3.—SUGGESTIONS FOR THE EMPLOYMENT OF IMPROVED TYPES OF VESSELS IN THE MARKET FISHERIES, WITH NOTES ON BRITISH FISHING STEAMERS.

BY J. W. COLLINS.

A.—INCREASE IN THE FRESH-FISH TRADE.

At this time no feature of the American fisheries is more noticeable than the increase in the demand for fresh fish in our markets. This is especially the case so far as the marine species are concerned. With improved methods of refrigeration, and a continuous increase in the facilities for inland transportation, it is possible to place before the consumer, even in places remote from the great markets, fish that are as fresh, delicate in flavor, and firm in texture as they were when taken from sea, lake, or river. Thus, while there will doubtless always be a call for certain kinds of salted fish, the tendency of the hour is to use a larger quantity of fresh-fish food and less of the salted article. And whatever tends to place fresh fish before the consumer in the best and most attractive condition will aid in increasing the demand for this kind of food and lead to an enhancement of profits to the producer. In view of the rapid growth of population in the United States, it is reasonable to suppose that the "fresh-fish trade" will grow to proportions not yet anticipated if such attention is given to it as its increasing importance seems to demand.

But while the fresh-fish business has derived many advantages from improvements in methods, increase in population and in facilities for transportation, much yet remains to be done in order to secure that full measure of success which is desirable. The important question at this time is that of securing rapid transportation from the fishing grounds to the markets, or the adoption of other means whereby fish may reach the point of shipment, and ultimately the consumer, without deterioration, even when taken far out at sea.

Besides the other benefits which may accrue as a result of improved sea transportation, an additional advantage will be secured to the market fisherman, inasmuch as he can extend his operations to more distant localities, where fish are abundant, but where he has not heretofore been able to go because of the impracticability of carrying his catch in good condition from there to market.

It is then evident that the prosperity and development of this industry are more dependent upon the adoption of new types of vessels and boats than upon anything else. Indeed, the maximum of success in the fisheries can not be reached until the

highest results have been attained in the direction of securing vessels that are best adapted to the special work they are built to perform. If safety, speed, and special fitness can be obtained at a reasonable expenditure, then much may be gained, though it is to be expected that local conditions will demand very dissimilar types.

B.—SUGGESTIONS FOR THE EMPLOYMENT OF STEAMERS IN THE NEW ENGLAND MARKET FISHERY.

Allusion has already been made to the increase in the market fishery of the United States, but in no other locality is this more strikingly noticeable than in New England. Twenty-five or thirty years ago a few comparatively small vessels and open boats found employment in fishing for market on the grounds near the coast. This fishery was then confined largely, if not exclusively, to the winter season. At the present time fleets of the largest, swiftest, and best fishing schooners in the United States find employment from early autumn till spring, and a somewhat less number throughout the year, in supplying the markets of the principal ports of Massachusetts, New Hampshire, and Maine, among which Boston, Gloucester, Portsmouth, and Portland are the most important.

Although many, if not the majority, of the vessels above alluded to are not of the most modern type, the advantage to be derived from the employment of the swiftest and most sea-worthy vessels has been so manifest that a constant change is now going on in the market fleet. There has been a marked improvement recently in the sailing vessels engaged in the Atlantic sea fisheries, and special attention has been given to the attainment of the maximum of speed, due chiefly to the requirements of the market fishery.

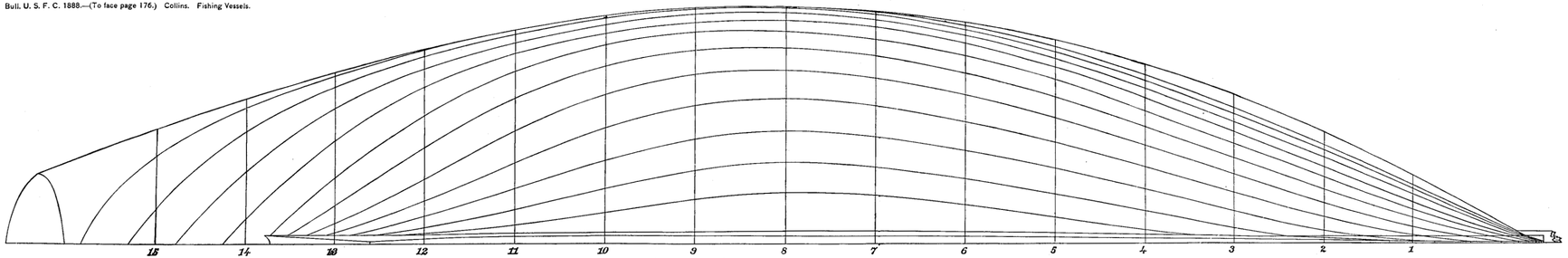
With several eminent naval architects in the field, as designers of fishing schooners, it is not surprising that some of the latest additions to the New England market fleet should be so highly specialized as to make it apparent that the limit of swiftness has been pretty nearly reached in the construction of sailing vessels. Although the cost of building such schooners is somewhat increased in proportion to their carrying capacity, the additional profit to be obtained by getting the catch to market in the briefest possible time has been so fully demonstrated that comparatively little is thought of a considerable increase in expenditure, if a vessel can be obtained which will outstrip all rivals.

As has been intimated, the success in the direction of improving the speed and sea-going qualites of the schooners has been very gratifying, and there is reason to suppose that the introduction of the very best sailing vessels will be rapid. Nevertheless, it is a fact too well known to admit of discussion that even the swiftest sailing vessels may be, and often are, seriously delayed by calms and head winds. Therefore, when they have to operate on distant fishing grounds, their catch may frequently become more or less deteriorated before they reach market. The result of such delay and injury to the quality of the fish is that the fisherman receives less for his labor, and a bad influence is exerted on the trade, since the consumer gets an inferior article of food, which tends to lessen the demand.

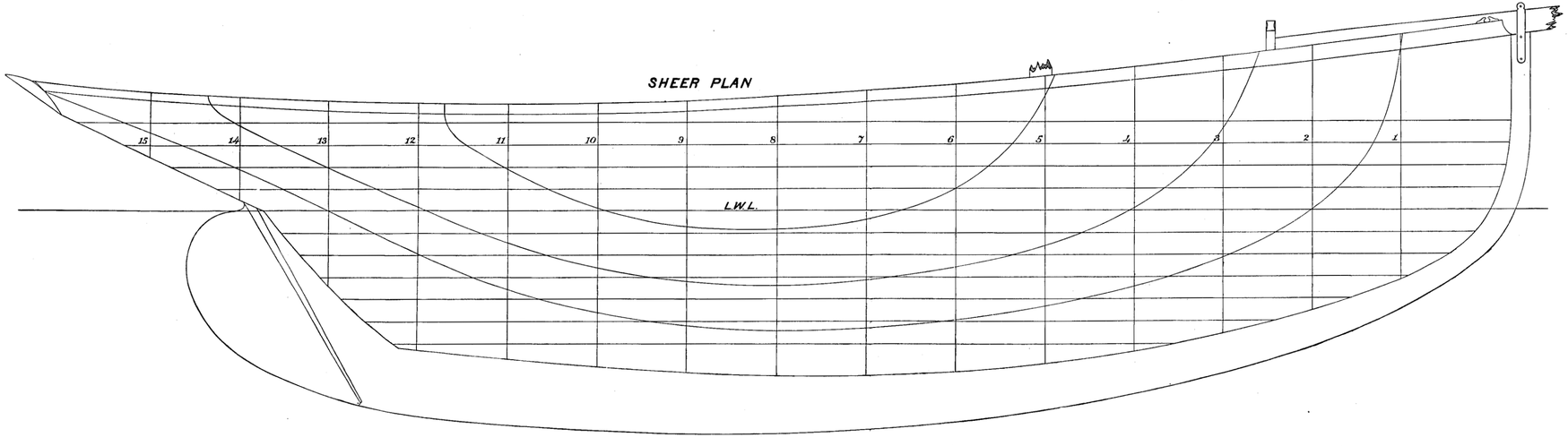
While this may not occur often enough in some localities to seriously handicap the fisheries, it is, nevertheless, a factor of such great importance in most regions that it is worthy of serious consideration, and whatever tends to decrease uncertain-

PLANS OF FISHING CUTTER. (Scale: ½ inch to 1 foot.)

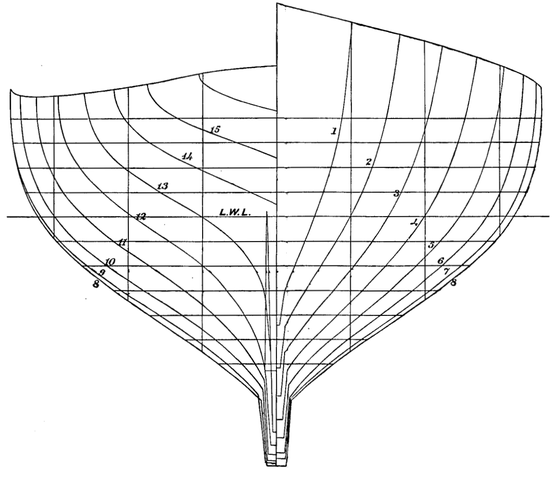
DESIGNED BY J. W. COLLINS.



HALF BREADTH PLAN.



BODY PLAN



ties of this kind will, beyond question, add to the prosperity of the business, providing the expense incurred is not disproportionate to the advantages to be obtained.

In view of what has been stated, it seems timely to consider the question of utilizing steam as a motive power on the vessels engaged in the off-shore Atlantic market fishery. If a swift and thoroughly sea-worthy screw steamer—one that can keep the sea and make passages in heavy weather—can be built and operated at a comparatively moderate expense, there is reason to believe that such a vessel would prove successful in the market fishery north of Cape Cod.

It is true that experiments have been made in the direction of employing screw steamers in the winter haddock fishery and that the results obtained were not satisfactory. But those trials have proved nothing excepting that the vessels were entirely unfit for the winter fishery. Indeed, they had been built for the menhaden fishery, which is prosecuted in summer, and by necessity in comparatively smooth water. What seems to be needed for the market fishery, if steam is to be employed, is a type of vessel that, while being of moderate size, will be swift and sea-worthy; is comparatively inexpensive to build and run, and will have, at the same time, sufficient carrying capacity to enable it to bring into market as many fish as it is liable to take.

The small screw steamers which are employed from England and Scotland in the long-line or trawl-line fishery, the beam-trawl fishery, and the drift-net fishery (and have been introduced also into other European countries), appear to possess the qualifications that may be required in a vessel to adapt it to the market fishery on the Atlantic coast of the United States. These steamers, though moderate in dimensions, are specially designed for sea service in all weathers. They are safe, swift under steam, and, in order that their expenditure of coal may be kept down to the minimum, they are provided with a considerable sail area. When cruising on the fishing grounds, sails alone can be used, when there is wind, and they serve as an important auxiliary power when making passages.

Appended are descriptions and plans of some of the best types of European fishing steamers. It is believed by the writer that similar vessels, modified so as to meet local requirements, would be well adapted to engage in the New England market fishery. The question of building such vessels of wood, iron, or steel, is one that must be necessarily left entirely to the judgment of those who should have them constructed. In England iron is generally preferred, for the reason that it is so much more durable than wood. But, on the other hand, the Scotch fishermen have shown a preference for wooden vessels, though it is probable that they, also, will prefer iron instead as soon as they consider the period of experimentation has been passed.

It will doubtless be found feasible to introduce on steamers the system of refrigerating fish by use of ammonia, and at very small expense, since all the motive power required could be furnished by the engines without any material increase in cost.

C.—NEED OF STEAMERS IN THE FISHERIES OF THE PACIFIC.

To secure the best results in the market fishery of the Pacific, it seems eminently desirable that steamers should be employed, and the need for such vessels in that region is greater than on the Atlantic coast. In summer, calms and light winds are very prevalent along the Pacific coast, while ice is expensive and often difficult to obtain. The lack of ice makes it impracticable to keep fish in a fresh condition for any consider-

able length of time, and since a boat or vessel may be delayed for days almost within reach of port, for want of wind, the need of some motive power which will make it possible to carry the fish to market without loss of time is apparent.

Small screw steamers, like those used by the Scotch and English, could, no doubt, be profitably employed in the fresh-halibut fishery which is just opening up from the ports of Puget Sound and Oregon. It would also seem that such vessels might find a fair field in the market fishery of San Francisco, either by working independently or as carriers for the fleet of sailing boats now employed from that port. It is, perhaps, possible that such small steam-vessels could visit grounds much more remote from San Francisco than those now resorted to by the sailing boats and bring thence to market fish in the best condition.

If practicable, it would, no doubt, be financially to the advantage of the fishermen of San Francisco if arrangements were made whereby the daily catch of each boat could be put on board of a swift steamer and carried directly to market, the boats remaining on the ground, if the distance from port was such as to make the going and returning a matter of much moment. This would not only insure a larger catch of fish by a given number of men and boats, but also the placing of the products of the fisheries upon the market in such condition as to vastly increase the demand.

D.—EMPLOYMENT OF STEAMERS IN THE CHESAPEAKE BAY FISHERIES.

Although the increase in pound-net fishing and the number of pounds operated on Chesapeake Bay has been something phenomenal in recent years, it is, nevertheless, a fact that there are localities in which it is believed excellent fishing could be obtained which are not now utilized. This is perhaps due to the fact that, up to date, steam has not been employed as it seems it might be. The fishermen, depending on sailing boats to carry their catch to market, or to the various landings on the bay for shipment by steamer or rail, are limited, of course, as to the distance to which they can extend their operations. If the weather is calm, as is frequently the case in spring and summer, they are compelled to depend upon rowing to reach the shipping point.

A small steamer, which would be comparatively inexpensive to run, could carry fish from almost any point to a landing where they might be shipped to market, and thus many localities not now utilized could be made profitable for the fishery. Among those that may be mentioned are Wolf-Trap Spit, and in the vicinity of Smith's Point. The last-mentioned locality is about 30 miles from a steamer landing, and it is evident that it would be impracticable to transport fish in a sailing craft that distance and be sure of making the landing at the proper time.

E.—NEED OF SMALL WELLED VESSELS OR BOATS FOR THE MARKET FISHERY OF SOUTHERN CALIFORNIA.

At present, the coast towns of southern California are supplied with fresh fish that are taken in small boats (generally sailing boats), that go out to the grounds within easy reach. Fish are reported to be abundant in that region, but owing to the prevalence of light winds and calms, and to the fact that ice is not used, the catch of the fishermen frequently, if not generally, is not in the best condition when it reaches the consumer; occasionally it may have to be thrown away before it can be sold. The

Fig.1.

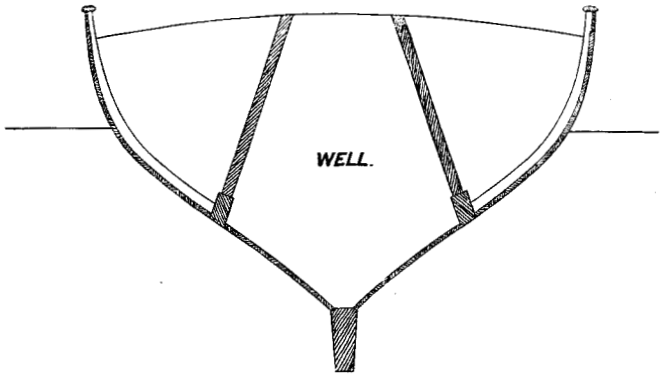
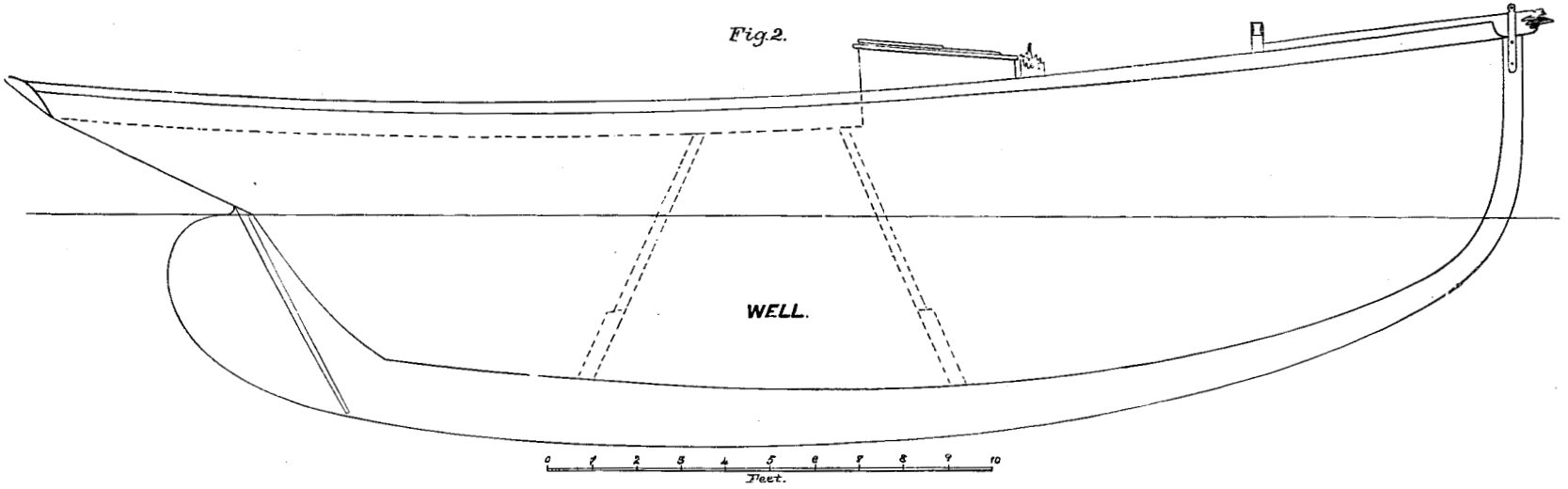


Fig.2.

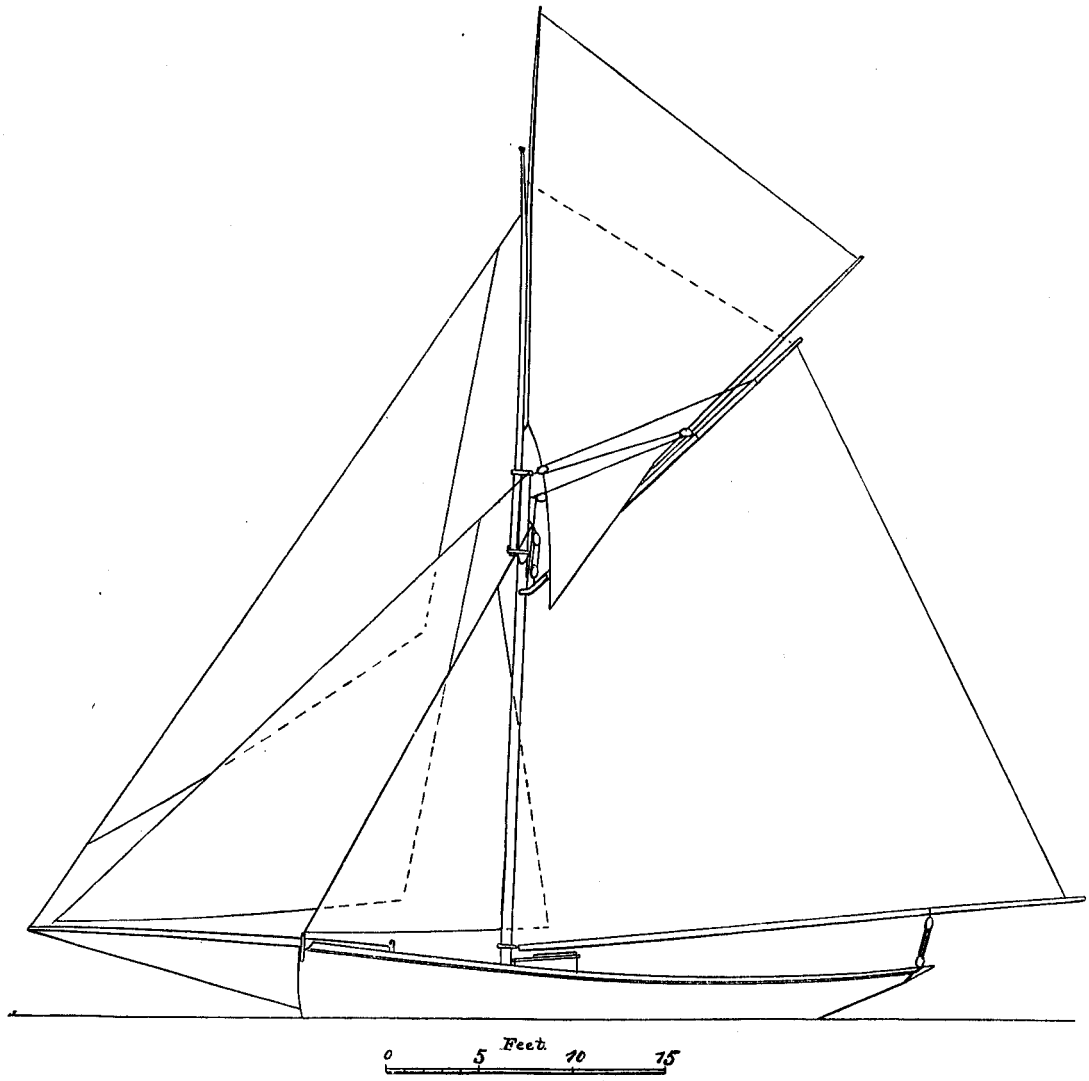


PLANS OF FISHING-CUTTER SHOWING FORM AND LOCATION OF WELL. (See page 180.)

Designed by J. W. Collins.

FIG. 1. Midship cross-section.

FIG. 2. Sheer plan.



SAIL PLAN OF FISHING-CUTTER. (See page 180.)

Dotted lines across club-topsail indicate size of working gaff-topsail.

Designed by J. W. Collins.

result is, of course, much to the disadvantage of the market fisherman, since any uncertainty about obtaining fish in good condition tends to decrease the demand, and thereby to make the price lower than it otherwise would be.

The demand in southern California will not at the present time warrant the employment of large fishing vessels or steamers to supply the ports with fresh fish, but it seems entirely feasible to improve the market fishery very materially by using small welled boats in which fish can be kept alive. This would insure, beyond all question, placing the products of the fisheries upon the market in the best possible condition, and would doubtless lead to a material increase in the demand, to the advantage of both fisherman and consumer.

Mr. A. B. Alexander, who has visited the region referred to, as fishery expert on board of the Fish Commission steamer *Albatross*, and who had a good opportunity to note the boats, and condition of the fisheries there, writes as follows:

"A smack would be the proper vessel to use in this locality, and it seems strange that that class of vessel has never been employed in the California fisheries. In summer there is but little demand for fish in the markets south of San Francisco, owing to the fact that nearly all fish which are exposed for sale are in a partially-decomposed state. Ice is too high for fishermen and fish-dealers to think of using it for preserving fish. By using smacks fresh fish could be constantly kept on hand. He who first engages in this business will do well."

Deeming this a matter of more than ordinary importance, I have prepared plans (Plates 16, 17, 18) of a sailing welled-boat, which can be built at a moderate cost, and I believe it will be well adapted to the market fishery of southern California, and may, perhaps, also be profitably employed at San Francisco and elsewhere on the west coast.[1]

In making the designs for this boat I have been influenced somewhat by consideration of the fact that she can carry comparatively little ballast, owing to her buoyancy being decreased to the extent of the capacity of the well. Therefore she has ample beam to give her the requisite stability. Since it is also necessary to have as much capacity in the well as practicable, her depth is considerable. This feature will, however, improve her sea-going qualities.

If a portion of the ballast can be put outside, in the form of a metal keel, it will add materially to the stability, and, at the same time, make the boat easier in a sea-way, since then the weights will be more central than if put inside, where they can be placed only forward and aft of the well.

The arrangement of the deck and interior must be adapted to the special needs of those who use the boat, and may vary considerably in different localities. I will suggest, however, that tolerably comfortable quarters for sleeping and cooking can be had forward of the well (Plate 17, fig. 2), and in that part of the boat the deck might be nearly flush with the rail, as indicated, to give the maximum of head-room. Aft of the cuddy the deck might be lower, as shown in the plan, and in the hold, abaft the well and on each side of it, can be stowed nets, lines, etc., also fish that die in the well, or otherwise.

[1] In most cases it will doubtless be most economical for those fishermen who have suitable boats to build wells in the boats they now own. This can be done at little cost. It will probably be necessary to use a live-car in connection with each boat, this to be moored at the market port for the storage of such fish as can not be immediately disposed of.

The cutter rig is the one best adapted to a boat of this kind when speed is a special requisite. Besides, a running bowsprit (which can be pulled in when the sea is rough) and a housing top-mast add materially to the power and efficiency of a boat in heavy weather. The sail plan, Plate 18, shows a large area of canvas, most noticeable, perhaps, in the club gaff-topsail. But the prevalence of light winds on the Pacific coast during a portion of the year seems to call for considerable light canvas, and, on a boat like this, it can be easily managed and will do most effective work.

The special feature of this boat is, however, the well. It is believed that the so-called "box well" (Plate 17, figs. 1 and 2), which is peculiar to the Key West "smackees," is the style best adapted to market fishing, and for this reason such an one has been shown on the plans. If greater capacity for living fish is required it can be obtained by making the well of the ordinary type with a deck, and building it with "primings-out." It is probable, though, that a box well will be found quite sufficient to accommodate the catch from day to day, and any surplus which can not be marketed can be transferred to live-cars, as previously mentioned.

The plans have been made for a boat of such size as is believed to be most suitable for the market fishery of the west coast. It is, however, entirely feasible to construct one smaller or larger from the plans, as will be understood by practical builders.[1]

The following are the principal dimensions:

	Feet.	Inches.
Length over all	34	3
Length, load water line	28	2
Beam, extreme	10	9
Beam, load water line	9	7½
Depth, deck to keel, amidships	6	0
Draught, extreme	5	½
Least freeboard	1	9
Length of well, extreme	8	0
Length of well at deck	3	0
Width of well, extreme	5	0
Width of well at deck	2	0
Mast, from fore side of stem at deck	10	9½
Mast, deck to hounds	22	9
Masthead	4	6
Topmast, fid to truck	22	0
Boom	30	6
Gaff	20	0
Bowsprit, outside stem	14	6
Topsail pole	23	0
Topsail club	16	6

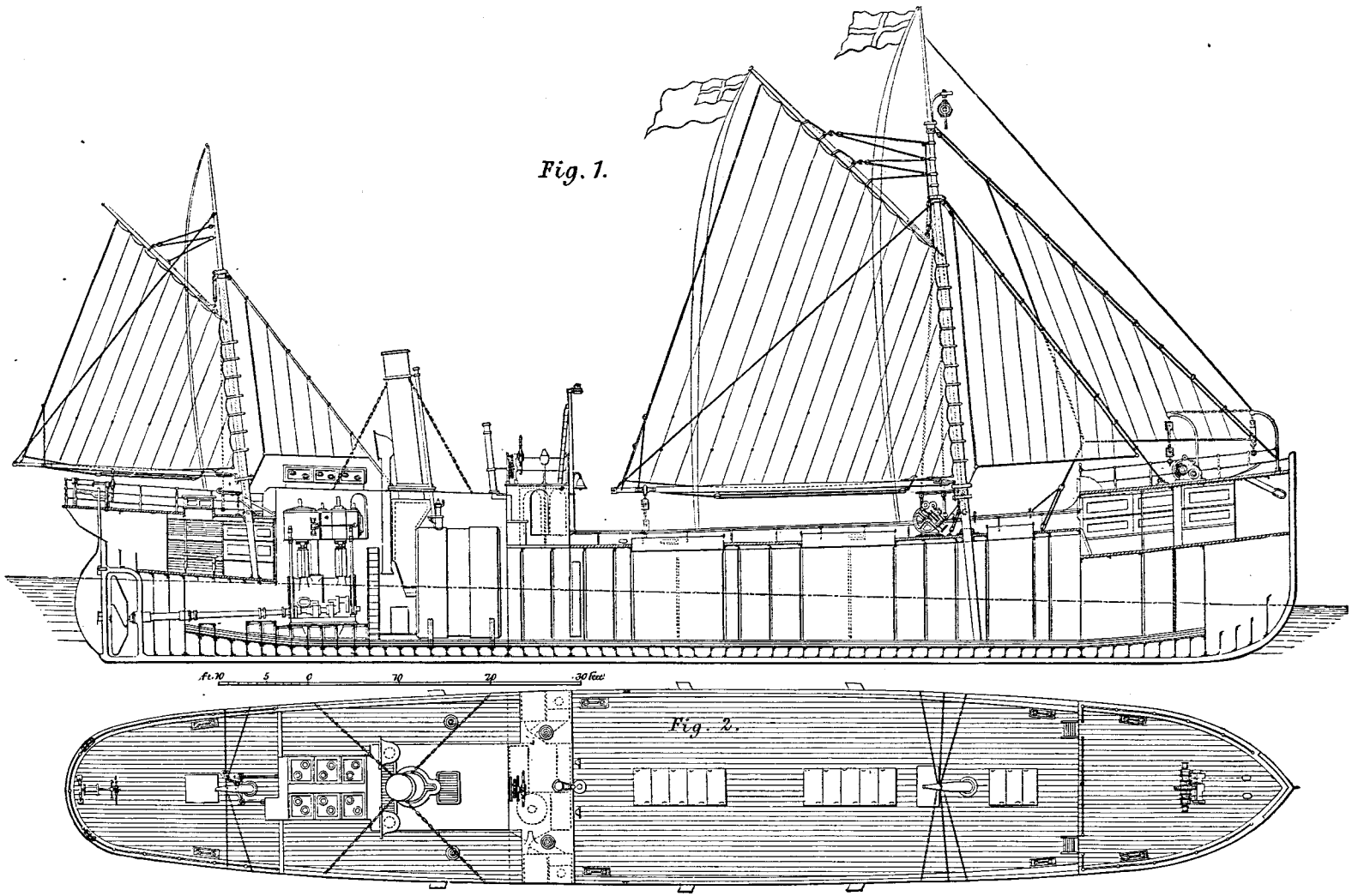
F.—NOTES ON BRITISH FISHING STEAMERS.[2]

1. STEAM FISH-CARRIERS.

No vessels employed in the British fisheries play a more important part than those which are termed "carriers," the chief business of which is the transportation of fresh fish from the fleets of beam-trawlers in the North Sea to the principal markets.

[1] The lines have been drawn to show the form and dimensions of the boat to outside of planking instead of to outside of frames, as is commonly the case.

[2] These notes are extracted from a manuscript report, prepared by the writer, on the fishing vessels of foreign countries.



PLANS OF STEAM FISH-CARRIER AUSTRALIA.

FIG. 1. Sectional elevation and sail plan.

FIG. 2. Deck plan.

There are two distinct systems of fishing adopted by the trawling smacks. One is called "fleeting," and the other the "single-boating" system. When pursuing the former an arrangement is made between a number of vessels to fish in company, thus forming a fleet, one of the captains, an experienced fisherman, being appointed *pro tem.* as an "admiral," whose duty and privilege it is to decide upon what grounds the fleet he commands shall fish, and by a system of signals he controls and directs the movements and operations of all the smacks following his flag. The others put out their gear in response to a signal from the admiral, and they all head on the same tack, towing their trawls together in the same direction.

"In connection with each of the fleets there are several steam-vessels, called steam-cutters, which ply to and fro between the fleet and the port where the fish has to be discharged, generally London, Hull, or Grimsby. One of these cutters is generally arriving every day at the fleet, and the fish which have been caught by the smacks, and have on board of them been packed in boxes, are transferred or boarded in the smacks' boats to the steam-cutter, with which she then goes back to her port of discharge. The smacks engaged in fleeting remain at sea for periods varying from six to eight or ten weeks, when they return to their port to refit. From Yarmouth there are about six hundred and seventy smacks engaged in fleeting and thirty in single-boating all the winter and summer; from Hull one hundred and fifty or two hundred are engaged in fleeting, and from two hundred to two hundred and fifty in single-boating in the winter, and in the summer nearly all are engaged in fleeting; and from Grimsby there are about three hundred engaged in fleeting and 100 in single-boating in summer; but none of them go fleeting in winter."[1]

Messrs. Hewett & Co., of London, who own a large fleet of trawlers, have the reputation of being the first to introduce the system of fleeting. Their carriers at first were swift-sailing cutters like the trawlers now employed at Brixham.

"These carriers," writes Dunell, "would visit the North Sea fleet and bring in the fish in all weathers. Perhaps in the whole history of sea-faring life there has never been a better example of the courage and endurance of sailors than was shown by the skippers and crews of the old sailing carriers. 'No matter what the time of year, so long as the boat could stagger under her canvas she was driven hard through all weathers. 'So great was the desire of the men to get their fish in that nothing was thought of danger and little of personal discomfort. Hardships that can be but faintly imagined by those who have not known what it is to be continually forcing a passage in winter at sea, were cheerfully undergone month after month by these men, they caring nothing so long as their fish were in time for the market."[2]

The importance of this carrying trade, as indicated by the foregoing statements, naturally led to the introduction of steam-vessels to take the place of sailing carriers, for it was soon found that adverse winds or calms rendered uncertain the supply of fresh fish, notwithstanding the fact that every possible effort was put forth by the crews of the cutters. Steam-carriers were sent out to take the fish from Hewett's fleet as early as 1864, but they were not employed from Hull until 1880.

These steamers, as a rule, have been designed especially for the trade. They are built of iron, generally not extremely sharp; the most important qualifications in

[1] Report to the Board of Trade on the system of deep-sea trawl-fishing as conducted in the North Sea. London, 1883.

[2] George R. Dunell, in (London) "Engineering," August 10, 1884.

such vessels being good carrying capacity and sea-worthiness, with the ability to make headway against strong winds and heavy head seas. One who has sailed many months in a steam-carrier told the writer that he never had seen a time when that vessel would not keep on her course, and make good progress, when she was bound to market.

The London steamers are celebrated for having more than the usual amount of sheer—indeed, they are decidedly crooked, with their ends well up from the water even when they are deeply loaded. But, as a rule, vessels of this class are not remarkable for having a strong sheer, and some of them are rather straight on top.

The steam-carriers built and engined by Earle's Ship-building and Engineering Company (limited), of Hull, enjoy a very high reputation amongst those interested in the beam-trawl fisheries. The illustrations (Figs. 1 and 2, Plate 19) are a longitudinal section with sail plan and deck plan of the *Australia*, one of the latest built and best of the steam-carriers produced by the above-mentioned firm.

The form of this vessel is excellent, considering the purpose for which she is intended. She has a moderately sharp bow, rather strongly convex above the water, which gives her good lifting power, or buoyancy, forward, when plunging into a sea; her stem is straight and nearly vertical above the water-line, but curved below. She has a long, rather flat midship section, with low, rounding bilge, short but clean run, and a rather light and graceful stern.

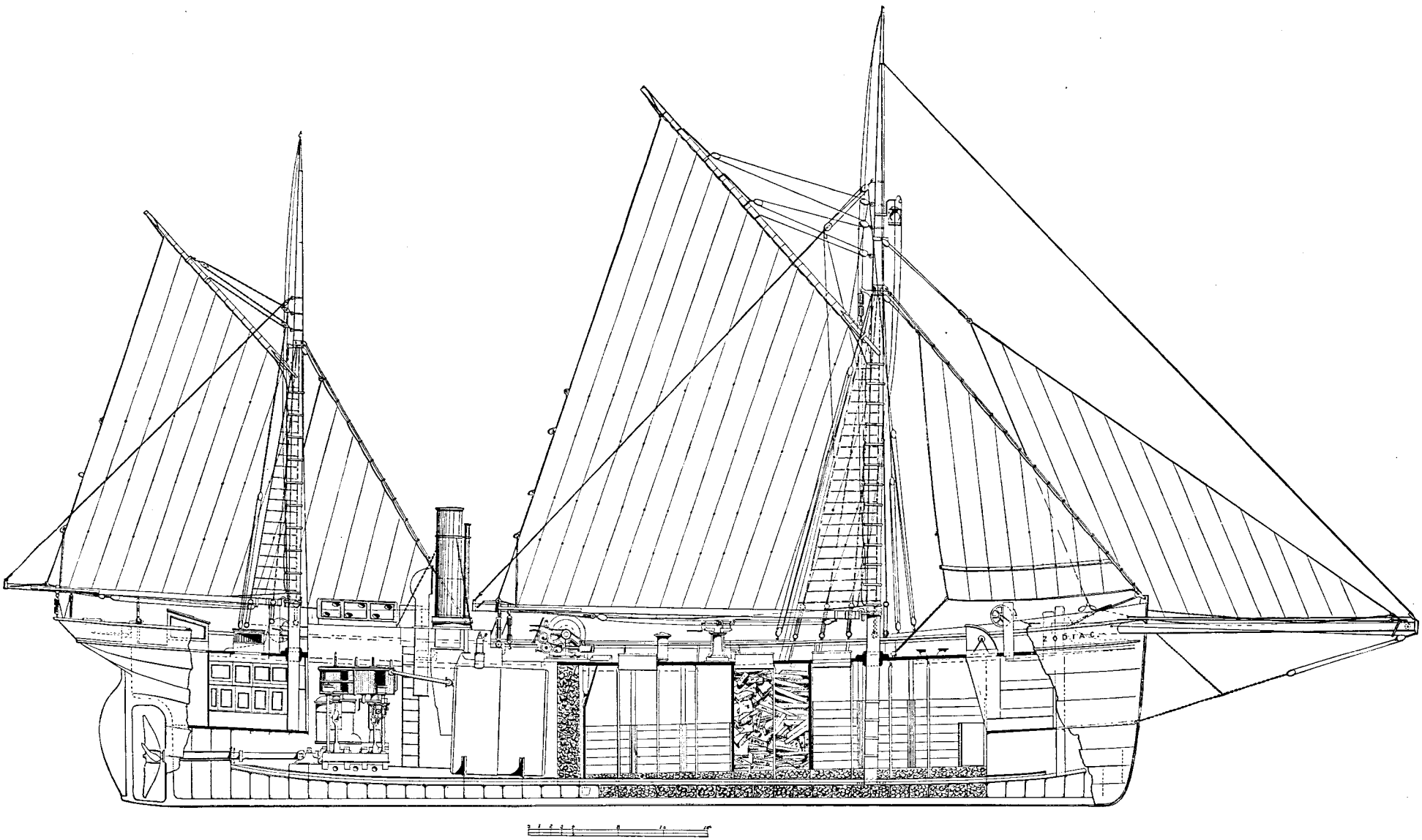
The following are the under-deck arrangements: Abaft the forecastle, and separated from it by a bulkhead, is the ice-room, this being entered through a hatch which is located just aft of the forecastle companion. The ice-house is 9 feet long, fore and aft, and holds 25 to 35 tons of ice. Abaft this, and between it and that portion of the vessel where are placed the engine-room and coal bunkers, is the fish-room in which boxes or "trunks" of fish are stowed and iced, whether the vessel is fishing on her own account or acting only as a carrier.[1]

The coal-bunkers are forward of the boiler, and next to the after bulkhead of the fish-room, directly beneath the bridge. They extend from the deck to the keelson, and, when filled with coal, prevent the heat from the furnaces penetrating the bulkhead of the fish-room. Aft of the engine-room is the cabin, where the captain, engineer, and other officers sleep and eat.

The *Australia*, like other vessels of her class, is ketch-rigged, but has no bowsprit, the jib-stay setting up at the stem-head. The forecastle, which affords accommodations for the crew, is partly above the main deck forward; aft, the quarter-deck is flush with the main rail, and underneath this is the cabin.

"The length of the vessel is 135 feet, breadth 22 feet 6 inches, and depth to floors 11 feet. With about 50 tons of permanent ballast on board, the draught forward would be 4 feet 10 inches and aft 10 feet 6 inches, the freeboard being 4 feet 6 inches. The engines are compound surface-condensing, with cylinders 21 inches and 40 inches in diameter, and 27 inches stroke. The cooling surface in the condenser is 617 square feet, the indicated horse-power being 380. The boiler is of the ordinary return-tube type, 12 feet in diameter and 9 feet 6 inches long, having a total heating surface of 1,205

[1] Mr. Charles Hellyer, a smack owner of Hull, is my authority for stating that these vessels occasionally engage in trawling, particularly when, owing to calms or other interruptions, the sailing trawlers are detained somewhat from working, and therefore have not enough fish to load the carrier when she arrives at the fleet.



SECTIONAL ELEVATION AND SAIL PLAN OF STEAM-TRAWLER ZODIAC. (See page 183.)

square feet and a grate surface of 38.5 square feet, the working pressure being 80 pounds. On the official trial of this vessel a speed of 10.8 knots was obtained, the consumption of coal per twenty-four hours being between eight and nine tons."[1]

These steam-carriers have a capacity for cargo of from 3,000 to 3,500 "trunks" of fish, each trunk or box holding from 80 to 90 pounds. The amount of ice carried to preserve these fish varies from 10 tons in winter to 25 or 35 tons in summer.

The crew, as a rule, numbers twelve men, all told, four of these being in the engine-room, and eight on deck and in the galley. The deck gang is composed of the captain, mate, boatswain, and four seamen, while the cooking is done by one of the men, who is usually called a steward.

2. ENGLISH STEAM-TRAWLERS.

The Grimsby Steam Trawling Company was established in 1881, and in the beginning of the following year (1882) it commenced practical operations with two steamers.

The pioneer vessel of this company, the *Zodiac*, was soon followed by the *Aries*, and so successful did these two vessels prove that in 1883 four other steamers had been added to the fleet.

These are all iron, ketch-rigged, screw steamers, and differ chiefly in length, the more recently built vessels being a few feet longer than the others—the beam and depth remaining the same—and having a high quarter-deck.

Description of the steam-trawler Zodiac.—The *Zodiac* has a flush deck, with a forecastle under deck forward, aft of which is the forward fish-room. Between the two fish-rooms is the ice-house, provided with air-tight doors, in which is stored the ice that is used for preserving the cargo, and of which the vessel carries 8 tons in winter and 15 tons in summer. This ice-house is just abaft the mainmast. It extends from side to side and is about 7 feet fore and aft. Just abaft the after fish-room is the forward coal-bunker, which extends from deck to keelson and from side to side. This is located a little aft of amidships, and between it and the cabin, at the stern, are the boiler and the engine-room. She has engines which are essentially the same as those supplied to other vessels of this class, the cylinders are compound surface-condensing, 17 inches and 32 inches in diameter by 18 inches stroke; cooling surface in condenser 350 square feet; boiler, return-tube pattern, 9 feet 8 inches diameter, and 8 feet 10 inches long; heating surface 653 square feet; grate surface, 19.25 square feet; working pressure, 75 pounds; indicated horse-power, 182. The speed on trial was nearly 9 knots; consumption of coal per twenty-four hours is about four tons.

The *Zodiac* is 98 feet over all, 92 feet between perpendiculars, 20 feet (molded) beam, and 10 feet 6 inches deep.

Details of construction of a steam-trawler.—The following are the details of dimensions, construction, etc., of one of the recent additions to the Grimsby Company's fleet of steam-trawlers: Length between perpendiculars, 95 feet; beam, 20 feet; depth of hold, 10 feet 6 inches. Spars: Pole foremast, 70 feet long, 26 feet from eyes of rigging to truck, diameter at deck, 15 inches; pole mizzen-mast, 57 feet long, 21 feet feet from rigging to truck, 13 inches diameter at deck; bowsprit, full length, 33 feet,

[1] "Engineering," August 10, 1883.

diameter at gammon-hole, 11 inches; main-boom, 40 feet long, diameter 10 inches; main-gaff, length, 32 feet; mizzen-boom, length, 25 feet; mizzen-gaff, length, 19 feet; two topsail-yards, the forward one 12 feet long and the after one 15 feet.

The sails are made of canvas of the following weights: The mainsail and foresail are made of No. 1, extra G; small (or "storm") jib, No. 0, extra G; second jib and mizzen, No. 1, ordinary; big jib, fore-topsail, and mizzen-staysail, No. 2; and mizzen-topsail of No. 3. The dimensions of the lower sails carried by the *Zodiac* are: Jib—luff, 49 feet; leach, 27 feet; foot, 27 feet. Stay-foresail—luff, 29 feet 3 inches; leach, 23 feet 6 inches; foot, 16 feet 6 inches. Mainsail—luff, 22 feet 6 inches; leach, 45 feet; foot, 32 feet 6 inches; head, 27 feet. Mizzen-staysail—luff (about), 22 feet 10 inches; leach, 20 feet; foot, 17 feet 3 inches. Mizzen—luff, 19 feet 6 inches; leach, 32 feet; foot, 21 feet; head, 20 feet.

These vessels are built to class 100 A1 at Lloyd's. They are provided with accommodations for eight men, there being four berths aft in the cabin for the officers, and four berths forward. The cabin and forecastle are fitted in a comfortable and substantial manner, are provided with side and deck lights, and each has a cooking-stove of an approved pattern.

Nothing but the best material of its respective class is used in the construction of these trawlers. The butts of all plating, the stringers and keel, are planed and drawn hard together All butt strips are $\frac{1}{16}$ in. thicker than plates they connect, and all are double-riveted. The double lugs on the frames, for the attachment of stringers, are of the same scantlings as reverse bars, and fixed with at least three rivets.

The liners behind the frames, at alternate strakes of outside plating, and wherever required, are made in one piece, so that they accurately fill the space in length, breadth, and thickness. All stringers are continued fore and aft, the bulkheads and other obstructions being notched and made good up to them.

The keel and stem are made of bulb bar-iron $7\frac{1}{2}$ by $1\frac{1}{4}$ inches. The stern frame is $7\frac{1}{2}$ by $2\frac{1}{4}$ inches. The frames are angle-iron, 3 by $2\frac{1}{2}$ by $\frac{6}{16}$ inches. The reverse bars are of angle-iron, $2\frac{1}{2}$ by $2\frac{1}{2}$ by $\frac{4}{16}$ inches, every alternate one running up to the deck and above the bilge stringers. The floors are of plate-iron, 13 by $\frac{5}{16}$ inches. The keelson is made of two bars of angle-iron 4 by 3 by $\frac{8}{16}$ inches, running fore and aft, with a bulb bar 8 by $\frac{8}{16}$ inches, between, extending from fore bulkhead to 3 feet 6 inches abaft of the aft engine-room bulkhead. The stern frames for bulwark are 4 by 3 by $\frac{7}{16}$ angle-iron, with $\frac{5}{8}$ plate knees riveted on the top for rail. The bilge stringers are composed of two bars of angle-iron 3 by 3 by $\frac{6}{16}$ inches, riveted back to back, and to double reverse bars, being properly tied at each end by a plate hook and riveted. The stringer between bilge and deck is made of two bars of angle-iron, 3 by 3 by $\frac{6}{16}$ inches riveted back to back, and to reverse bar and lugs, and is continued fore and aft. It is properly connected forward and aft by plate hooks between the bars and riveted. The main deck stringer is of plate iron 24 by $\frac{6}{16}$ inches wide, tapering to twenty inches at ends, fitted to skin with a 3 by 3 by $\frac{6}{16}$ inches angle bar which is riveted to the skin, and stringer carried fore and aft the vessel. The deck ties on the beams are 8 by $\frac{8}{8}$ inches, and are carried fore and aft. The deck beams are made of angle-iron $5\frac{1}{2}$ by 3 by $\frac{9}{16}$ inches, with welded ends riveted to each end with not less than four rivets. The carlins and fore-and-afters are all of the same dimensions as the beams; double fore-and-afters are placed where the bitts go through the deck, and plates are riveted on the top before the deck is laid, not less than $\frac{5}{16}$-inch thick.

Fig. 1.

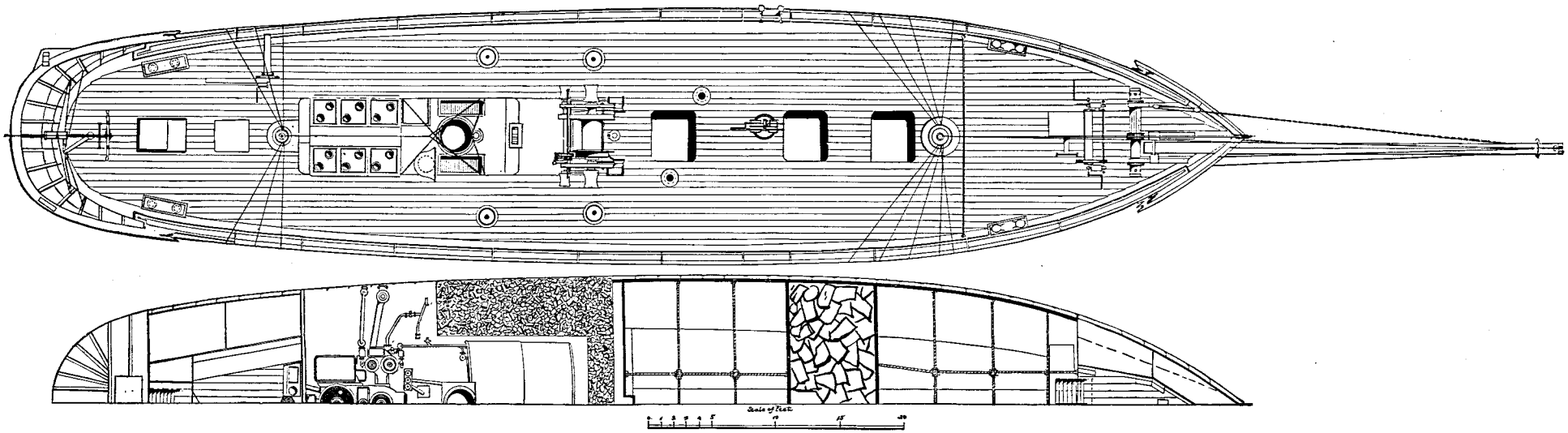


Fig. 2.

PLANS OF STEAM-TRAWLER ZODIAC.

FIG. 1. Deck plan.

FIG. 2. Half-breadth plan with deck removed, showing interior arrangement.

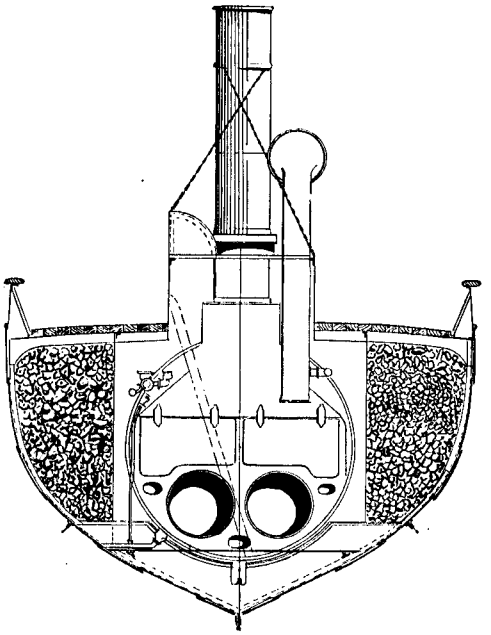
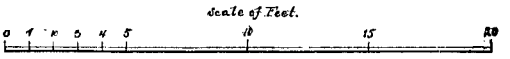


Fig. 1.



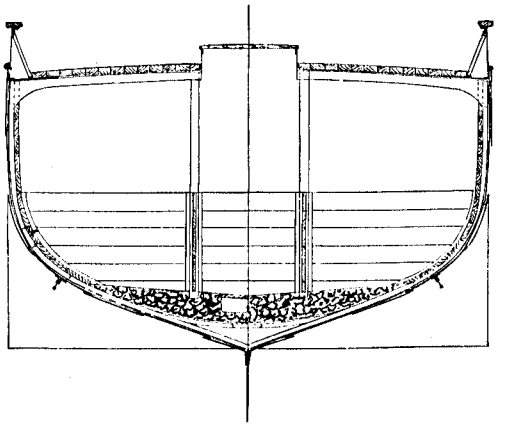


Fig. 2.

PLANS OF STEAM-TRAWLER ZODIAC.

FIG. 1. Cross-section in boiler-room, showing location of boiler, coal-bunkers, etc.
FIG. 2. Midship section, showing construction, ballast, etc.

Iron plates, from $\frac{5}{16}$ to $\frac{7}{16}$ inches, are riveted to the beams in the wake of all coamings, dandy winch, windlass, capstan, fore-winch drum, etc. All of the chocks under deck, between the beams, for properly securing the same, are made the depth of the beam in thickness.

There are three water-tight bulkheads, carried up to the deck, of $\frac{4}{16}$-inch plate-iron, stiffened with $2\frac{1}{2}$ by $2\frac{1}{2}$ by $\frac{4}{16}$ inches angle-iron, provided with valves to be worked from the deck.

The outside plating is as follows: The garboard strakes, two bilge strakes at each side, sheer strake, and boss-plates are $\frac{7}{16}$ of an inch thick, the remainder of the shell plating being $\frac{6}{16}$ of an inch thick. The bulwark plates are $\frac{4}{16}$, except the two fore-plates and the plates in the wake of the rigging, which are $\frac{6}{16}$ of an inch thick. The bulwarks are provided with two water-ports on each side. The rudder head is $3\frac{1}{2}$ inches diameter and $2\frac{1}{4}$ inches at the heel; it has a welded wrought-iron frame, and is plated with $\frac{4}{16}$-inch plates.

The boiler is made of steel. There are two side bunkers and one athwartship for coal (as shown in the plans, Plates 21, 22, and 23), the whole having sufficient capacity to hold fuel enough for fourteen days' consumption.

The knight-heads are oak, $5\frac{1}{2}$ inches thick, and extend 5 feet on each side of the stem; they are pierced with hawse pipes and bowsprit hole. The forward warping chocks are also of oak.

The deck is pitch pine, the planks being 6 by $3\frac{1}{2}$ inches. The space below deck, under the capstan, is filled in solid with American elm chocks, and oak planking 14 inches wide is laid next to the gunwale bar, fore and aft, and also for capstan, windlass bitts, alongside of the hatchways, etc.

Two-inch pitch pine is used for ceiling in the hold, carried from keelson to deck, and caulked so that it is perfectly tight above the ballast. The coal bunkers are sheathed with 2-inch American elm. The hatch coamings are iron, with round corners of plate-iron 12 by $\frac{6}{16}$ inches, with half-round iron bar $2\frac{1}{2}$ by $1\frac{1}{4}$ inches, round top edges, and they are $9\frac{1}{2}$ inches in height above deck. The bulwark stanchions are iron $1\frac{5}{8}$ inches in diameter. The beam stanchions in the hold are $2\frac{1}{2}$ inches round iron. The rail-bar is 4 by 3 by $\frac{5}{16}$ inches angle-iron; and the beading iron is half-round bar $2\frac{1}{2}$ by $\frac{3}{4}$ inches, this being fastened with $\frac{3}{4}$-inch rivets 12 inches apart.

The main rail is made of American elm, $7\frac{1}{2}$ by $3\frac{1}{2}$ inches, with a greenheart capping on top, $6\frac{1}{2}$ by $2\frac{1}{2}$ inches, extending about 40 feet on each side, and well rounded on top. There is also an iron bar fastened to the outer edge of the capping with a 6 by $2\frac{1}{2}$ inch sheave at each side of the forward end of the towing chock.

The windlass is the ordinary handspike form, and is provided with a lever-ratchet purchase on the spindle outside of the bitts. The forward winch, similar to those on sailing trawlers, is carried, and, by a peculiar arrangement, the winch and windlass can be combined on one set of bitts, if necessary. There is a steam drum for winding in wire warp. This is provided with reversing gear and separate action of main barrel and winch ends at end of drum, with brake power, separate pawls to main barrel, and ends fitted with hand gear to treble purchase. There is also a capstan similar to those on a sailing trawler, which acts as a fair-leader to the drum. The dandy winch, placed at the mizzen rigging on the port side, is the same as the improved forms used on other trawlers. The trawl-warp gangway is provided with both horizontal and vertical iron rollers. There are two bollards aft for towing, and one revolving bollard

or sampson post on each side. At each side there is a rolling chock 30 feet long, made of bulb bar-iron $7\frac{8}{16}$ inches between two angle-bars 3 by $3\frac{1}{2}$ by $\frac{6}{16}$ inches, riveted to the ship's sides. The sheet of the stay-foresail works on an iron traveler, which extends from side to side of the bow. The chains are galvanized, and the anchors are of the ordinary short-shanked pattern carried by other trawlers. The side of the vessel is made flush, the chain plates being riveted to the bulwarks, so that boats may come alongside in a sea-way without being damaged by projections.

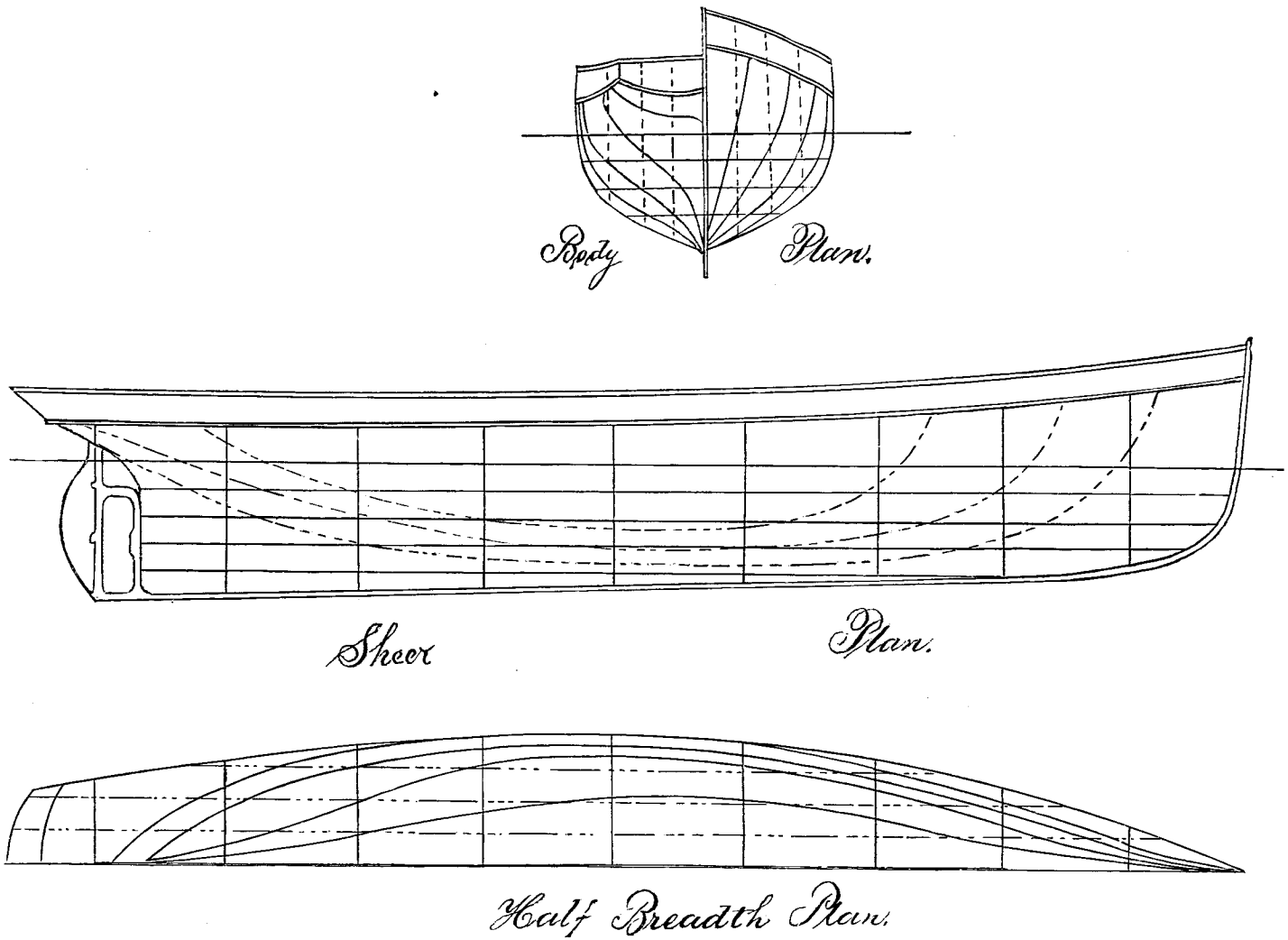
Provision is made to pump the vessel out by steam, but she is also supplied with a 6-inch hand pump. There are two iron water-tanks, having a total capacity of 500 gallons.

About 40 tons of ballast are carried, this being the best iron slag; it is grouted in with cement, and over the top of the ballast there is put a 3-inch face of Portland cement. The cement is rabbeted to take a wooden cover 2 inches thick, and a 9-inch gutter is left in the center for drainage purposes. In the ice-room a redwood floor, $2\frac{1}{2}$ inches thick, is laid on top of the ballast and firmly secured.

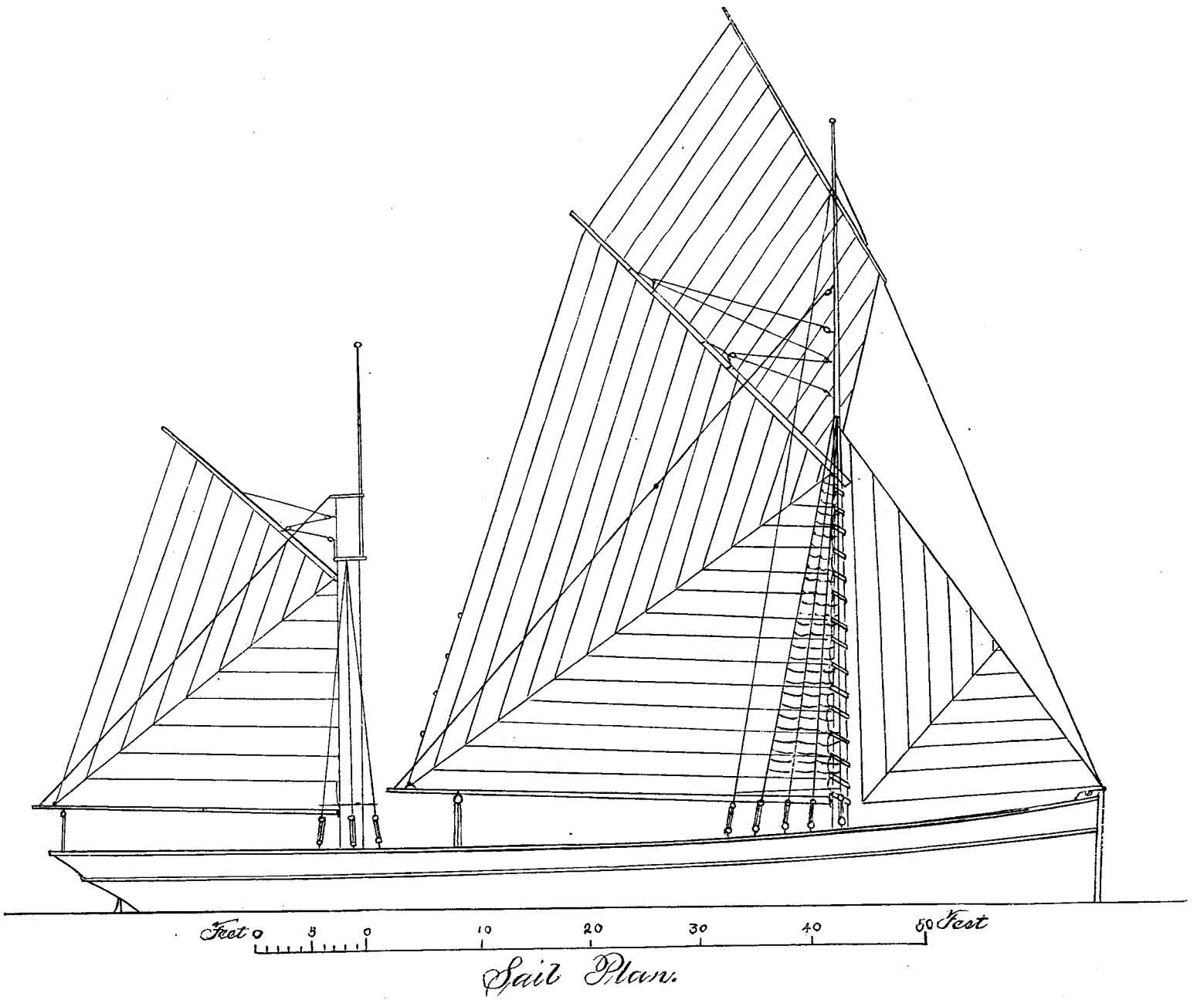
Description of one of the latest built steam-trawlers.—A fine model of one of the most recently built steam-trawlers of the Grimsby Company's fleet, which differs somewhat from the *Zodiac*, was exhibited at London, 1883. The lines of this vessel are excellent for sea-worthiness, carrying capacity, and for a reasonable amount of speed. She is moderately sharp forward, with straight stem and nearly square fore-foot; rounding bilge, with medium dead-rise; a long, finely shaped run, and round stern. She has more sheer than the average vessel of this class, which, with the high bow chock forward, and raised quarter-deck aft, gives gracefulness to her appearance, which is all the more pleasing because of its general absence in British steam fishing vessels.[1] The main deck extends from the bow to within about 25 feet of the stern, where the quarter-deck begins; the latter adds to the height of the after section, and gives more cabin room. The bridge extending from side to side, and elevated 7 to 8 feet above the main deck, is placed just forward of the quarter, and over the after part of the engine-room. It is protected by a metal railing, and is reached by steps, from the quarter-deck, on the starboard side. The cabin companion is on the quarter-deck, just forward of the mizzen-mast, and a little to starboard of the latter. A large skylight abaft the mizzen-mast affords light and ventilation to the cabin. The entrance to the forecastle is aft of the windlass, while three hatches, one foreward of the main-mast and two aft of it, on the main deck, lead to the hold and fish-rooms. The trawl-warp roller is on the port side (about 5 feet aft of the main rigging), and a capstan stands abreast of the roller in the middle of the deck. On the main deck, a little forward of the smoke-stack, is a steam winch for winding in the trawl-warp, hoisting sails, etc., and the dandy winch, or "wink," is on the port forward end of the quarter. The boat is carried on the davits aft of the starboard main rigging. As previously stated, the rig differs in no essential particular from that of the *Zodiac*.

She is 70.63 tons; her length, breadth, and depth being the same as have already been given. She carries a 60-foot trawl-beam, and has a capacity for 1,700 "trunks" of fish. Her speed, under steam alone, is 10 knots, and, being so heavily rigged, she

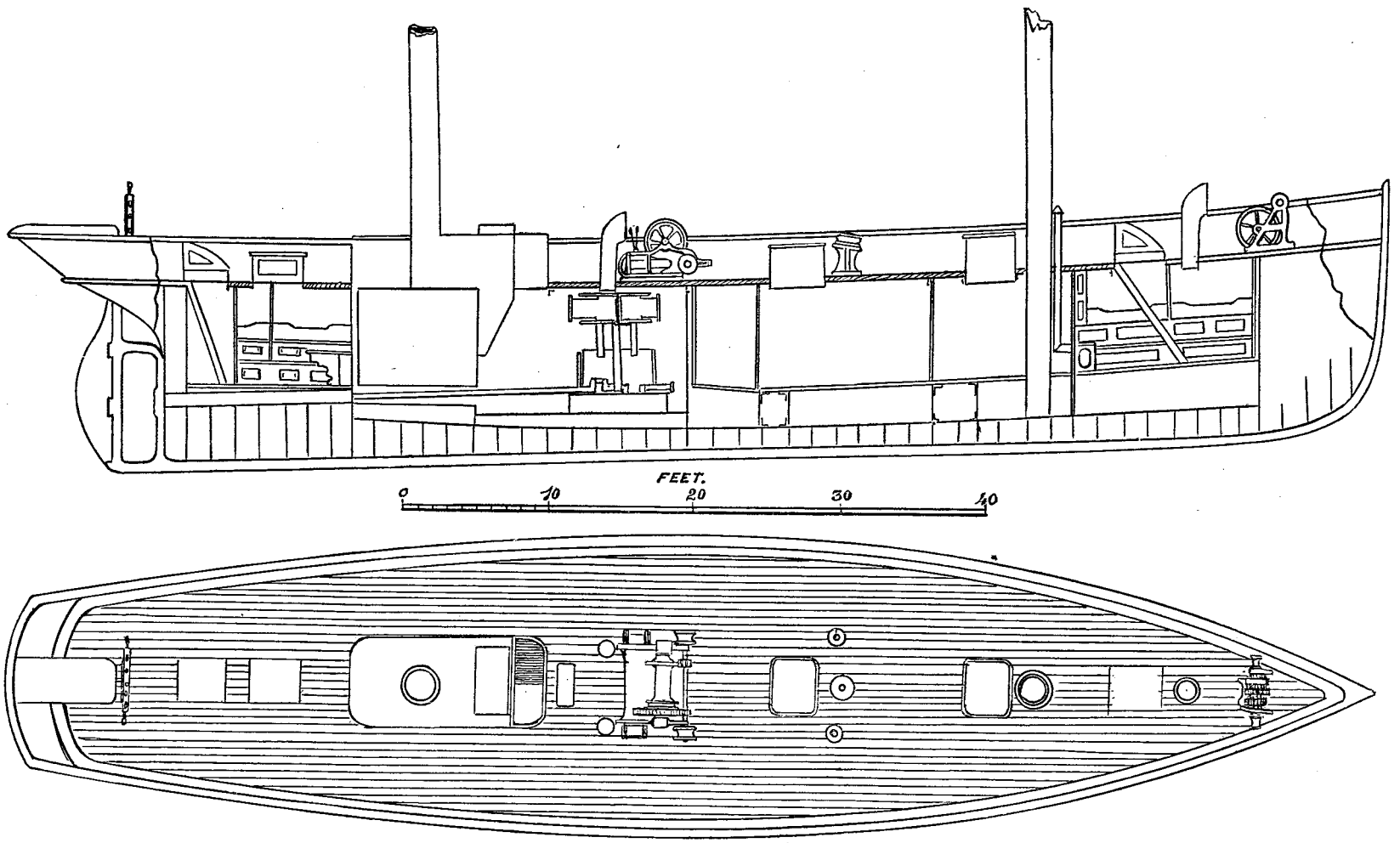
[1] Many of the fishing steamers, probably most of them, judging by the models exhibited at London, are flush-decked, and some are so straight on top that their appearance is not pleasing to the eye. In some cases they looked almost as if they were "hogged." The vessel above described differs from the *Zodiac* chiefly in having a raised quarter-deck.



PLANS OF STEAM-TRAWLER DESIGNED BY W. E. REDWAY. (See page 187.)



SAIL PLAN OF REDWAY'S STEAMER. (See page 187.)



SECTIONAL ELEVATION AND DECK PLAN OF STEAM-TRAWLER DESIGNED BY REDWAY. (See page 187.)

will often make 11 to 13 knots under sail and steam. Often, when vessels of this class have a favorable wind, they disconnect the screw and run under sail alone.

Cost and expense of running a steam-trawler.—A steam-trawler, such as has been described, would cost from £4,000 to £4,500 ($20,000 to $22,500), which is about three times as much as a first-class sailing trawler would cost. Then a steamer is more expensive to run. In the first place, she must have three more men, of the class, too, that receive high pay; then there are the repairs to machinery, coal, oil, etc., which together amount to quite a sum. As an offset to this, a steamer will stock from twice to three times as much as a sailing trawler.

Redway's steamer.—The smaller class of steamers designed alone for fishing are sometimes considerably sharper than those from Grimsby, not requiring so much carrying capacity The following details of dimensions, etc., are those of a design by W. E. Redway, of Milford Haven (Plates 23, 24, and 25), from which several steam-trawlers were built in 1883. This type of vessel is now in high favor, it is said, and it is claimed that they are very serviceable, swift, and sea-worthy.

The following are the principal details of a vessel of this type:

	Feet.	Inches.
Length by Lloyd's measurement	87	6
Breadth by Lloyd's measurement	20	0
Depth by Lloyd's measurement	12	4
Depth of hold	10	8
Load draught	10	6
Least height of freeboard	2	9

	Tons.
Tonnage gross register (approximately)	96
Tonnage net register (approximately)	50
Builder's measurement	155
Weight of hull	62
Weight of machinery	20
Weight of outfit	15
Weight of coal	20
Weight of water	10
Total dead weight capacity	48
Total displacement	175

Elements of design of hull:

Length of fore body	feet	48
Length of after body	do	40.5
Area of immersed midship section	square feet	118
Ratio that area of immersed midship section bears to its circumscribing rectangle		.65
Area of load water plane	square feet	1,218
Ratio that load water plane bears to its circumscribing rectangle		.688
Displacement per inch of immersion at load water line	tons	2.9
Square feet of immersed surface		2,082
Square feet of augmented surface		3,836

Coefficient of fineness $= \frac{\text{displacement}}{\text{LXBXD}} = .390$

Area immersed vertical longitudinal section	square feet	770
Center of lateral resistance from fore end of load water line	feet	47.4
Center of buoyancy below load water line	do	2.99
Metacenter of buoyancy	do	4.68
Area of lower sails	square feet	2,238
Center of effort above load water line	feet	29.25
Center of effort abaft fore end of load water line	do	46.25

The engines fitted to these vessels are of the ordinary inverted compound surface-condensing type with an intermediate receiver. The cylinders are 12 inches and 24 inches in diameter, the stroke being 24 inches. They are supplied with steam by an ordinary return-tube steel boiler.

The vessels are classed 90 A1 at Lloyd's, and as shown in the illustration are dandy-rigged. There is, however, no mizzen-mast proper, the funnel serving for hoisting the after-sail upon, a plan which has evoked most hearty expressions of contempt from some old-fashioned fishermen, but which according to some authorities has stood the test of practical experience and been found to answer well. In regard to the fault found about the funnel serving as a mast, I have heard many complaints from those competent to judge of its merits, and was credibly informed that it had so far proved a failure that many of the owners who have had their vessels provided with funnels of this kind are discarding them and are using the ordinary smoke-stack. There is no bowsprit. It is anticipated that the engines will give about 120 indicated horse-power, and with the fine water lines and beautiful models Mr. Redway has given these craft a good speed should be attained.

The vessels constructed on this design, though sharper than those built for the Grimsby Company, are well proportioned, both for speed and sea-worthiness, and when large carrying capacity is not specially required it is difficult to see where their form can be improved.

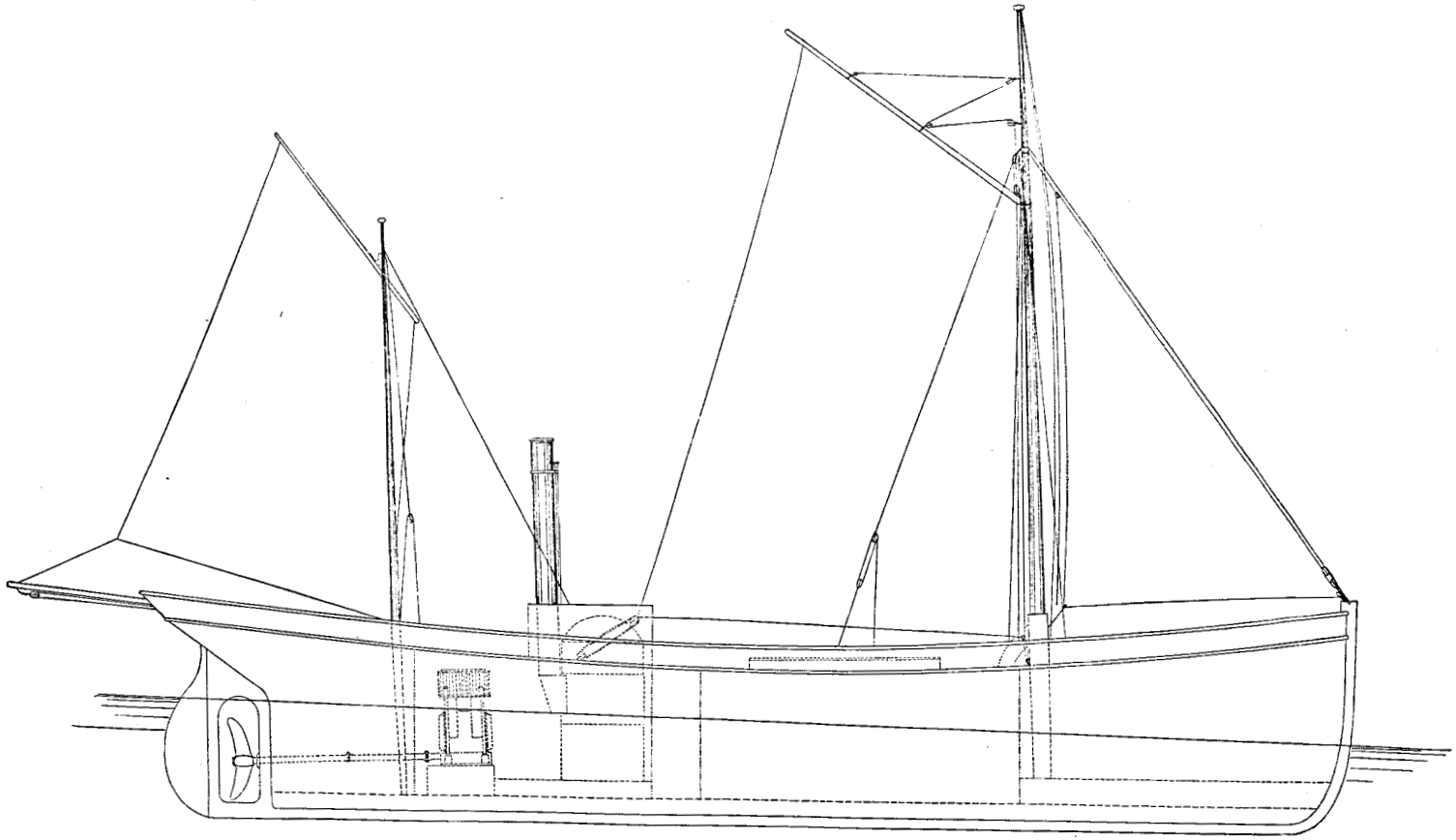
3. LONG-LINE STEAMER.

Steamers have recently been employed successfully in the long-line fisheries of the North Sea. The first vessel of this class was the *Albatross* (Plate 26), which was built in the summer of 1884 for Mr. T. F. Robertson-Carr, of Berwick (now, 1889, Tynemouth). Mr. Carr states that this was the eighth vessel of the kind which has been constructed with a view to arrive at the class of boat that is now wanted on the east coast; she is 10 feet longer than any of the rest. He adds: "What defects I have seen in those already built I have remedied."

In her leading characteristics this vessel is not very much unlike the Scotch steam-trawlers and steam-drifters, which are discussed at length elsewhere. As will appear by the following description, she is so designed that she is equally well adapted to either the drift-net or long-line fishery—though intended for the latter industry—and it is now deemed probable that this class of small steamers will supersede the Scotch fishing luggers, unless steam-tugs are to be extensively used to tow the sailing boats to and from the fishing grounds.

The *Albatross* is a wooden screw steamer, built under Lloyd's special survey. She has an elliptical stern, and a handsome model, the lines being specially fine under water. She is 75 feet long over all, 70 feet between perpendiculars, 17 feet extreme beam, and 8 feet 9 inches deep. The engines are of the compound surface-condensing type, specially designed for craft of this description, and fitted with patent air and circulating pumps. These engines occupy less space than any other; besides, they are simple and more effective than the ordinary form of compound marine engines, while the consumption of fuel is considerably less. The high-pressure cylinder is 8 inches in diameter, and the low-pressure 16 inches diameter, with a stroke of 12 inches. She has a working pressure of 100 pounds per square inch, and 45 indicated horse-power.

Bull. U. S. F. C. 1888.—(To face page 188.) Collins. Fishing Vessels.



Fishing Steamer Albatross.

Scale of Feet.

SHEER AND SAIL PLAN OF STEAMER ALBATROSS.

The after bulkhead of the hold forms the front of the cross coal bunker. This arrangement of having a coal bunker forward of the engine and boilers, extending from side to side, has been found a desirable one, and has been extensively if not universally adopted on all fishing steamers, since by this means the heat from the boilers is prevented from penetrating into the hold and affecting the fish. The after bulkhead of the bunker, the side bunkers, and deck casings are of iron. There is a store-room abaft the engine.

The crew have large accommodations forward, with companion entrance from the deck. There is a sliding door in the bulkhead, so that the "wings" of the hold can be easily reached, this being requisite during the herring fishing, at least before the nets are sorted. There is a large hatchway to the hold which has nothing peculiar in its arrangement.

The vessel is ketch-rigged, with a lug mizzen and outrigger for sheet, and, like the average sailing drifter, she has her mainmast arranged so that it can be lowered when necessary. On account of steam being the principal propelling power, and also for the attainment of "handiness," the sail area is comparatively small, no light sails being carried. She is expected to make a speed, under steam alone, of 8½ knots per hour, and in fresh winds this can be materially increased by the aid of the sails.

4. SCOTCH STEAM SCREW TRAWLERS.

One of the best types of screw trawlers used in Scotland was represented at London by two rigged models exhibited by a Granton firm who are well-known builders of fishing steamers.[1] These were the models of the steamers *Granton* and *Gannet*, which apparently differ only in size. The vessels are adapted to trawling, net and line fishing, and carrying purposes. They are, however, used chiefly as trawlers. They are carvel-built, keel craft, have excellent lines for sea-worthiness, and are swift enough for all practical purposes, while their form gives them good carrying capacity. They have a moderately sharp, rather straight up-and-down bow—the forward frames being U-shaped—curved forefoot, low deep bilge, with a rather short turn at floor timber-heads, long floor, finely formed run, and round stern, which is rather fuller than the stern of average vessels of this class, thereby giving more buoyancy to this section. They have flush decks, are ketch-rigged, with two masts, and carry three sails (foresail, main, and mizzen). There is a house just aft of the mainmast, which is similar in form and function to the cabin house of an American fishing schooner, and

[1] This firm has built several steamers of about the same type for Spain, France, and the Canary Islands. The following, corroborative of the above, is clipped from an article in the Edinburgh Scotsman of July 2, 1881, describing the opening of the Edinburgh Dock: "A branch of this industry, which only came into existence a few years ago, is the building of wooden screw steam trawling vessels. Messrs. Allan & Co., who may be said to be the inventors of this class of vessel, have now removed from Leith to larger premises at Granton, and their ground has been taken by Messrs. Ramage & Ferguson. The first steam trawling vessel of the kind, the *Pioneer*, was launched in 1877, and since that date fourteen vessels of a similar construction have been launched. Others are in progress. While some of these vessels were for the home trade, others have gone to Spain, France, and the West Indies. These trawlers have quite revolutionized the fishing industry, and have financially proved most successful."

It may not be out of place to mention here that two special prizes were awarded the firm at the International Fisheries Exhibition, London, in addition to the gold medal, for the excellence of their models.

gives greater height to the cabin. The engine-room is aft of amidships. A steam-winch, for heaving in trawl or net warps, stands just abaft the foremast.

The dimensions of the *Granton* are: Length over all, 108 feet; between perpendiculars, 100 feet; beam, 19 feet; depth, 10 feet. She steams 11 knots, and makes 14 knots, with favorable circumstances, under sail and steam. The following additional particulars have been kindly furnished by the builders, who have also supplied the details of their other steamers, together with the plans: The *Granton's* gross register tonnage is 120 tons; net, 50 tons; cargo measurement, 100 tons; dead weight, 180 tons; draught of water, loaded, 10 feet; same, light, 8 feet. She is provided with compound surface-condensing engines, placed amidships; cylinders, 18 by 34 inches; length of stroke, 24 inches; number of revolutions, 120 per minute. Nominal horse-power is 45; effective horse-power, 225. She has a horizontal multitubular boiler, working pressure, 85 pounds; one steam-winch, and one donkey-engine. The consumption of coal is 3 tons per day; capacity of bunkers, 30 tons. There are three bulkheads and one hatchway.

The dimensions of the *Gannet* are: Length, 102 feet; beam, 18 feet; depth, 10 feet.

The same firm exhibited a builder's model of the screw-boat *Onward*, which was built in 1877, and is 60 feet long between perpendiculars, 16 feet wide, and 7½ feet deep. Her gross register tonnage is 40 tons; net, 20 tons; nominal horse-power, 20; effective horse-power, 100; speed, 8 knots. She had a long, rather full body, hollow floor near the keel, bow full above water (for a steamer), very concave below, short run, and round stern. The shape of this vessel is not so good as that of the others, though it must be borne in mind that the smaller size of the *Onward* did not, perhaps, admit of the fine lines which are noticeable in the *Granton*.

The following interesting history of the attempts to successfully use steam fishing vessels is from the pen of Mr. David Allan, senior partner of the firm of D. Allan & Co. Under date of September 13, 1883, he writes:

"You will observe in the extract from the Scotsman of 25th July, 1881, it is there mentioned that the *Pioneer* was the first steam trawler launched by us in 1877. This is a slight mistake, as the *Pioneer* was simply a fishing boat, built by us with steam-engines of 10 horse-power (driving the vessel about 6 knots an hour in a calm), solely for net and line purposes, in the Shetland Islands. She answers the purpose well for which she was intended; but the people on board were unable to work the machinery, and hence, like many pioneers, she proved unremunerative to the owner.

"The *Onward*, we might say, was the first steamer designed and built especially for fishing purposes. We, however, put small high-pressure engines on board, which were very imperfectly made, and consequently were continually breaking down, and being unable to get any skilled fishermen to go on board, owing to their prejudice to steamers, she also proved unremunerative.

"The *Mamelena 1st*, built from the same lines as the *Onward*, and engined with compound surface-condensing engines, and sold to Messrs. Mercader & Sons, San Sebastian, Spain, was really the first successful screw fishing vessel; and I might say she combines all our experience to that date. The machinery has given every satisfaction, and she happening to fall into the hands of men such as Mr. Mercader and Mr. Goristidi, who was associated with him in the enterprise, both being men of great intelligence and perseverance, they have the credit of being the first to make screw fishing steamers a commercial success, which you can easily see from the fact that they have

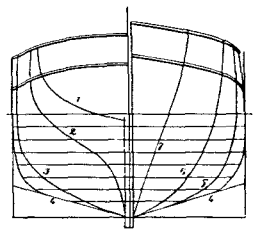


Fig. 1.

Fig. 2.

PLANS OF STEAM-TRAWLER GRANTON.

FIG. 1. Body plan.

FIG. 2. Sheer and sail plan.

Drawn by D. Allan.

since bought two other vessels, viz, *Mamelena* 2*d* and 3*d*, and they are also connected with a fishing company at Canary Islands for which we built three vessels."

The excellent sea-going qualities of these are shown by the following extract from a letter written by the captain of the *Sea Queen*, a vessel similar to the largest fishing steamers. The *Sea Queen*, which is engaged in trading about the West Indies and vicinity, left Leith, Scotland, January 2, 1881, and arrived at Kingston, Jamaica, on February 9, encountering very heavy southwest gales on her passage. A little more than a month later the captain wrote as follows:

"BERMUDA, S. S. SEA QUEEN, 11*th March*, 1881.—I just finished delivering the cargo at St. Anne's Bay, and was leaving, when I got a telegram to come full speed back to Kingston to carry Government dispatches. I arrived there at 6.30 a. m. next morning, and after a detention of two and a half hours, taking coal, water, and stores, was sent off to this place, Bermuda, with news of Colley's death, and the Cape Despatch, with orders to stop the troop ship *Orontes*, with the Ninety-ninth Regiment, and send them to the Cape. H. M. S. *Phœnix* had been dispatched from a place 86 miles nearer Bermuda, twenty-eight hours previously. I had strong head winds the first two days; when I met a heavy northwest gale. Knowing the importance of the mission intrusted to me, and the capabilities of the vessel, I kept on, although it blew with hurricane force at times, and the crew complained that I was trying to drown them. I arrived safely the morning of the fifth day, the distance being 1,130 miles. I got here just in time to stop the *Orontes*, as she was to have left two hours after I arrived. The admiral said he would be doing nothing but his duty in writing the home Government, and the government of Jamaica, of the valuable services I had rendered them in delivering the dispatches. H. M. S. *Phœnix* did not arrive until twenty-four hours after I did, she being hove to thirty-six hours."

5. SCOTCH STEAM-DRIFTERS.

There were four steam-drifters employed in the Scottish herring fisheries in 1883, of which the *Kingfisher* is the type. These were modeled and rigged like the steam-trawlers built at Granton, and which have already been described. The following are the details of dimensions, etc., of the *Kingfisher:* Length over all, 92 feet; between perpendiculars, 85 feet; beam, 18 feet; depth of hold, 9½ feet; tonnage, 80 tons gross; 25 nominal horse-power; speed, 10 knots under steam alone; 12 to 14 knots with steam and sail. The consumption of coal is 2 tons per day when fishing, and 2½ tons when running. She carries 20 tons of permanent stone ballast, and has capacity for 100 tons of cargo.

William Jarvis (ship and boat builder), of Anstruther, Scotland, also exhibited at London a model of a screw steamer intended for the drift-net and long-line fisheries of Scotland. This boat had a sharp bow, concave below water-line, straight stem with square forefoot, hollow floor near keel, but rather flat as it extended outwards, with short turn on bilge, giving good sail-carrying power. The floor merged into a long, fine run, which was thinner than the run of the average British fishing vessel. The stern was round. The screw had only two blades. The model was yawl-rigged, the mizzen being a lug-sail, and the mainsail of the ordinary fore-and-aft type, with gaff, but having no boom. The mainmast, as in nearly all drift-net boats, worked on a hinge

and could be lowered when the nets were out,[1] while she had a running bowsprit. There were two large oblong hatchways just abaft the foremast, the after one of which extended athwartships, and both were provided with rollers on their sides to lessen the friction when the nets were being transferred to and from the hold, which was divided into pens or bins, for the reception of gear and fish. There was a small forecastle at the bow, entered by a companion placed alongside of the mainmast. There were two small hatches on either side of the deck, just forward of the smoke-stack. Aft of the net and fish rooms was the engine-room, while at the extreme after part of the vessel was the cabin, entered by a small companion which stood athwartships close abaft the mizzen-mast. The vessel steered with a tiller. On each side of the bow was a warp-chock with three sheaves. These sheaves were for the purpose of lessening the friction when the net is being hauled in. The dimensions of the vessel represented by this model are as follows: Length over all, 63 feet; on keel, 58½ feet; extreme beam, 16½ feet; draught aft, 7½ feet; height of mainmast above deck, including pole topmast of 13 feet—the whole spar is one piece—is 52 feet; bowsprit, outside stem, 24 feet; main gaff, 24 feet; mizzen-mast above deck, 36 feet; spanker-boom, 24 feet; spanker-yard, 18 feet.

[1]The steamers built by Allan & Co. have no provision for lowering their mast, and, indeed, there seems little use for it, since a steamer can, if necessary, always turn ahead slowly and take any heavy strain off the net.