, as has been stated, the fyke-net catch alone was 899,527 pounds, having a value of \$22,561; more than a fourth of the quantity and nearly a fifth of the value of the catch thus represented the output of the fykes.

\* Report on an Investigation of the Fisheries of Lake Ontario. Bull. U. S. Fish Commission, 1890.

As compared with 1880, the present status of the fyke-net fishery of this lake is more important than it was then; but since 1885 there has been a decrease in this fishery, as in the industry in general. An account\* of the fisheries of this lake in 1885 stated that fyke nets had been employed for some years along various portions of the coast where the shore is low and swampy, or in bays where there are extensive mud flats, and were fished chiefly for bullheads, though small quantities of bass, yellow pike, eels, and perch were also secured. More than a thousand were said to be at that time fished with more or less regularity in the waters of the lake, most of them being owned by farmers living along the shore.

The extent of the fyke-net fishery decreases from east to west. In Jefferson County, which occupies the eastern part of the lake, more than two-thirds of the nets used in the entire lake are fished; and in Oswego County, which lies west of Jefferson, more than half the remaining nets are employed. The number of fishermen and the number and value of the fykes set in each county in 1890 were as follows:

*Fyke-net fishery of Lake Ontario.*

Counties.	No. of fishermen.	Fykes.		Boats.	
		No.	Value.	No.	Value.
Jefferson .....	42	458	\$6,850	37	\$1,582
Oswego .....	18	140	2,100	17	500
Cayuga .....	3	26	315	3	85
Wayne .....	6	39	365	4	80
Monroe .....	5	21	192	5	65
Total .....	74	684	9,822	66	2,318

Catfish enter most conspicuously into the catch and constitute nearly half the quantity and value of the yield. Next in point of value are pike, yellow perch, eels, and suckers, although the order of importance based on the quantity taken is perch, suckers, pike, and eels. The minor fish taken include sheepshead and rock bass. The fyke-net fishery of this lake in 1890 resulted as follows:

*Products of the fyke-net fishery of Lake Ontario.*

Species.	Pounds.	Value.
Bass .....	72,353	\$1,845
Catfish .....	400,273	10,484
Eel .....	56,336	2,177
Perch .....	170,645	3,111
Pike .....	73,770	3,340
Suckers .....	76,320	1,056
Other fish .....	49,830	548
Total .....	890,527	22,561

\* Review of the Fisheries of the Great Lakes.

## THE FYKE NET IN OTHER COUNTRIES.

Information is lacking on which to base a satisfactory account of the fyke-net fisheries of other countries. While it is known that the fyke net constitutes a more or less prominent type of apparatus in most of the principal waters of Europe and Asia, and doubtless other grand divisions, it is possible at this time to do little more than describe a few styles that have been met with in reports, museums, and exhibitions. While some of these are similar to and identical with nets employed in the United States, others represent widely divergent forms.

Aside from the general interest which a study of the different types of fykes possesses, descriptions of the fykes of other nations and illustrations of the forms peculiar to them may not be without practical value to our fishermen.

Fykes are used only to a limited extent in Canada. They are most numerous in the district of Montreal, in the St. Lawrence River, and in Lake Ontario. They are not found on the coast. The fishery is not very important and is mostly carried on by farmers whose lands abut on the waters in which the nets are set. The catch consists chiefly of sunfish, perch, catfish, and suckers, and other "soft fish" (*poissons mou*). Black bass are taken, but they are said not to remain in the nets when caught, and the yield is small. In Upper Canada the name "hoop net" is usually given to this form of apparatus; in lower Canada it is known as the fyke net. Among the French population it bears the same designation as in France—*verveux*. Its introduction into Canada can be traced to the early French colonists.

The fishery regulations operative in Canada requiring the issuance of a license for each device employed and limiting the number or quantity of apparatus that may be set by one person applies to fyke nets as well as to pound nets, trap nets, and other sedentary appliances, so called. The practice of setting fyke nets end to end, as is done in parts of the United States, is not permitted in Canada. Not more than one net may be set in a line, and the number that may be used by one person is limited to five. A license fee of \$2 or \$3 per net is charged.

The most common forms of fykes used in Canada have from 4 to 6 hoops, are usually provided with wings, and often have, also, a leader; they do not differ from similar nets used in the United States. One special type, however, seems to be peculiar; instead of opening into a regular pocket or bag, the last funnel enters and terminates in a large rectangular compartment like the bowl of a pound net or the crib of a floating trap. This style of fyke is employed only in the Richelieu River, which drains Lake Champlain.\*

The fyke net is employed in a number of minor fisheries in Great Britain, where, as has already been stated, it is known as the hoop net. It is not a popular form of apparatus, and shares with the pound net and similar devices the disapprobation in which such sedentary fisheries are held in the British Isles.

An English writer on fishing nets, referring to this apparatus at a time when machine-made nets were unknown and unthought of, gives the following curious detailed instructions for its manufacture:

The hoop net consists of two parts, the body and the valve or funnel, which are united in the manner hereafter to be described. Begin with the body at its lower or pointed end and work up to its mouth thus: Net 37 loops round on a 4-inch spool, one row; take a 2-inch spool and net 20 rows

\* For the foregoing information on the fyke nets of Canada the writer is indebted to Dr. William Wakeham, of the fisheries department of Canada.

of dead net; in the next row set in 5 false meshes equidistantly; then 20 rows of dead net; then a row with 5 false meshes; then 20 rows of dead net; then 5 false meshes in the next row; then 36 rows of dead net; net the thirty-seventh row in double twine. This done, cut off both threads, leaving ends, and fill a needle with single twine, but the last row you have netted being in double string, you have an upper and a lower row; to the end proceeding from this lower row, where the double thread was cut off and from which the valve is to issue, tie the twine you have on the needle and work as follows, taking care to pick up only the loops of the lower row on the needle as you go round: Net 14 rows of dead net, then, at equal distances in the circumference, make in the fifteenth row 8 stole meshes, *i. e.*, take 2 loops up at once 8 times in that row; then 2 rows of dead net; in the next row 8 stole meshes, and so on as before for 3 times more. After you have for the fifth time put in 8 stole meshes, net a row of plain netting; then lay aside your 2-inch spool and take a 12-inch, on which net 1 row. The funnel or valve is now finished and must be reflected inward to gain its right position. You now take your needle, charged with single twine, and join on to that other row which was left before and where the funnel issued from the body of the net. Net 11 rows of dead netting on your 2-inch spool; in the next row set in 5 false meshes, at equal distances from each other, and continue to set in 5 false meshes at every fourth row for 7 times, leaving 3 rows of dead netting between. After you have set in your false meshes for the seventh time, make 7 rows of dead netting, then one row on a 4-inch spool. This last row is strung on to a length of wood about 6 inches long and bent in a bow; a piece of stout string keeps the two extremities bent, answering to the string of an archer's bow, and the last meshes of the net's mouth are strung on to this string as well as on the bow. A moderate weight is generally attached to the bow at its extremities. Four hoops are placed round the net through the meshes of twenty-first, forty-second, sixty-third, and one hundredth rows (reckoning from the pointed end). The hoops are made larger as they proceed from the point toward the mouth, and all are made of much slighter wood than the bow. The diameter of the first or smallest hoop is about 1 foot 5 inches; the next about 1 foot 7 inches; the third about 1 foot 10 inches; and the fourth about 2 feet. The hoops are bound to the meshes by twine after they have been passed, and this, of course, is done before the ends of the hoops are lashed together. In some hoop nets more than one funnel is inserted, but many fisherman prefer only one.\*

In the various parts of Germany a number of different forms of the fykes are used, and it appears to be a rather common means of fishing both on the coast and in the interior waters. Some of the nets closely resemble kinds used in the United States, which in all probability have been introduced by German emigrants, but most of the styles observed differ in some slight features from types employed in this country.

One common form consists of 8 iron hoops and 2 wings 6 feet in length; the first hoop is 16 inches in diameter, the last 6 inches, the hoops being from 10 to 18 inches apart. There are 3 funnels, which terminate in a square opening, from the corners of which lines pass to the adjacent hoops for the purpose of keeping the end of the funnel in proper position. The funnels are peculiar in that they do not originate from the hoops but several inches in advance of the hoops to which they would ordinarily be attached. The net described is such as is employed for eels. Similar nets, with 4 to 6 hoops made of iron or wood, are also used for both eels and fish. One style with 4 hoops, 2 funnels, and wings about 20 feet in length, employed in the vicinity of Memel, in East Prussia, on the Baltic Sea, is known as the *neunaugen reuse*, in allusion to the lampreys (*neunaugen*) taken. Another type, practically identical with this, but set for fish, is called a *fischsack*.

A double fyke, with wings and leader, such as is found in the Middle Atlantic States and shown in plate LXXX, fig. 1, is also used in parts of Prussia; each bag has 4 hoops and 2 funnels, the latter arising from the netting in front of the hoops, as already mentioned.

A very interesting fyke, analogous to an eelpot and probably set for eels, is found in northern Germany. It is known as a *bolldreuse* (round fyke) and is peculiar in

\* Notes on Nets. By Charles Bathurst. London, 1838.



having 3 hoops of equal size and an opening at each end guarded by a funnel. In a model of this net, which has been seen by the writer and on which the figure (plate LXXXIX, fig. 2) is based, the hoops were 6 inches in diameter and were placed 6 inches apart in the bag; the funnels were 6 inches long and their ends were kept in position by lines passing from one to the other. The full diameter of the hoops is probably from 12 to 24 inches.

A study of the fyke nets of Norway discloses the existence of a number of interesting forms operated in fresh and in salt water. The numerous fiords, coves, bays, and rivers and the generally irregular coast line which characterize that country would seem to favor the extensive use of fyke nets and contribute to the evolution of peculiarities in form and use depending on the different physical conditions prevailing and the various kinds of fishes taken.

One of the simplest and commonest types found in Norway is characterized by 4 hoops, 2 funnels proceeding from the first and third hoops, and 2 straight wings. An example of this style with unusually large hoops has been seen by the writer, the first hoop being  $5\frac{1}{2}$  feet in diameter, and the fourth 4 feet wide; the hoops consisted of rough, undressed saplings; the length of the net is about 20 feet. The wings are 25 feet long, are supported by two stakes, and join each other above and below about 2 feet in front of the first hoop, forming a kind of funnel-shaped entrance.

The setting of two simple nets at the ends of a common leader, which is an uncommon practice in the United States, appears to be frequent in Norway. One such arrangement has the following features: Length of nets, 9 feet; 3 iron hoops,  $2\frac{1}{2}$  feet in diameter; 2 funnels, from the first and second hoops, terminating in a circular orifice kept open by a wire ring; leader, 50 feet long, extending 1 foot into the first funnel of each net, supported by flat corks, 3 inches long, placed at intervals of 6 feet, weighted by earthenware sinkers 3 inches long and 6 feet apart. (See plate LXXXIX, fig. 1.) Similar nets with 5 wooden hoops (the first  $2\frac{1}{2}$  feet in diameter) and two funnels are also employed.

A single net at the end of a leader is also fished in some parts of this country. One form is 8 feet long and has 8 hoops, the first 20 inches in diameter, the last 8 inches; the first and second hoops are 20 inches apart, all others 10 inches; there are 4 funnels, arising from every alternate hoop; the leader is continued well into the first hoop. Larger nets of this type, with the first hoop  $3\frac{1}{2}$  feet wide, are also employed. On either side of the lower part of the first hoop rather heavy lead weights are placed in order to keep the net in an upright position. Such a fyke is usually set in salt water.

A curious Norwegian fyke, entirely unlike any that has been ascertained to exist in any other country, is illustrated in plate LXXXVII. The bag is 10 feet long and is supported on 7 arches made of stout, rough strips bent into the shape of a semicircle and fastened to broad wooden crosspieces. Funnels extend from the second and fourth arches. The first arch is  $3\frac{1}{2}$  feet wide at the base; the last bow is 6 inches high and 8 inches wide. A small anchor keeps the end of the net in place, and a strong rope runs the length of the fyke along the top and ends of each bow to add to the strength. Two 6-foot wings and a 10-foot leader are added, each supported at its distal end by a stake; they are buoyed by wooden blocks 10 inches long, about an inch wide, and half an inch thick.

Another form of net that appears to be peculiar to the Scandinavian peninsula is represented in plate LXXXVIII. The peculiarity is in the construction of the bag and the expansion of the final apartments. It consists of 7 hoops; the first is  $2\frac{1}{2}$  or 3 feet in

diameter, and the others decrease in size until the fourth is reached, which is 6 or 8 inches wide; the fifth is the same size as the fourth and is separated from it by 2 inches of netting; the sixth and seventh hoops are about 10 and 12 inches wide, respectively. There are three funnels, which originate from the netting several inches from the first, second, and fifth hoops, as in the German fykes elsewhere mentioned. The entire net is about 8 feet long. Two wings 6 feet long, supported by stakes, diverge from the sides of the first hoop. The smaller end is anchored. In the language of the Norwegian fisherman, this net is designated *ruse til saltvands fisk* (fyke for salt-water fish).

In the rivers tributary to the Baltic Sea, the Gulf of Finland, and the Gulf of Bothnia, in Finland, fyke nets are used in large numbers. They are chiefly set for whitefish (*Coregonus oxyrhynchus*), herring (*Clupea harengus*), and salmon (*Salmo trutta*). The principal fisheries are in the rivers at the head of the Gulf of Bothnia. Some fykes with the first hoop  $2\frac{1}{2}$  or 3 fathoms in diameter are used in the Baltic Sea, Ladoga Lake, and Vuoksen River. A form which is most common in the latter stream has 4 to 7 hoops, each provided with a funnel; they are placed in sets of three or more on one side of a common leader, similar to the shad fyke used in Hudson County, N. J., with the funnels directed downstream, so as to intercept the fish migrating upstream. Another style of net which finds its prototype in the United States consists of two simple fykes set facing each other at the ends of a common leader; wings are sometimes added to this kind of net. It is generally set for small river fish. In the Gulf of Bothnia a net provided with curved wings and a leader extending to the shore is in use; it closely resembles some kinds of "pound" fykes in our waters. Another kind, with straight wings and a leader, is also in extensive use.\*

A form of fyke which has been ascertained to be used only in Russia is represented in plate LXXXVI, fig. 2. A model which has been examined by the writer and on which the plate is based consists of a 4-foot bag of netting distended by 5 hoops of uniform size ( $2\frac{1}{2}$  feet in diameter); the bag terminates at a circular block perforated with holes about half an inch wide, doubtless for the purpose of permitting the escape of small fishes that have been led into the net. The chief peculiarity of this fyke is in the funnels; these are two in number, extend between the first and second, and third and fourth hoops, and have rectangular orifices supported on a stout framework, as shown in the figure; the first opening is 2 inches wide and 16 inches high, the second is 2 inches wide and 8 inches high. The net is provided with a pair of short, straight wings. It is used in the River Don, and is known as the *vanda*.

The best account of the fyke nets of France which has been found is contained in a work published in Paris in 1769-1772.† This treatise has a very complete account of the different forms of nets employed in France and devotes considerable space to the particular kind of net under discussion. A large number of illustrations is given, some of which have been reproduced for this paper. So far as the information at hand goes, the French fishermen seem to have a greater variety of fyke nets than exists in any other country of Europe.

Two general types of nets, recognized in France by different names, appear to belong to the general class of fykes: these are the *guideaux* and *verveux* or *verviers*, so called. The former are very long cylindrical-shaped bags, distended with one or

\* For these notes on the fyke nets of Finland acknowledgments are due to Dr. Oscar Nordqvist, government inspector of fisheries in Finland.

† *Traité Général des Pêches, et Histoire des Poissons*. Par M. Duhamel du Monceau. 5 vols.

more hoops; the simplest *guideaux* seem to lack a funnel, and therefore not to be true fykes, the escape of the fish being prevented by the folds of the long, tapering sack. The *verveux* differ from the *guideaux* in being shorter and in always having one or more funnels. As defined in the work referred to, the *verveux* are like the *guideaux*, but "in order to prevent the fish from escaping one adds at the entrance and inside a net large in the mouth and terminating in a point, called the *goulet*." Besides the synonym *verviers* already given, a number of other names are applied to fykes in different parts of the country, among which are *loup* (wolf), *renard* (fox), and *quinque portes*, the latter designation being for an arrangement of five fykes such as is figured in plate LXXXIV, fig. 4. Fykes used on parts of the seacoast are variously called *queues*, *manches*, *sacs*, and *catches*.

Of the many kinds of fyke nets used in France and the various methods of setting them it is necessary to refer to only a few that present especially striking features. Some of these are figured in plates LXXXIV, LXXXV, and LXXXVI, fig. 1.

Simple nets, with numerous hoops and without leader or wings, are common. The entrance is usually arched. Some are set singly and others are placed close together side by side, so as to more completely cover a stream or section of coast. Three nets of this class are illustrated. In one the fish are finally led into a wicker compartment similar to that seen in oriental fishing devices.

A curious cylindrical net formed on three hoops of uniform size and having an entrance at each end consisting of a long funnel extending obliquely toward the top of one hoop and toward the bottom of the other is figured in plate LXXXIV, fig. 2. Poles are attached along four sides for the purpose of strengthening the net and to afford support to the buoy, weights, and ropes required in setting and hauling the net.

Methods of setting fyke nets with wings and three ways of constructing the wings are shown in plate LXXXV. The wings are termed *haies*, *arrets*, *brayes*, or *tonnelles*, according to the locality. Such nets are usually placed in localities in which the tide goes out rapidly and leaves them bare or nearly exposed, as at the mouths of small streams or bays. The net is pointed towards the water at right angles to the shore. These nets, besides the manner shown in the plates, are sometimes set in zigzag series, so that they will take fish swimming in either direction, each single wing being a part of two nets which face in opposite directions.

Nets provided with wings are also in use in parts of France. Those found in print consist of 5 to 7 hoops, with as many funnels. The wings are corked and weighted and tied to large stones at their ends. The net is kept in position by being attached to a large stone and by having individual weights tied to the sides of each hoop.

The method of combining a fyke net with the leader and heart of a pound net, as is done in the United States, is exhibited in plate LXXXVI, fig. 1.

At a comparatively early period in France the fyke net seems to have received its due share of legislative attention and to have caused in some localities a marked diminution in the supply of fish ascending streams. Referring to the type of net figured in plate LXXXIV, fig. 4, it is stated that—

Following the ordinance, an interval of 15 *brasses* should be left between each net. The fishermen arrange the nets so that what escapes one set of nets is caught by the other; or, altogether contrary to law, they set them close together, and in placing enough to occupy a great part of the river in this manner they catch all the little fishes which are swimming upstream and were destined to people the river with big fishes. The fishermen, who can not get any good out of these, throw them on the bank, where they infect the air; and the result is that fisheries which twenty years ago were worth a thousand livres are now worth not more than 200 livres, and the fishermen are ruined.—(Traité Général des Pesches, et Histoire des Poissons. 1769-1772.)

The fyke is not absent from the waters of Southern Europe. The fishermen of the Adriatic Sea employ a number of forms of this net, which is in some instances combined with seines and trawls.

The form of net called the *cogolo* seems to correspond very closely with the simpler fykes in this country and is the essential feature of the more elaborate nets. The *cogolo* is described\* as a hempen net made in the shape of a long conical bag, narrowing by degrees to the tail end, and held open by successive hoops (*cerchietti*). It is composed of different parts: the first, called *chiara*, is large-meshed; the second is the *busto*, and is made of smaller meshes; the third is the *mezzana*, made of still smaller meshes; last comes the *pillela* or *piela*, the purse, made of very coarse and strong twine and very small-meshed, into which the fish enter through a kind of very narrow funnel called *enca*. Once inside, they become packed, and are unable to turn back. It is also used for catching eels in the fishing ponds (*valli chiuse*).

A form of apparatus consisting of a seine combined with a *cogolo* is known as *bragagna* among the Adriatic fishermen and is fished from a boat called *braganella*. The boat, having previously cast anchor at a short distance off, hauls in the anchor chain on a roller (*molinello*), thus drawing the net in its wake. The net has no floats to keep up the head, but is held stretched in the water by a series of sticks fixed vertically along the two wings and around the mouth of the bag. At the end of each of the wings there is a small *cogolo* with three hoops, with the opening in an opposite direction to that of the middle bag. It is well weighted at the foot (*ima*) to keep it down, and the drag-rope ends are attached to the bows and the poop, the boat moving broadside on (*in fianco*), the net grazing the ground; it is worked by day or night, on muddy beds, in shallow water, in creeks and lagoons, chiefly for gobies and small shore fish. Length, 20 m.; depth, 4 m.; mesh, 2½ cm.; price, 60 florins.

Another net in which the fyke principle is an essential feature is operated in the Adriatic Sea. It is known as the *cocchia* or *coccia*, and is used exclusively by the *Chioggiotti*. It is drawn by two boats (*brogazzi*) under sail, each boat running parallel to the other and drawing one end of the net, which is held by drag ropes (*alzana*) 40 to 50 fathoms in length. It is worked, by preference, against the current, over muddy grounds by day, the mud raised by the passage of the net clouding the water and shutting out the light, which renders the fish confused and motionless, whereby they become an easy prey. At night it is worked over rocky beds. The depth of water in which operated varies from 20 to 50 fathoms.

The structure of this net differs from that of the seine (*tratta*) in the shape of the bag (*sacco* or *panza*), which in this case is conical, measuring 5 to 6 fathoms across at the opening and narrowing by degrees to 8 to 10 feet in diameter. Here commences a kind of funnel, which is kept open by means of hoops and ends in a purse, the opening of which measures 5 feet across, and the ends of which are gathered and secured by a rope. This has simply to be undone when the net is hauled on deck and the fish fall out at the end. The funnel and purse are known as the *cogolo* and form about one-half of the total depth of the bag, which is 6 fathoms. The *cogolo* is generally inclosed in a second net of coarse string in order to protect it against the friction with the bed and the depredations of the dolphins, which are apt at times to injure the net. The length of the wings or arms is often as much as 30 fathoms each, the depth

\*The Fisheries of the Adriatic. By G. L. Faber. London, 1883.

being 10 feet at the ends and 20 feet towards the middle, where the bag commences. The bag is small-meshed ( $1\frac{1}{2}$  to 2 centimeters) and well corked at the head to keep it well open whilst in motion. It is also extra weighted at the foot, so that it falls quickly to the bottom and is thus trawled along the ground, the boats being under full sail, the faster the better, the Italian fishermen fishing in almost all kinds of weather. Two pieces of wood are fastened longitudinally to the under side of the bag to protect it from friction with the ground and to enable it to slide along with greater facility. The value of the *cocchia* is about 100 florins. This mode of fishing was prohibited by the Venetian Republic in former times and by the Austrian Government by the enactment of 1835; but the want of organized inspection rendered it impossible to enforce the prohibition, and it is once more recognized under the Austro-Hungarian and Italian treaties of commerce of 1867 and 1878.\*

A stationary form of fyke net is used in the Venetian lagoons and the head waters of the Adriatic Sea. The fish are led into the fykes (*cogoli*) by means of converging screens or hedges (*serragli*) constructed of netting or reeds. As the tide recedes, the fish which may be inclosed within the hedges find their way into the *cogoli*, which are drawn up by means of a float to which they are attached, and are emptied of their contents.

In Spain and Portugal some of the fykes resemble the nets of northern Europe; some are similar to those of Italy and Austria; and some appear to be more or less peculiar to this part of Europe. Representations of some nets used in Portugal are shown in plates LXXXIX and XC, the illustrations being copied from a report† on the fisheries of that country.

The typical fyke is known in Portugal as the *botirão*, which is described in the work referred to as a "trap (*armadilha*) made of bows and netting, with a pyramidal or prismatic form, having a funnel-shaped opening through which the fish enter." The forms recognized are the movable or set fyke (*botirão de deitar*), the hand fyke (*botirão de mão*), and the stationary fyke (*botirão fixo*). One of the most extensively used is the first named, shown in plate LXXXIX, fig. 4. It has an arched entrance and 4 hoops, the second of which is largest, a short funnel arising from the second hoop. Connected with either side of the arch and extending backward along the hoops is a pole, which enters the cavity of the net at the third hoop, proceeds through the end of the final compartment, joins its fellow, and is finally fastened at a stake driven into the bottom a short distance from the net. A heavy stone is placed in the arched entrance and another is tied to the united side poles beyond the end of the net. From the top of the last hoop a piece of bait is suspended within the net. Two other forms of fykes, with only a single hoop, are represented in plate XC. One has a square entrance, supported by stakes, occupying the anterior third of the length of the net, the hoop, funnel, and bag constituting the remaining part. The other style has a leader, somewhat longer than the net proper, proceeding from the shore, the entire net being weighted and buoyed.

Another form of Portuguese fyke, having the general appearance of a pot, is shown in plate LXXXIX, fig. 3. It is called a *muzuar*, and consists of four broad bands of metal supporting a short bag; there is one funnel, and the end of the net is closed by a round door on a hinge, as is well exhibited in the figure. This net is employed principally in the capture of lampreys.

\* The Fisheries of the Adriatic.

† Estado Actual das Pescas em Portugal. Por A. A. Baldaque da Silva. Lisboa, 1892.

The ingenuity of the oriental mind has produced a marvelous variety of fishing apparatus; especially in China and Japan is there a bewildering multiplication of forms of nets, among which the fyke is well represented, either as a simple type or in combination with other kinds of apparatus. Bamboo is the material from which a great many nets, especially the more primitive ones, are constructed, but twine is also in common use in most localities. The absence of printed information in the English tongue precludes more than the mere mention of a few facts on this subject that have been incidentally collected.

A form of beam trawl employed in Japan for the capture of lobsters has, for the most essential part, a simple fyke net. The entire trawl is about 30 feet long, of which the fyke proper constitutes somewhat less than half. The mouth of the trawl, which is about 10 feet wide, opens into a compartment formed by netting above and on the sides and by the bottom of the sea below; the upper edge of this inclosure is buoyed by corks or wooden floats; and the sides are kept on the bottom by means of weights. The compartment tapers until it becomes 5 or 6 feet wide, when it joins the hoop of a fyke net. The fyke consists of a single hoop, a funnel, and a bag which tapers to a rather sharp point. The hoop is iron below, a break in its continuity being supplied by a large weight retained by a rope. The funnel terminates in a square aperture, kept open by lines running to the bag.

Figures of three forms of Chinese fykes are given (plate xci). These are selected from a large number of illustrations to show the different applications made of the fyke principle. The simplest form has already been referred to (page 303). It consists of a bag-shaped net distended by one hoop and provided with a single funnel (fig. 1). The combination of three such simple nets, with the addition of certain accessory parts, constituting a kind of fyke entirely peculiar to this country, is represented in fig. 2. This is called by the Chinese *san-yen-kao*. It is described as follows:

The *san-yen-kao* is composed of 3 fyke nets, having an opening of 3 feet in diameter and a length from 4 to 5 feet; there are iron weights holding the ends of these pockets, which open into a thread net with rather large meshes. This latter is held up by two stakes from 5 to 10 feet in diameter and 4 to 5 inches in thickness, which are driven into the ground at a distance of 12 to 14 feet from each other. On these two supports and above the thread net is fixed a plank 3 feet wide, covered with a white varnish and half submerged in the water. On the sides of this apparatus are two trellised inclosures in bamboo, which are used to prevent the fishes from escaping at the sides. The *san-yen-kao* is placed in rivers or in lakes, in pairs not far from each other, and is visited several times each day.—(La Pisciculture et la Pêche en Chine. Par P. Darby de Thiersant. Paris, 1872.)

An example of a style of fyke used in falls, in swift currents, or at the mouths of lagoons or rivers left partly dry by the tide, appears in fig. 3. The bag is long, narrow, and fusiform, and has a small entrance guarded by a funnel. Wings of various shapes and materials are provided, and serve to direct the current of water and with it the fish. The bag is kept distended by the force of the current. The particular style figured is known as a *tona-kao*, and is placed at the mouths of lagoons and lakes.



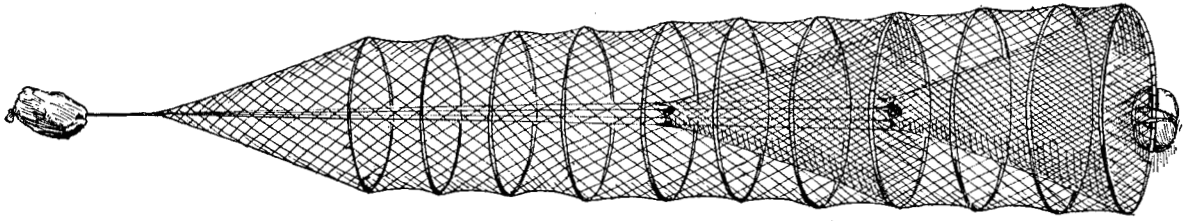


Fig. 1. BROOK FYKE; DROP FYKE. DELAWARE RIVER.

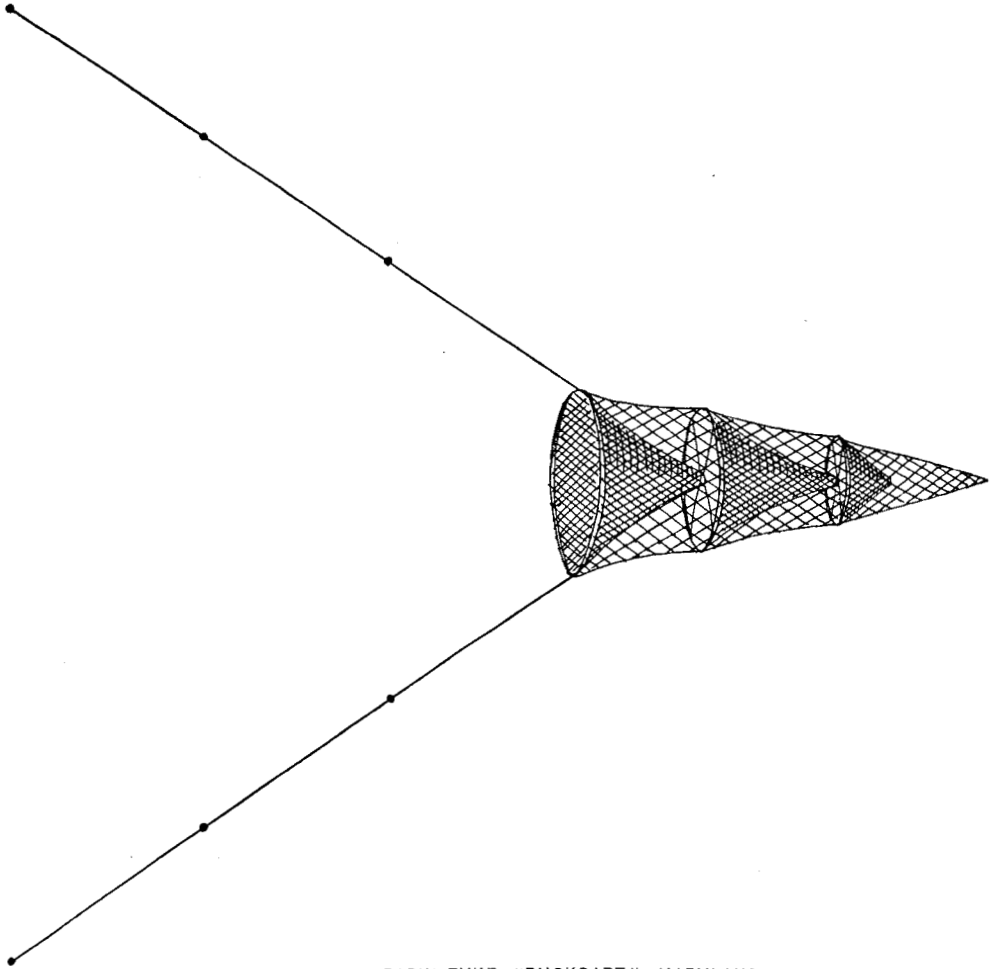


Fig. 2. TERRAPIN FYKE; "BUCKDART." MARYLAND.

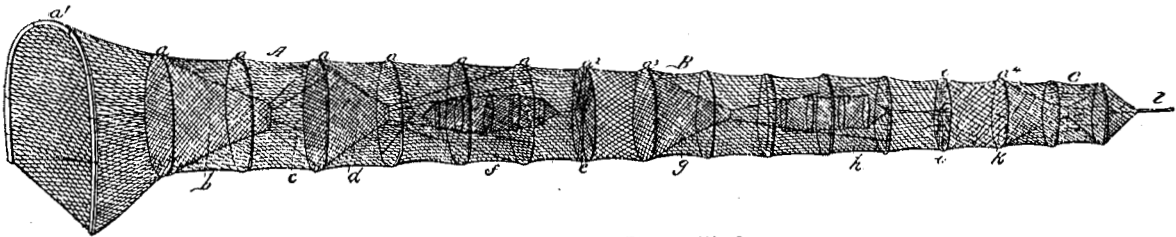


Fig. 3. "FISH NET." PATENTED IN 1844.



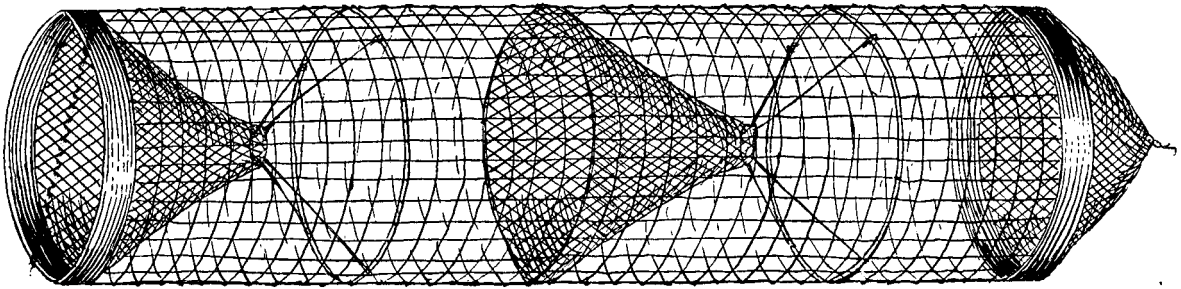


Fig. 1. EEL FYKE; EEL BAIT-POT. EASTERN UNITED STATES.

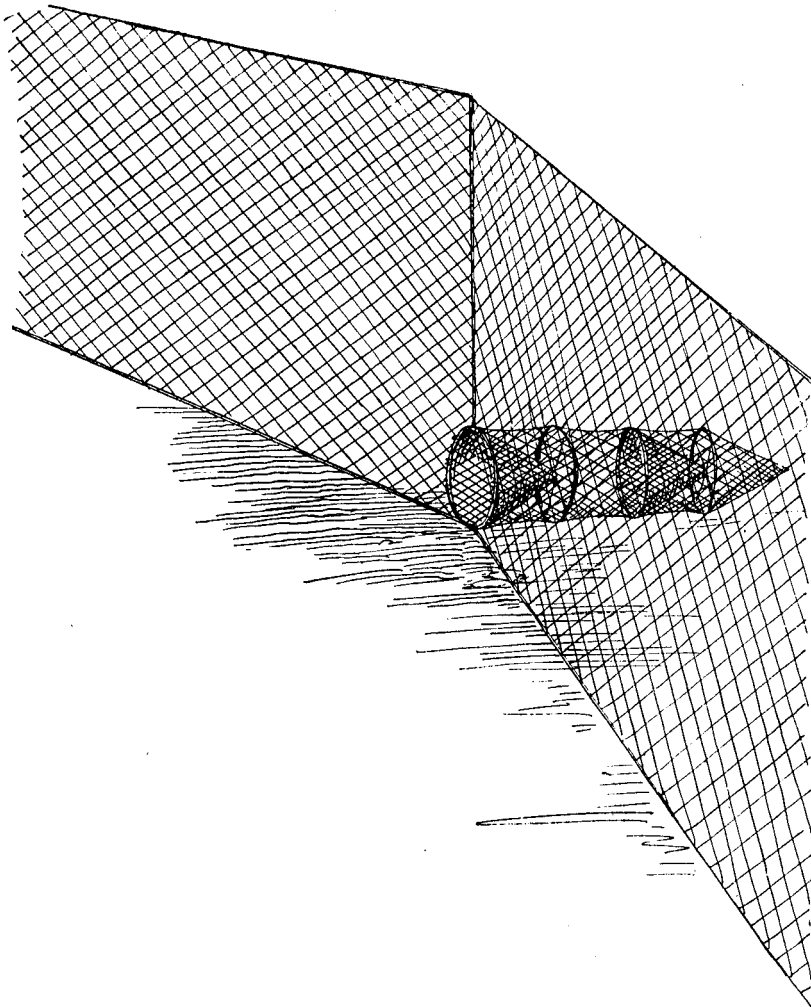


Fig. 2. EEL FYKE. NEW ENGLAND STATES.

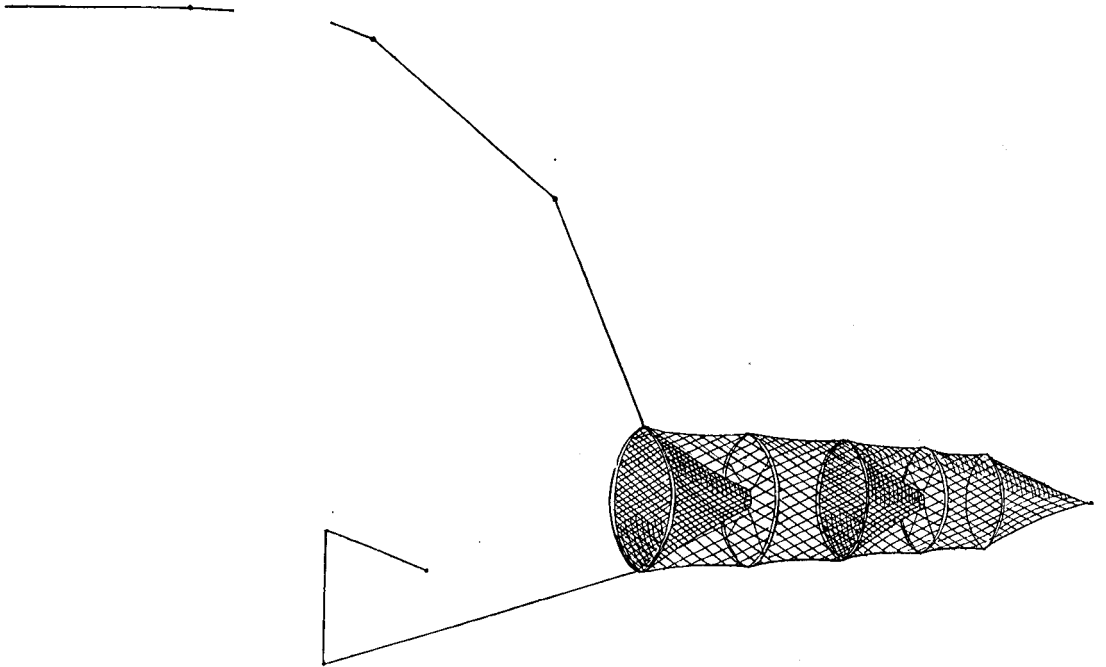


Fig. 1. WINGED FYKE. WESTCHESTER COUNTY, NEW YORK.

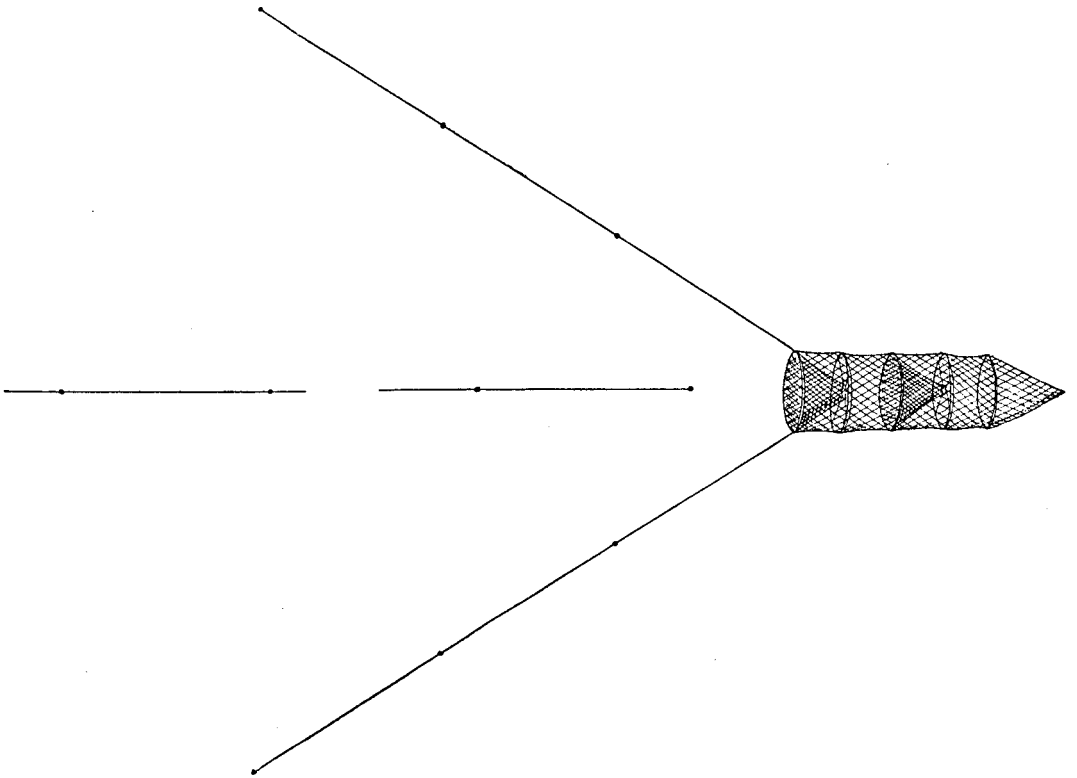


Fig. 2. FYKE WITH LEADER AND STRAIGHT WINGS. UNITED STATES, GENERAL.

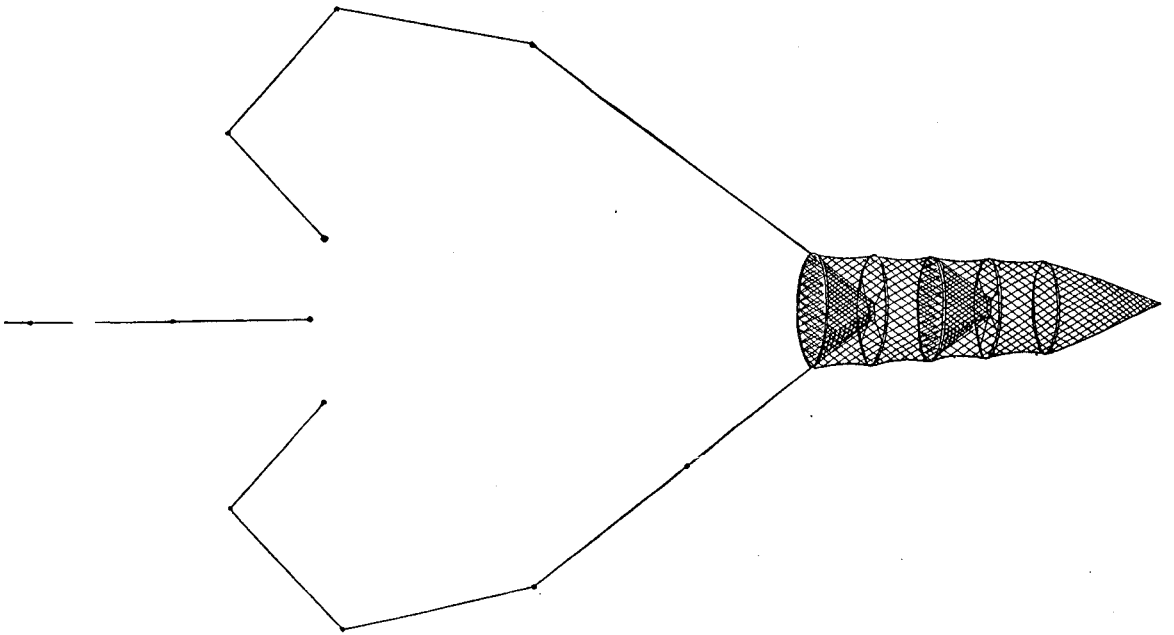


Fig. 1. POUND FYKE, WITH ANGULAR WINGS. MIDDLE ATLANTIC STATES.

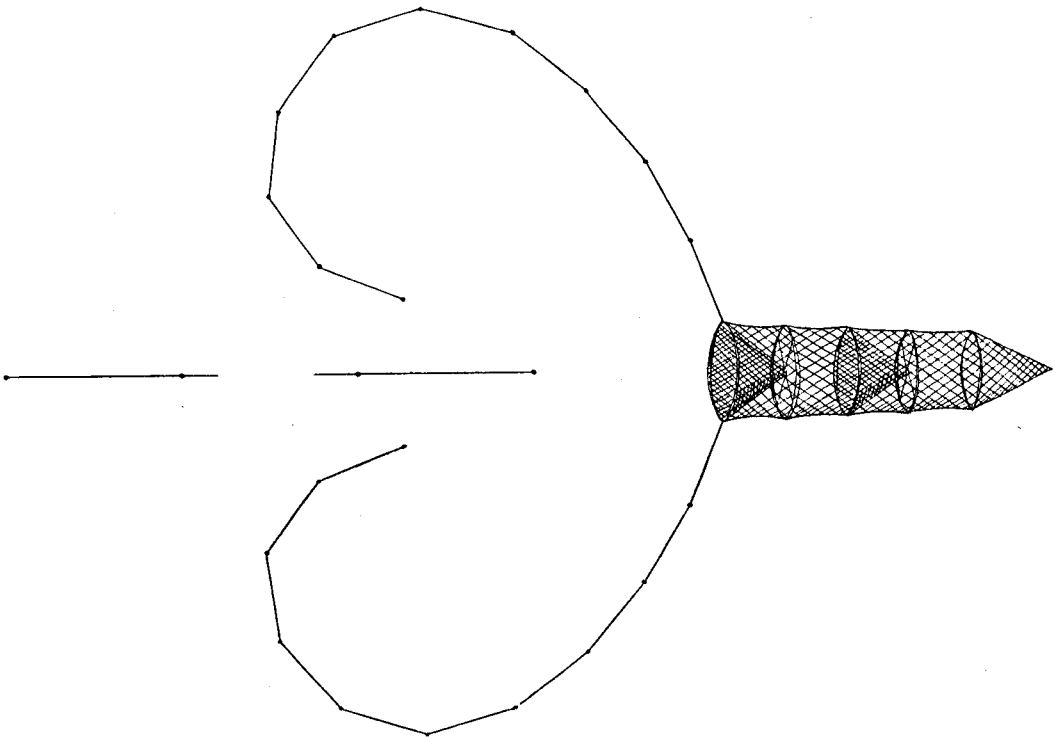


Fig. 2. POUND FYKE, WITH CURVED WINGS. MARYLAND.

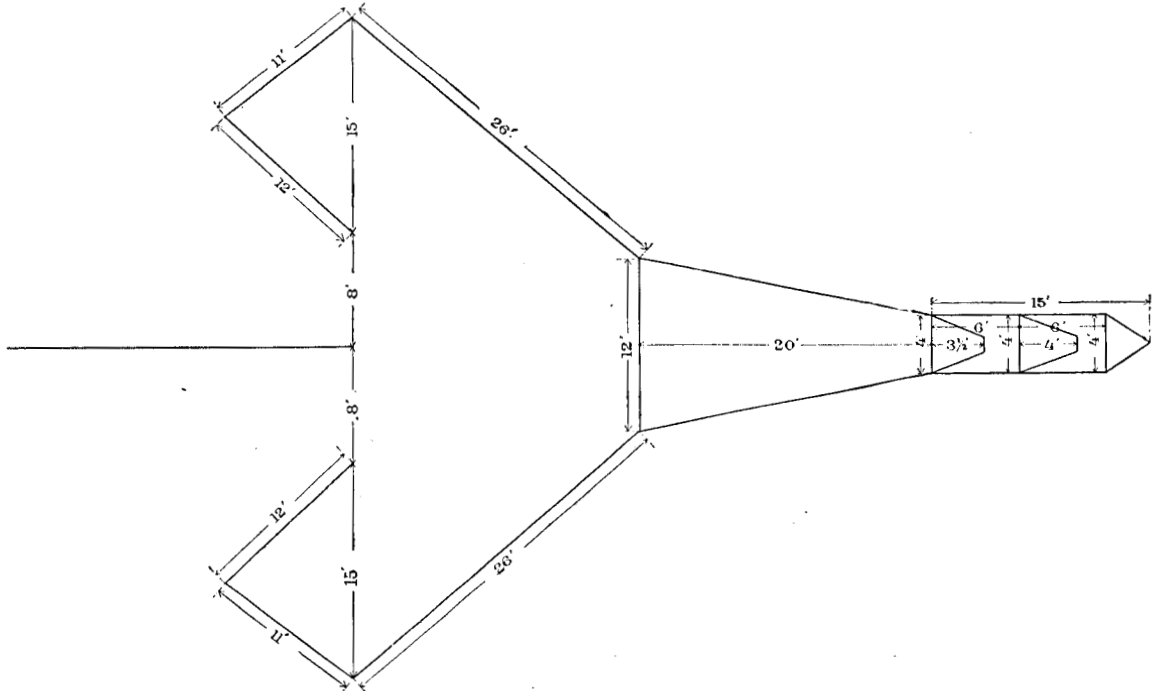


Fig. 1. POUND FYKE—PLAN. GREAT LAKES.

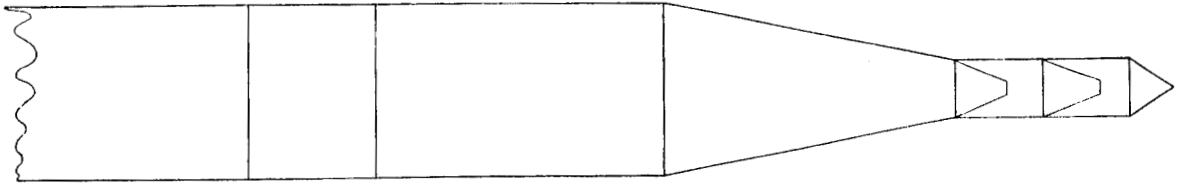


Fig. 2. POUND FYKE—SIDE VIEW. GREAT LAKES.

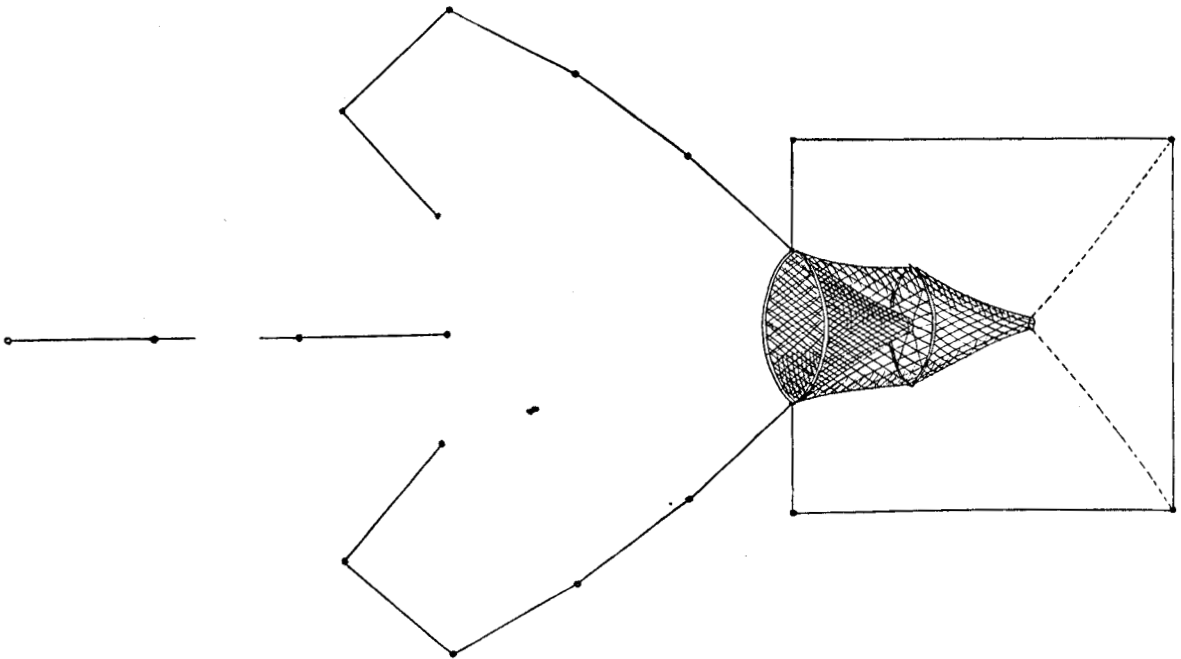
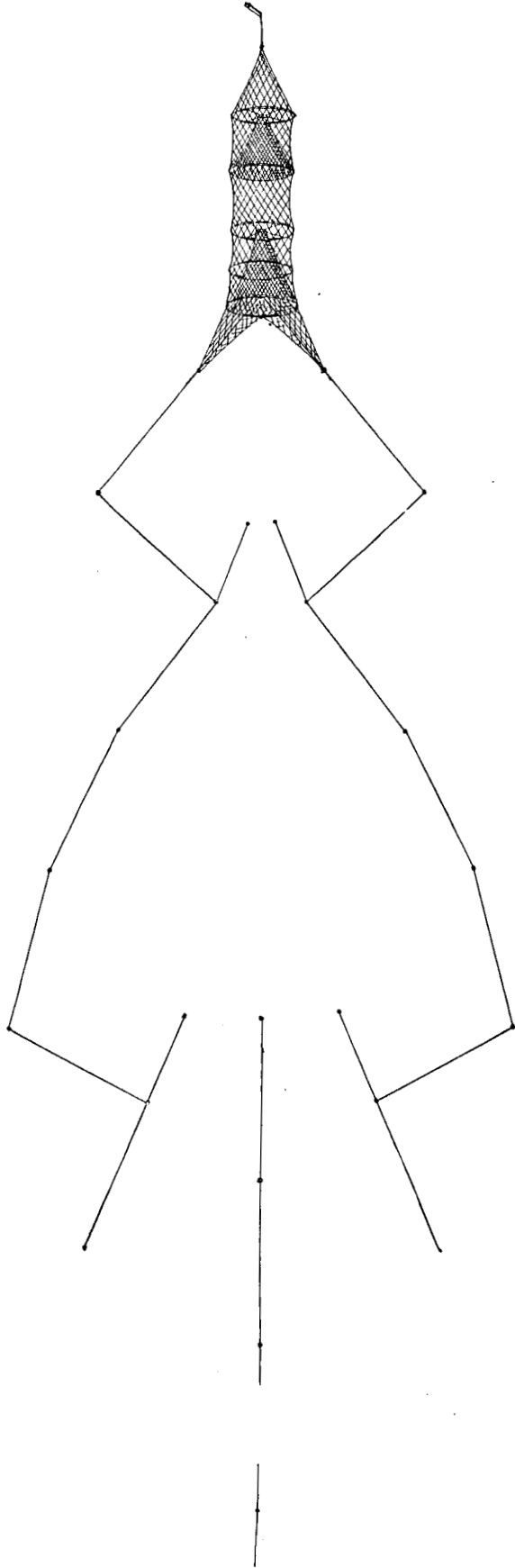


Fig. 3. "FUNNEL-MOUTH POUND," VIRGINIA.



POUND FYKE. MONMOUTH COUNTY, NEW JERSEY.

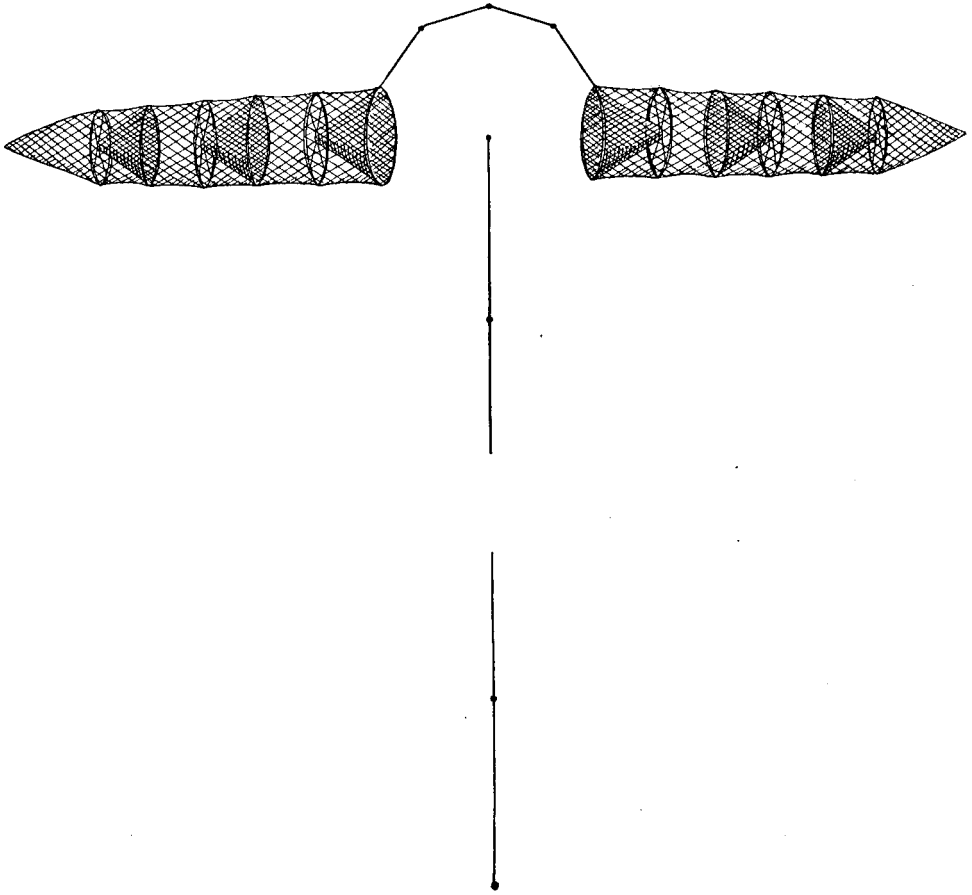


Fig. 1. DOUBLE FYKE; "SET OF FYKES." MARYLAND.

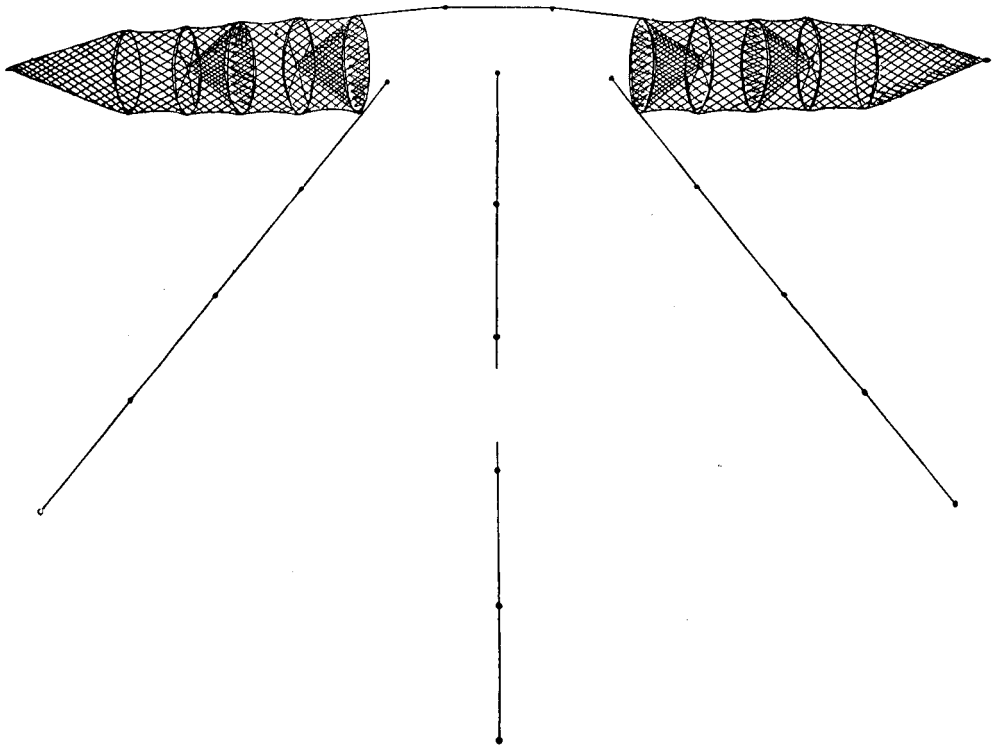


Fig. 2. DOUBLE FYKE; "SET OF FYKES." MARYLAND.

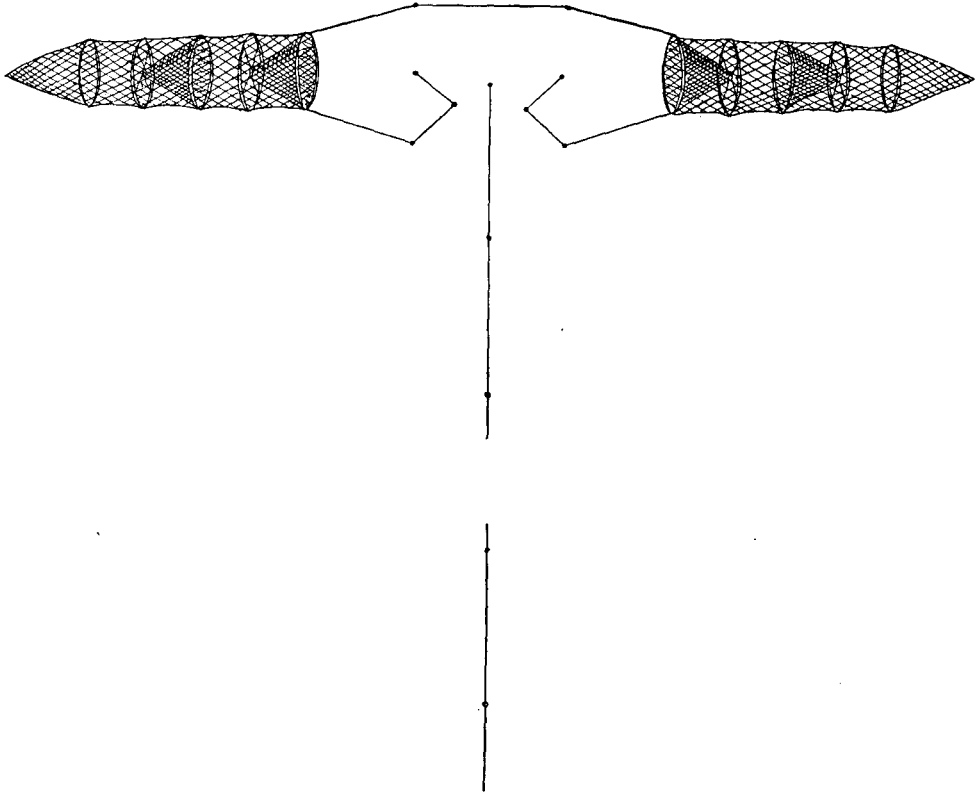


Fig. 1. DOUBLE FYKE; "SHAD FYKE." NEW JERSEY.

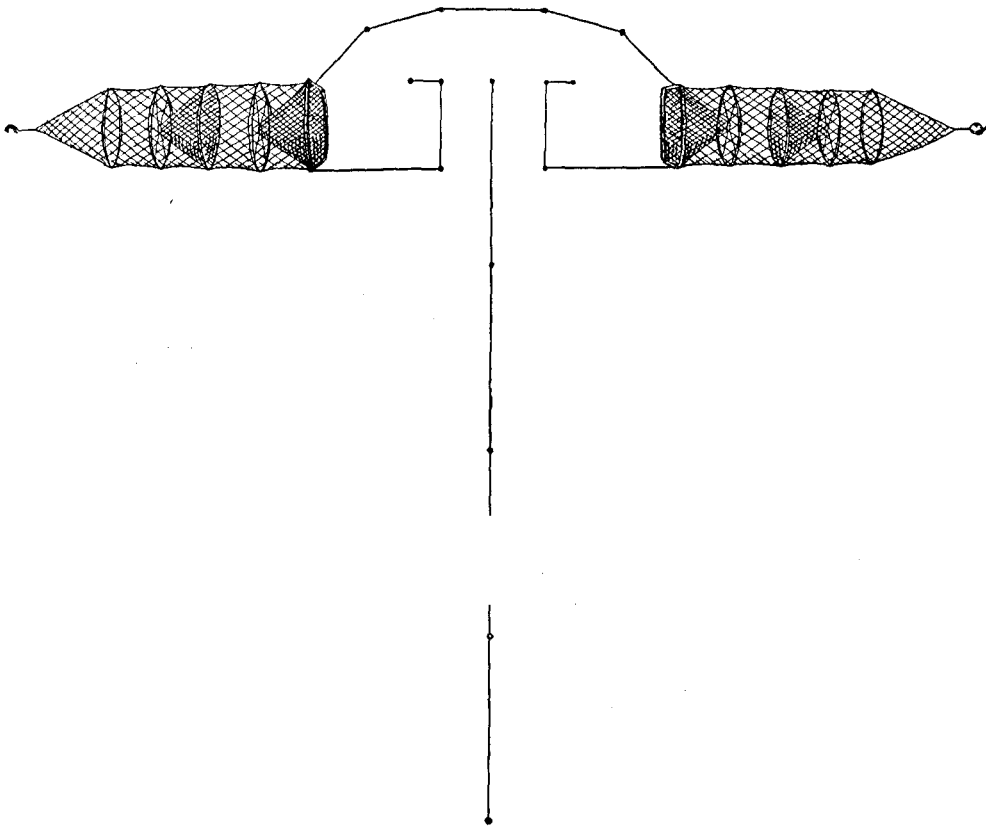


Fig. 2. DOUBLE FYKE, WITH SQUARE ENTRANCE; "HEDGING FYKE." BALTIMORE COUNTY, MARYLAND.

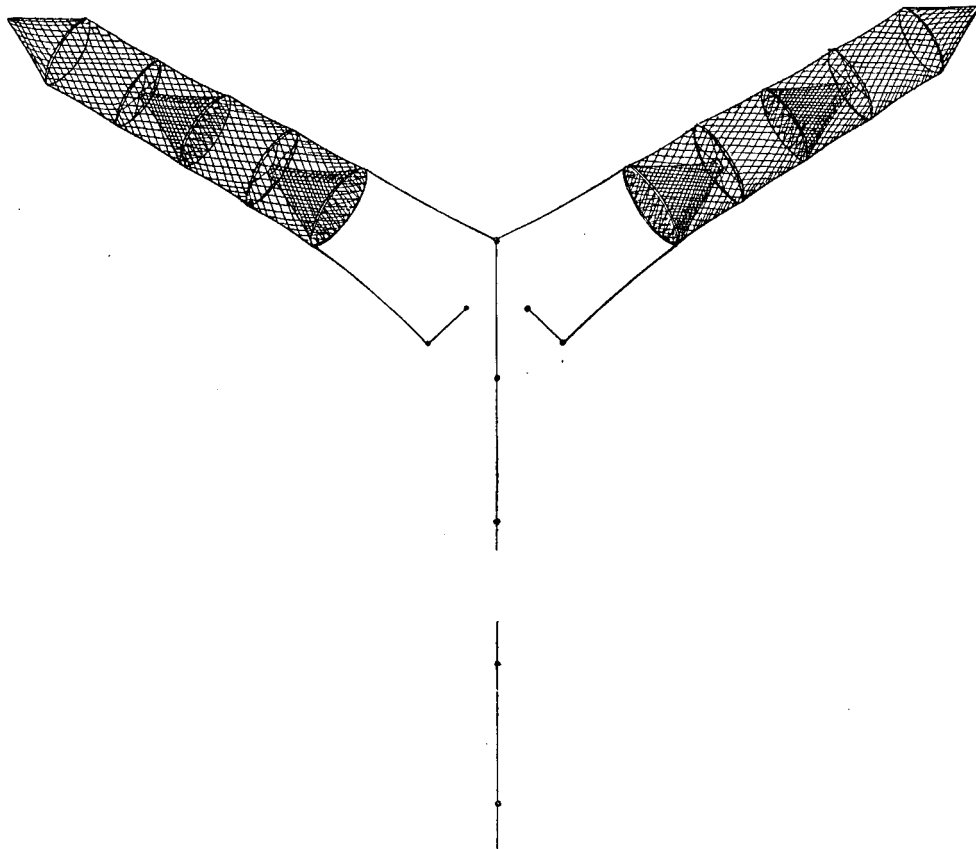


Fig. 1. DOUBLE FYKE; "BASS FYKE." NEW JERSEY.

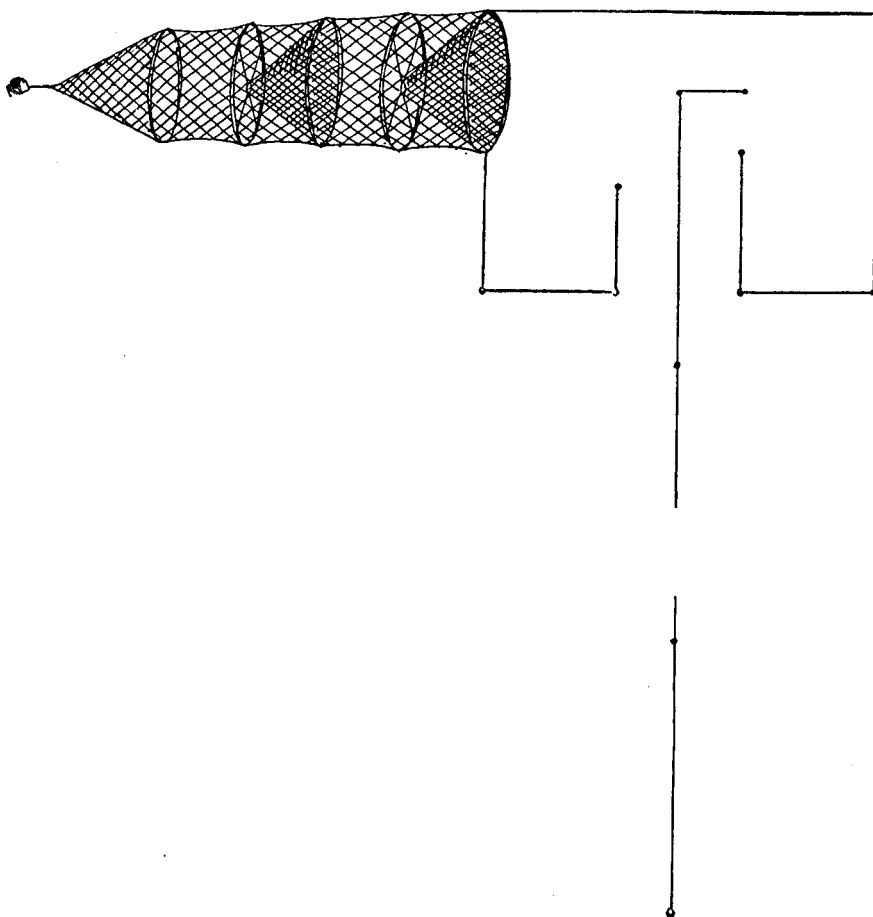
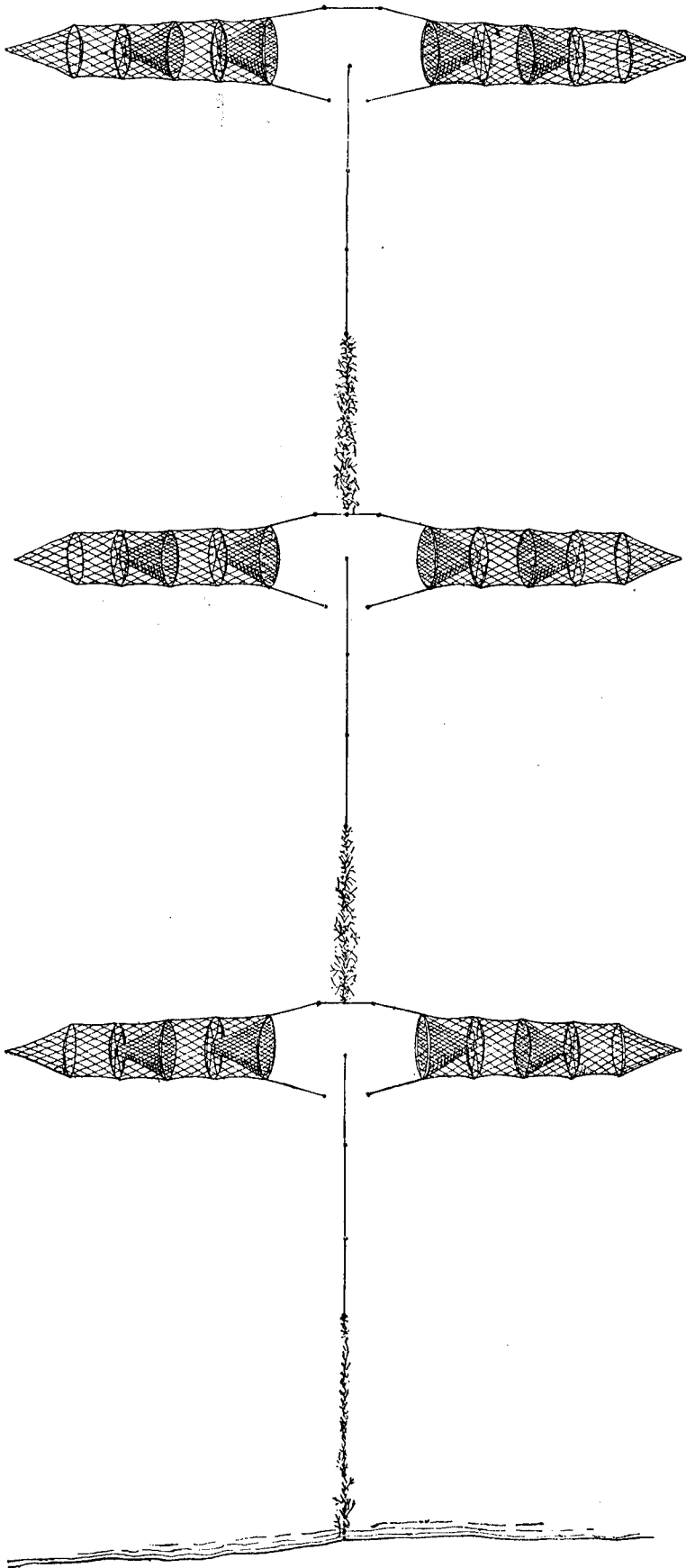
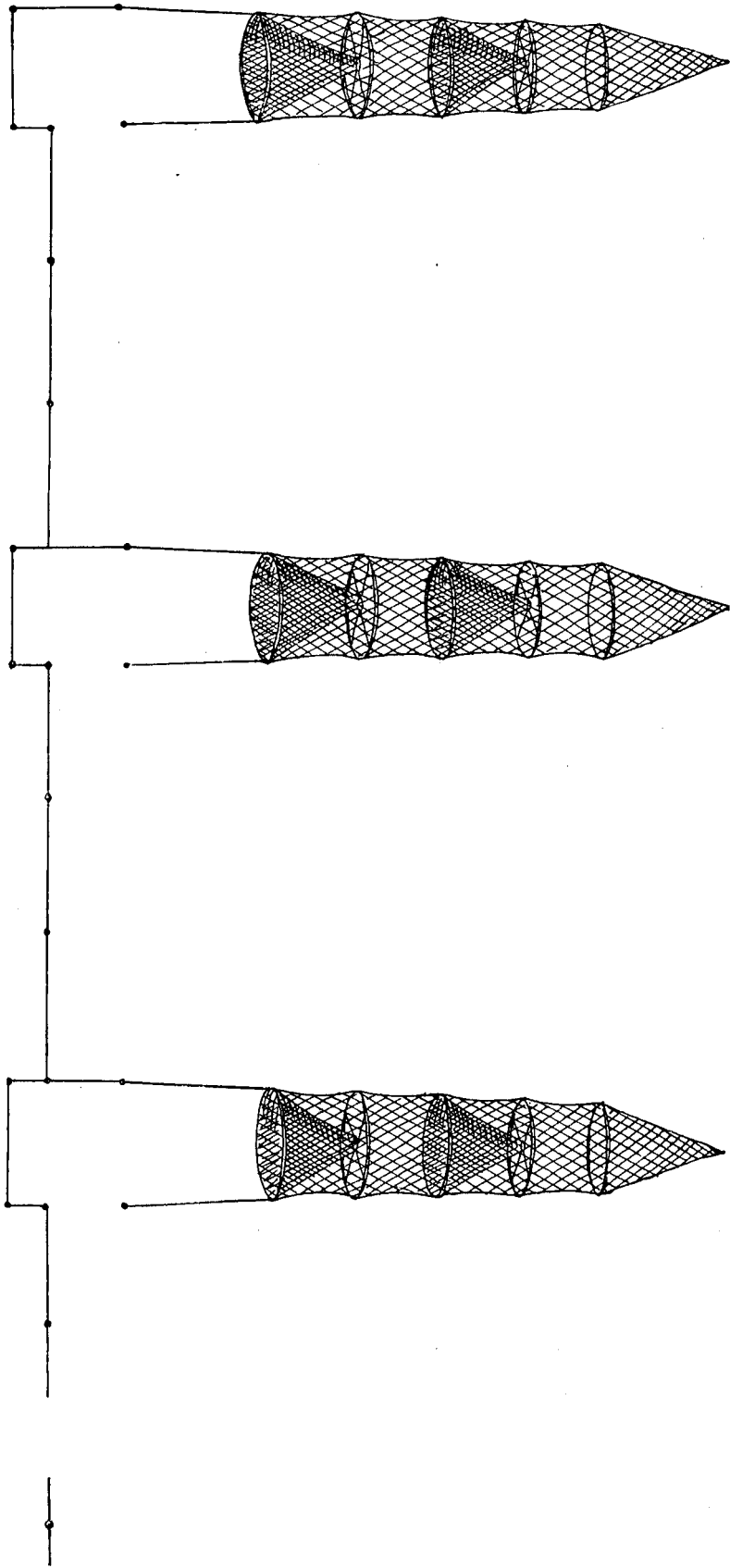


Fig 2. UNILATERAL FYKE. MARYLAND.





METHOD OF SETTING DOUBLE FYKE NETS FOR SHAD; LEADERS OF TWINE AND BRUSH. HUDSON COUNTY, NEW JERSEY.



METHOD OF SETTING UNILATERAL FYKES FOR SHAD. HUDSON COUNTY, NEW JERSEY.

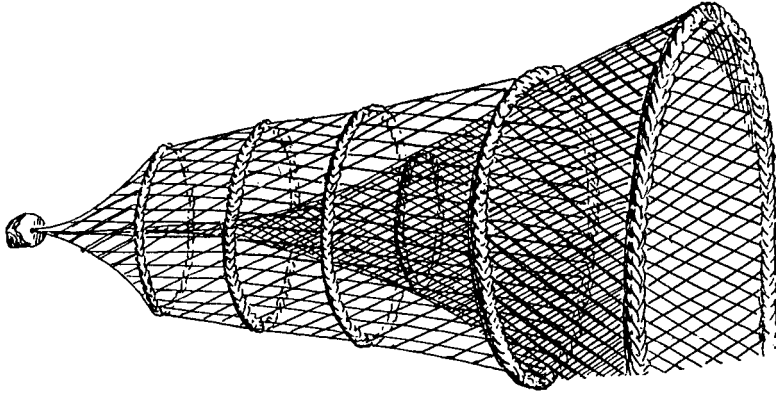


Fig. 1. VERVEUX, WITH ARCHED ENTRANCE AND SINGLE FUNNEL.

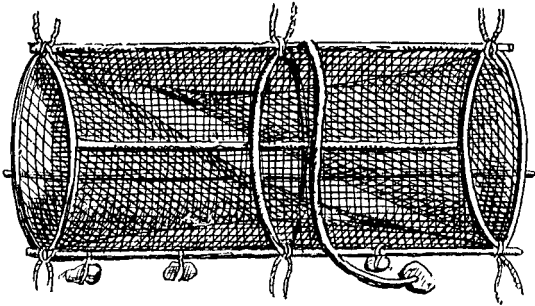


Fig. 2. LOUVE, OR VERVEUX Á TAMBOUR.

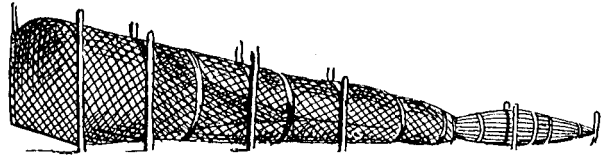


Fig. 3. GUIDEAU, TERMINATING IN A WICKER BASKET.

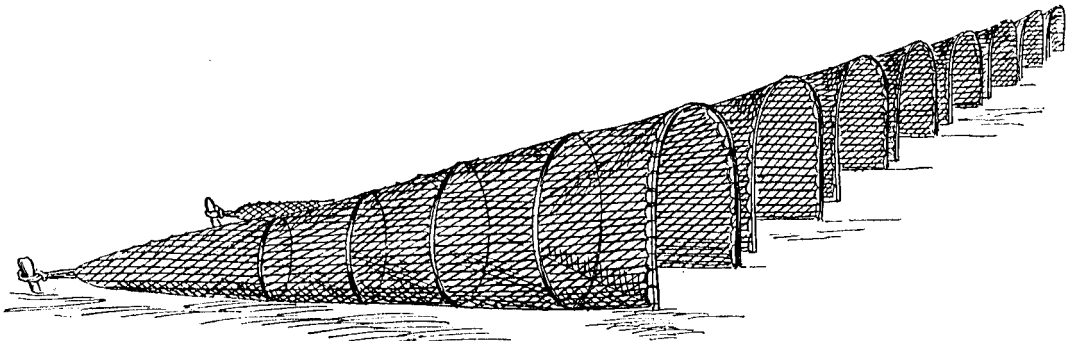
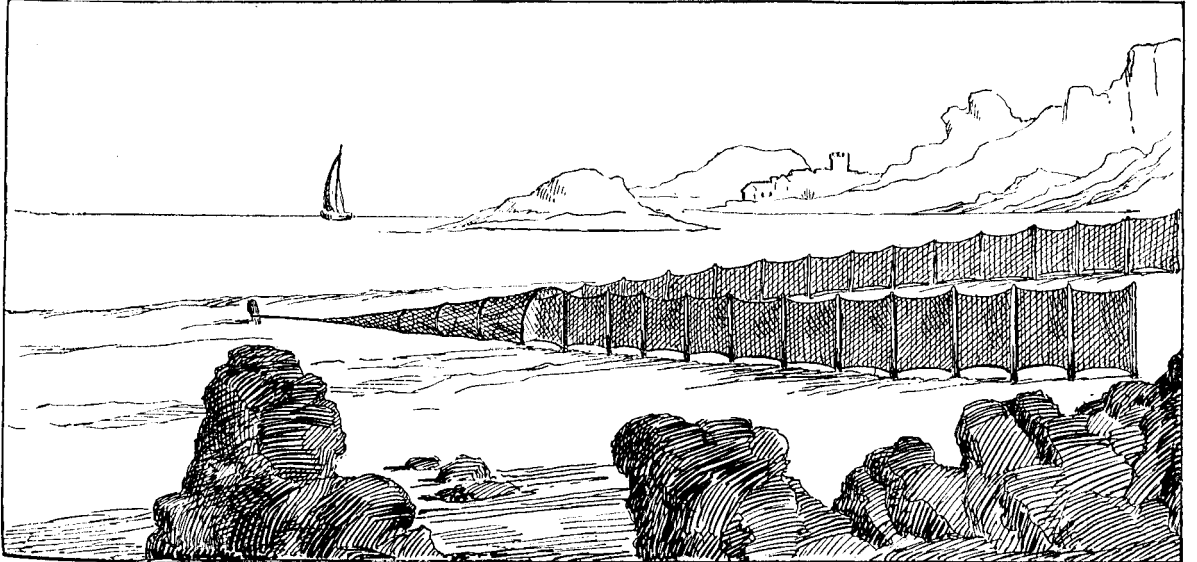
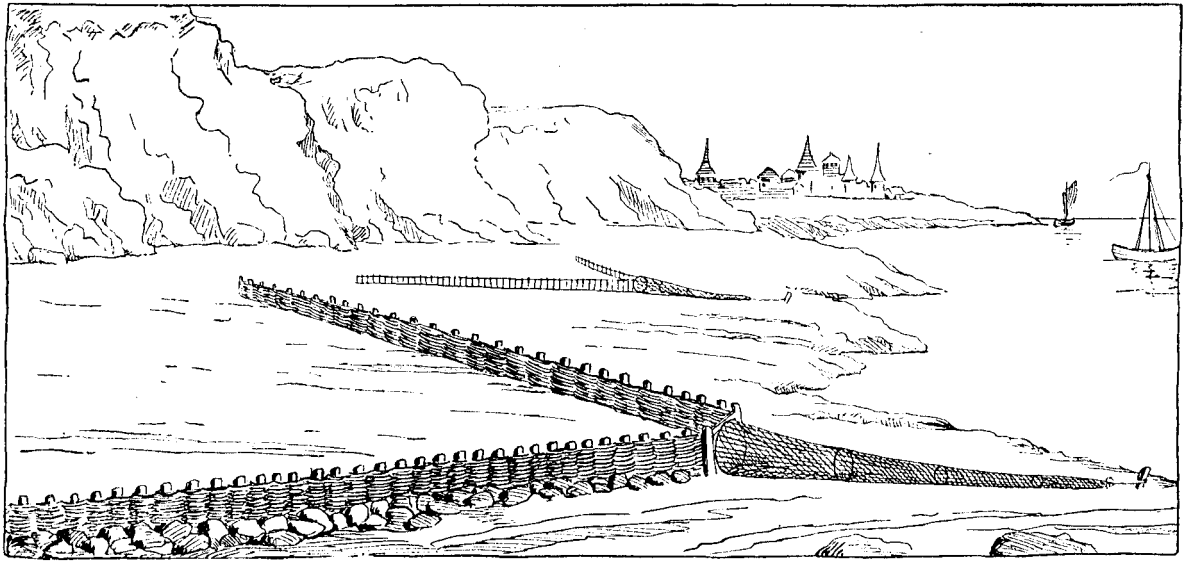
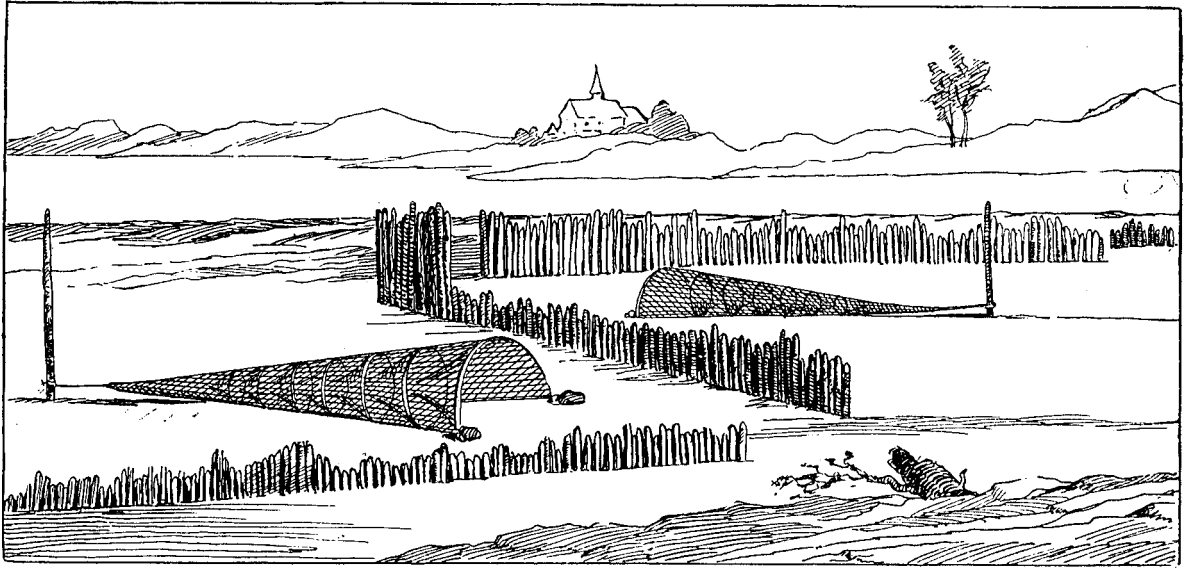


Fig. 4. METHOD OF SETTING FYKES ACROSS STREAMS.

TYPES OF FRENCH FYKE NETS.



METHODS OF SETTING FYKES ON PARTS OF THE FRENCH COAST, SHOWING THE DIFFERENT MATERIALS OF WHICH THE WINGS ARE CONSTRUCTED.

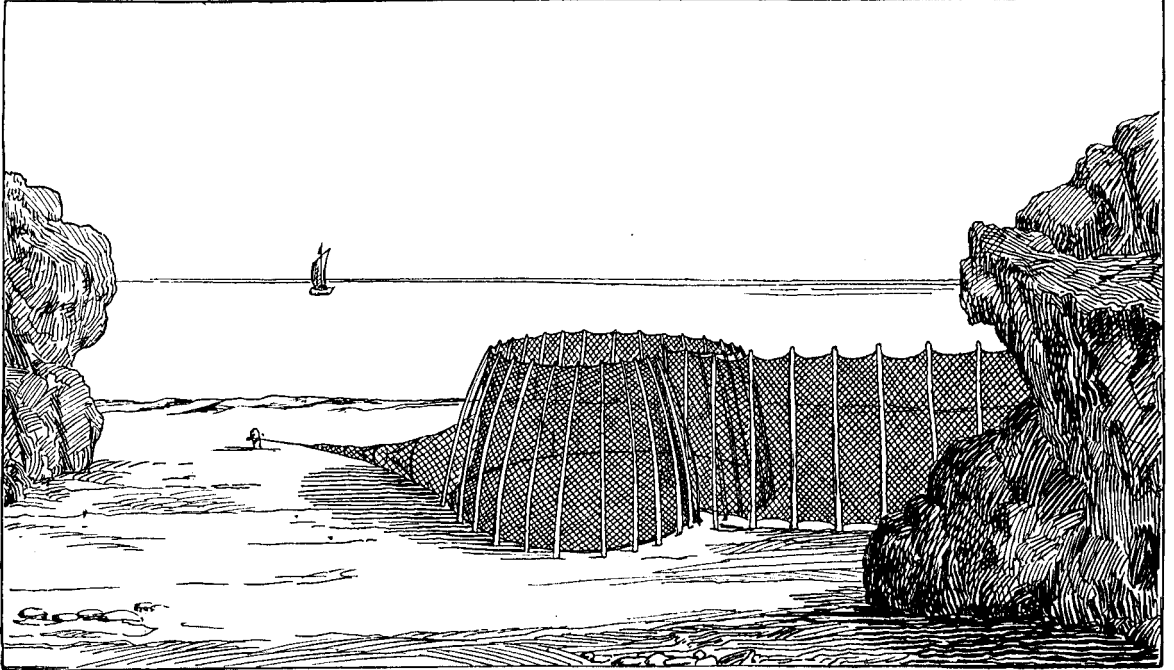


Fig. 1. POUND FYKE. FRANCE.

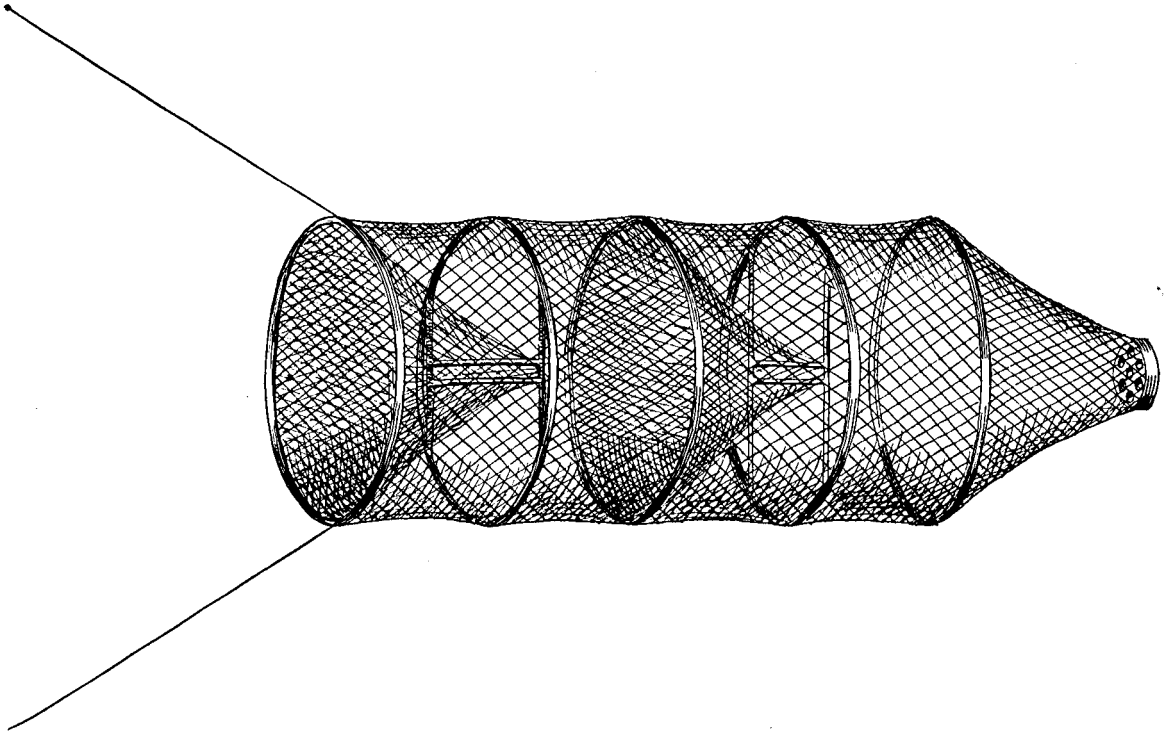
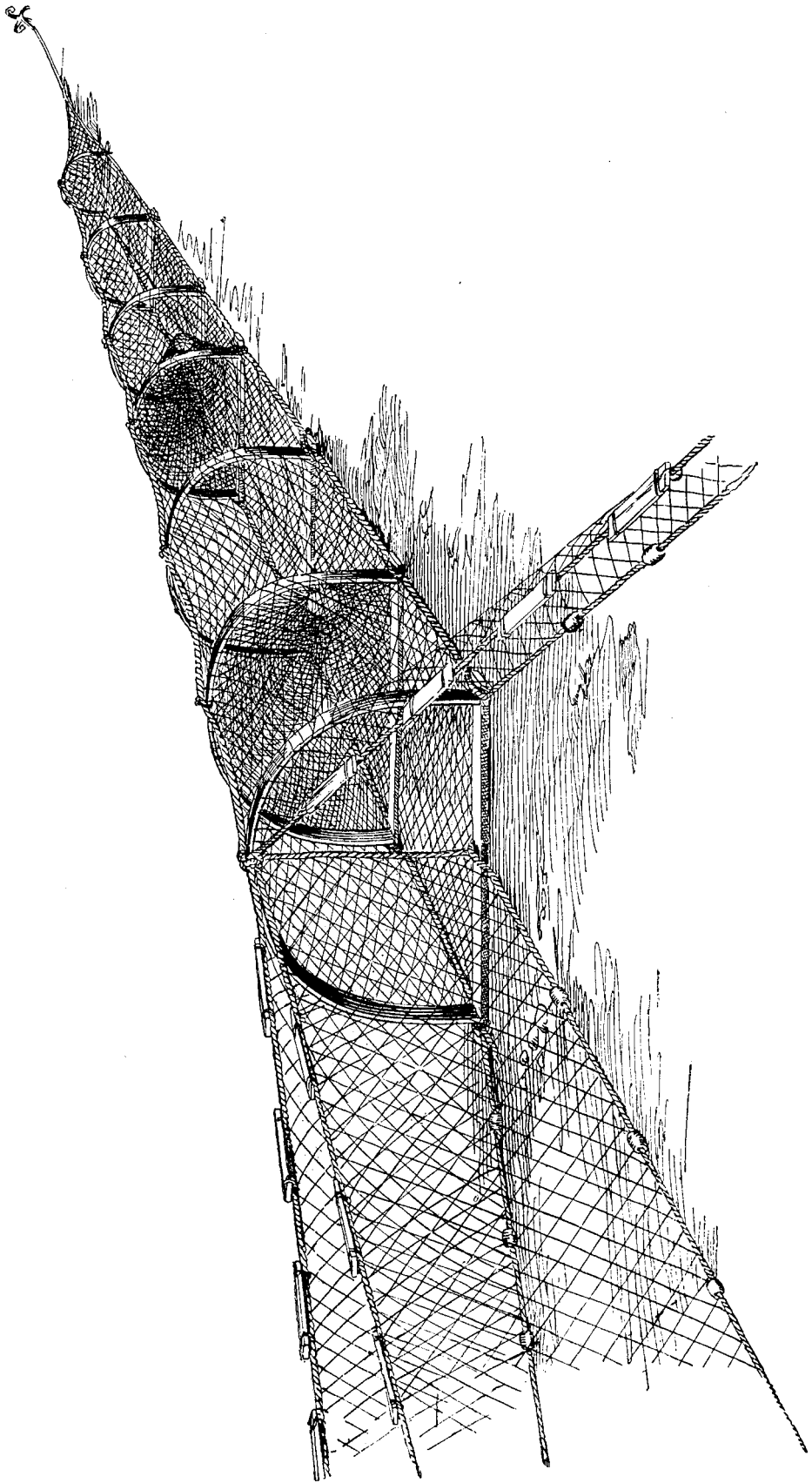
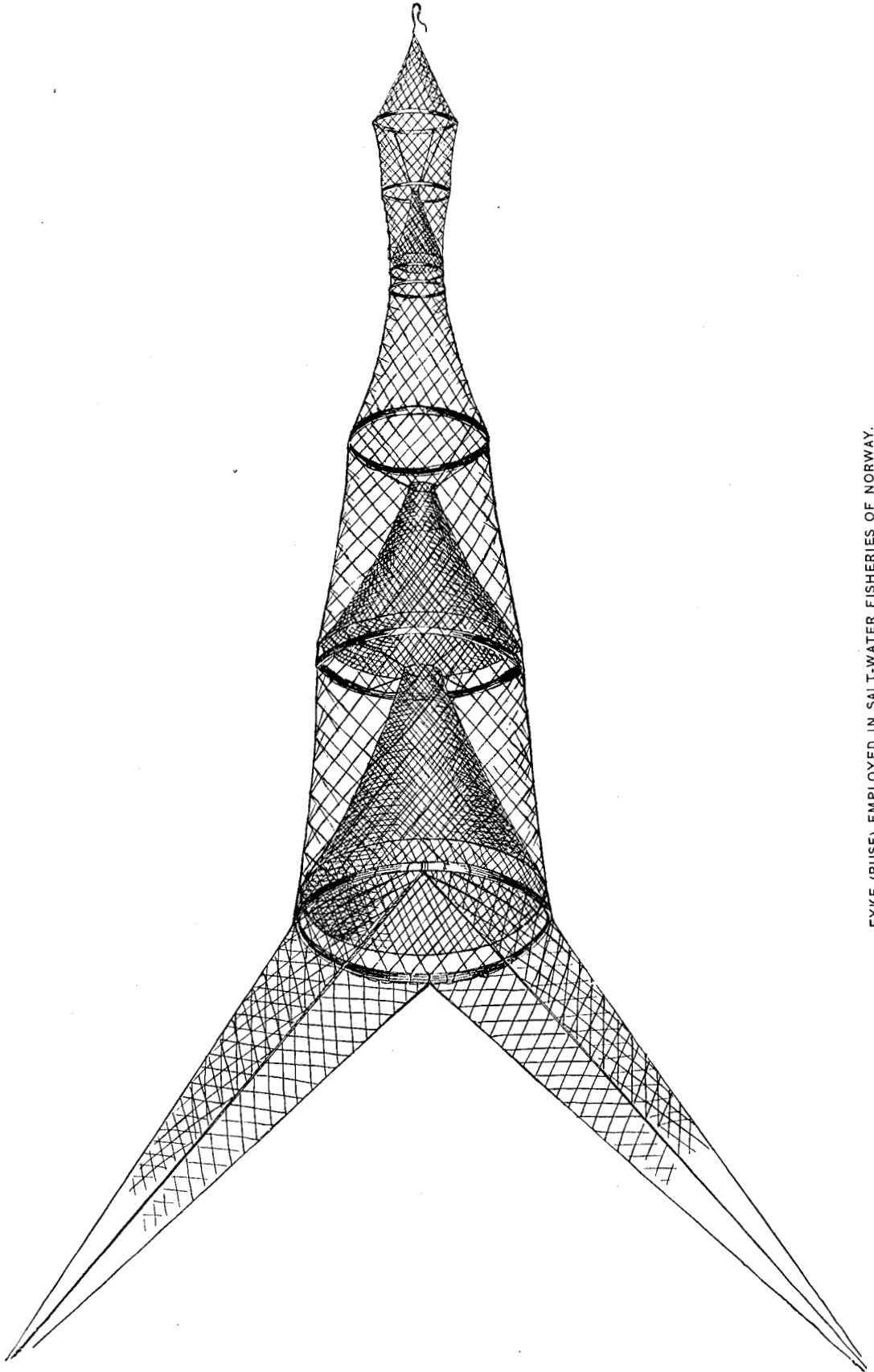


Fig. 2. FYKE (VANDA) USED IN RIVER DON, RUSSIA.



FYKE (RUSE). NORWAY.



FYKE (RUSE) EMPLOYED IN SALT-WATER FISHERIES OF NORWAY.

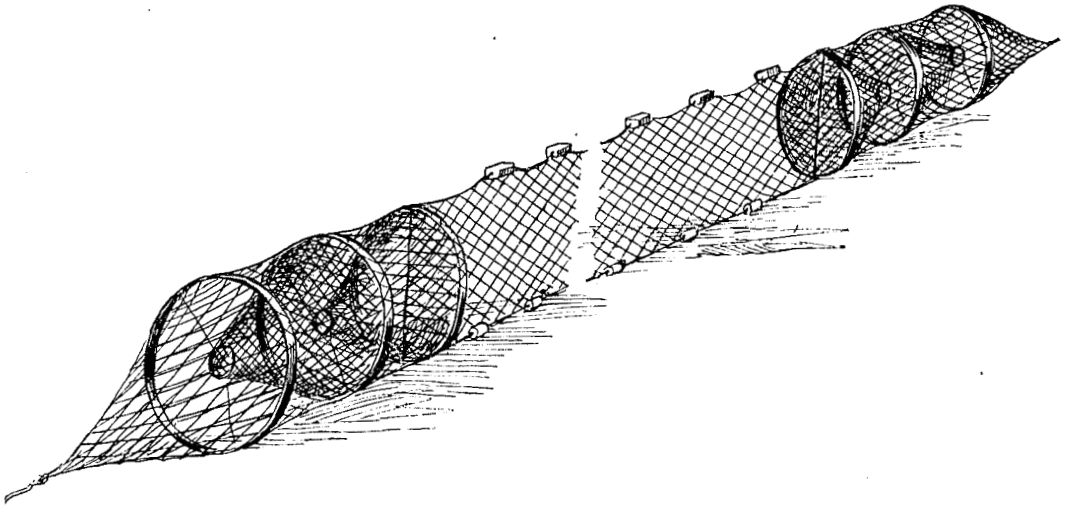


Fig. 1. FYKES SET AT END OF A COMMON LEADER. NORWAY.

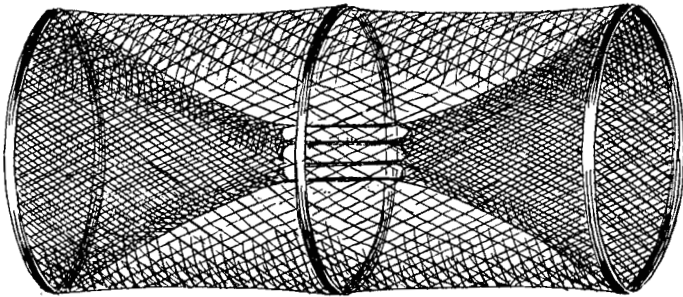


Fig. 2. ROUND FYKE (BOLLREUSE). PRUSSIA.

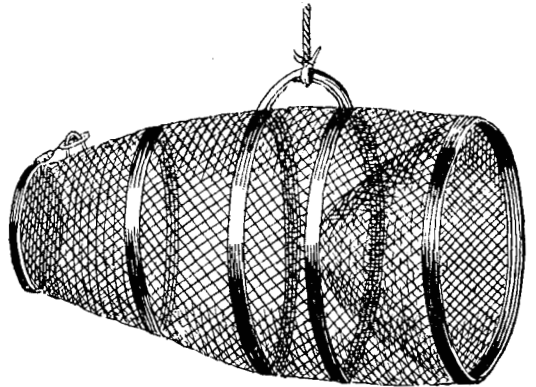


Fig. 3. POT-LIKE FYKE (MUZUAR). PORTUGAL.

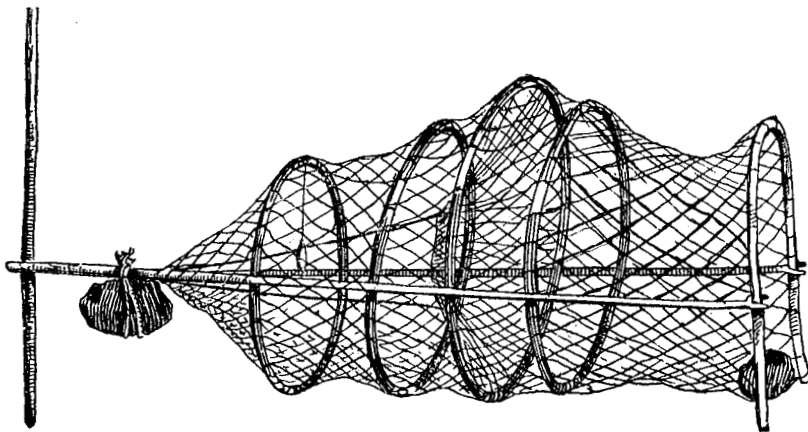


Fig. 4. SET FYKE (BOTIRÃO DE DEITAR). PORTUGAL.



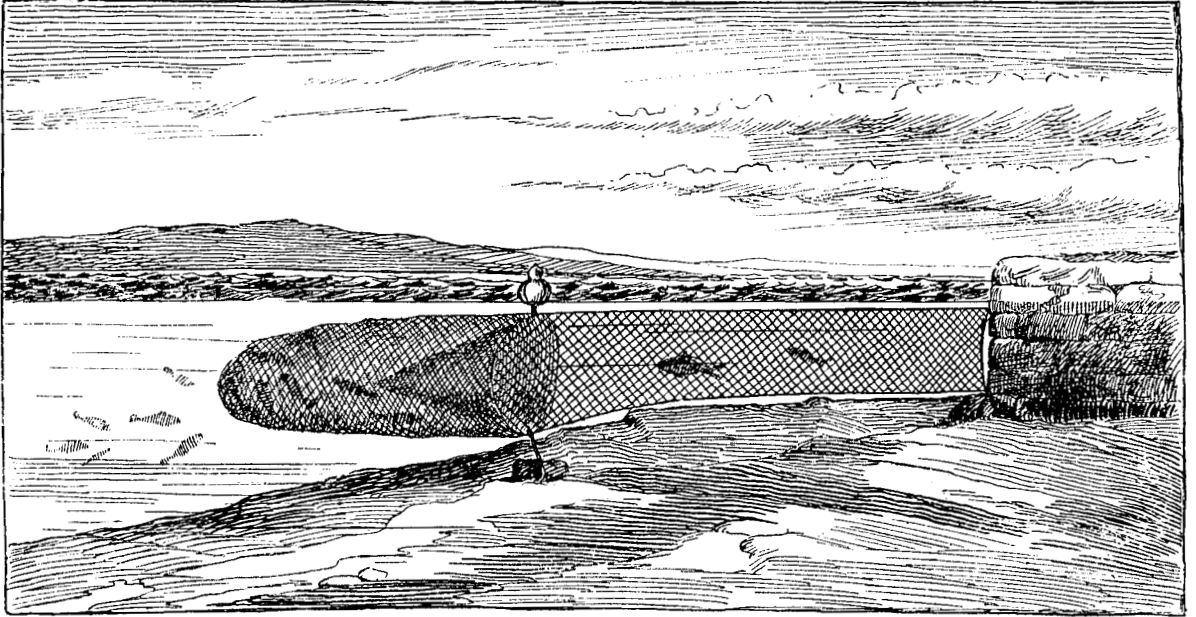


Fig. 1. BUOYED AND WEIGHTED FYKE (BOTIRÃO). PORTUGAL.

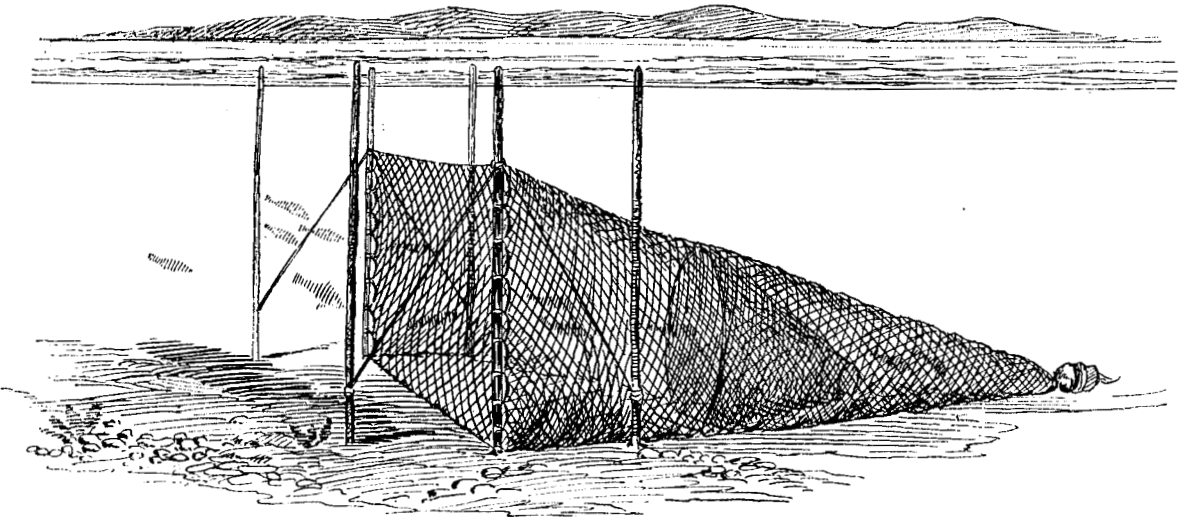


Fig. 2. STAKED FYKE (BOTIRÃO FIXO). PORTUGAL.

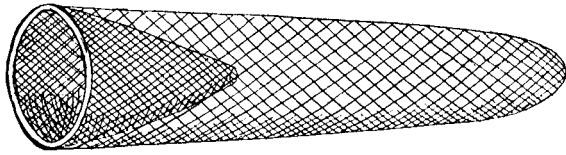


Fig. 1. SIMPLE FYKE (KAO).

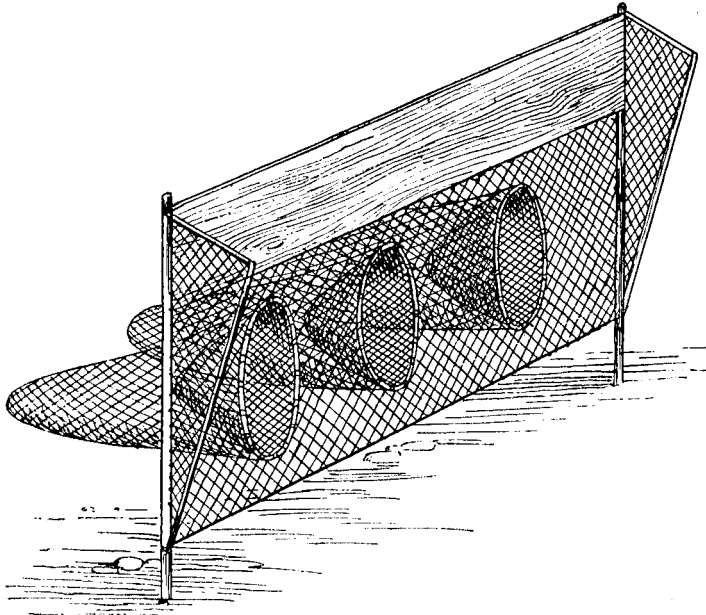


Fig. 2. SAN-YEN-KAO. COMBINATION OF NETS SIMILAR TO FIG. 1.

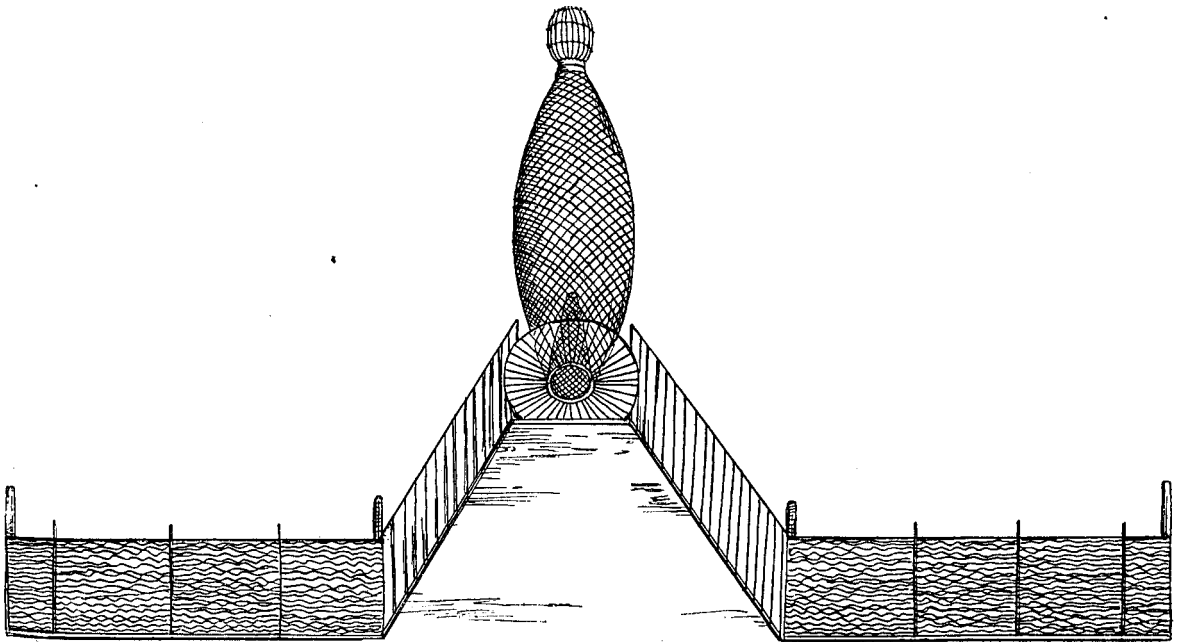


Fig. 3. TCHA-KAO. SET IN CURRENTS AND FALLS.

THREE TYPES OF CHINESE FYKE NETS.