

occupied with all a world of light, color, atmosphere, form and sentiment that he is content. Content to live because it is delightful to live—content to die because he has lived indeed.

Lillie Devereaux Blake, president of the New York City Woman's Suffrage League, says:

Life to the student of psychology or physiology is a mystery deep and impenetrable. Life to you or me is what we make it. Life is love in all its relations—love of home, children and humanity.

Colonel Robert J. Ingersoll says:

Life is something I know nothing about. It is something that no one knows anything about except the ministers. They know all about it; the other smart men gave it up long ago.

The theological point of view, represented by Dr. R. Heber Newton, runs along parallel lines with Mr. Edison. Does the rector of All Souls' church profess to solve the question? Oh, no. He declares it unsolved and, as it appears to him, unsolvable.

We have not, says he, even a hint from anything around us in the past or future that will help us to the solution. The greatest scientific men of to-day who might be expected to assist us only confuse us the more.

All our roads lead out into mysteries. Science, so far from exhausting this mystery, has only deepened, broadened and heightened it. I will not deny that we have had a vast light shed upon the problem of life.

MERRY-GO-ROUND.

Of all the apparatus constituting the ordinary material of fairs, the one that has undergone the most improvement during the last few years is undoubtedly the merry-go-round. The two-story apparatus, actuated first by a horse and afterward by a steam motor, have gradually replaced the antique affair moved by a winch. To-day such improvements appear insufficient, and they have been completed by various additions, especially by tables revolving around a vertical axis which itself participates in the rotary motion of the merry-go-round, and by the substitution of rocking horses for fixed ones, etc. Our engraving shows a still more complicated arrangement, and which is likely to meet with great success. The carriages, which are placed according to a same radius, are suspended from a cranked shaft formed of two sections connected by a bevel gearing and each carrying two cranks of opposite direction. It follows, in the first place, that carriages 1 and 3 will rise, while 2 and 4 will descend, and inversely; but, moreover, by reason of the motion in contrary direction of the two sections of the shaft, the carriages 1 and 2 will turn in a direction from right to left, for example, while the two others will move in the opposite direction. As the whole is carried along in the general rotary motion of the merry-go-round, it will be seen that the *ensemble* will produce a most curious effect, not only for the persons partici-

decomposition of these older rocks and the accumulation of the tin as gravel.

According to Whitney the ore deposits of this metal occur in four principal forms. These are (first) in flat sheets or beds lying between the laminae of the schists and granites and parallel with one another. Each such deposit is usually quite limited. Such are called floors by the Cornish miners. The second form is the so-called stock work, in which the ore is concentrated in innumerable small veins ramifying through the rock. The third form of occurrence is in true fissure veins, and the fourth in alluvial deposits, which yield the so-called stream tin. This last form is wholly secondary and the ore may have been derived from any one or all of the others mentioned.

There is still a fifth form closely allied to the stock work deposits, but which is of sufficient importance to merit especial attention. In these deposits the cassiterite is found impregnating for varying distances the wall rock adjacent to the true veins, as at the East Huel Lovell mines in Cornwall, or again disseminated throughout the rock apparently quite independently of or but remotely connected with veins, as at some of the Saxon mines, or as is illustrated in a more striking manner in the so-called carbonas of the St. Ives Consuls, also in Cornwall. Such are known as impregnations.

The first promising discovery of tin in America was made at Jackson, New Hampshire, in 1840. A bar of tin smelted from this ore has been for many years among the collections of the National Museum. Another deposit at Winslow, Maine, was at one time regarded as promising, and which attracted considerable attention. The veins, however, were seldom more than an inch in thickness and occurred interlaminated with the rock, the veinstone consisting of purple fluor spar, silvery white mica, and quartz. In the gangue the cassiterite is associated with mispickel.

Tin-bearing areas of greater promise occur along the line of the Appalachians farther to the southwest. According to Arthur Winslow, now State Geologist of Missouri, a tin-bearing area in Virginia "extends along the east edge of Rockbridge County, in the line of the Blue Ridge Mountains, from a few miles north of the James River Gap to about the north line of the county." Throughout this area cassiterite has been found at many points, but that of most promise at the time of writing was considered to be along the upper waters of Irish Creek. The country rock is a coarse hornblende granite intersected by trap dikes, and traversed by numerous fissure veins of quartz, or quartz, iron pyrites and mica, nearly all of which show more or less tin ore. The veins are mostly small, rarely more than a foot or so in width, and the cassiterite occurs in disseminated crystals, nodules and strings. The average yield of tin is, however, low, varying from 0.63 per cent. to 1.12 per cent.

Occasionally the tin stone occurs as a solid veinlet an inch or more in thickness, and mention is made of a nodule found about six feet below the surface nearly a foot in diameter and which consisted of nearly pure cassiterite. The national collections contain a block of ore from the Cash mine in this vicinity which shows a solid mass of cassiterite some 3 to 5 inches in diameter and weighing together with the attached gangue some 76½ pounds.

Tin ore has been found in considerable quantity in the eastern suburb of King's Mountain, Cleveland County, North Carolina. A good deal of prospecting has been done and shafts sunk to the depth of 30 feet. In no place has the deposit, either of drift or vein, been found sufficiently rich to pay for working. The ore here occurs not in greisen, but in quartz veins, and it is stated only in the vicinity of trap dikes.

Cassiterite in quantities sufficient to seemingly warrant the erection of dressing and smelting works occurs in lodes and disseminated in gneiss some two miles southeast of Ashland, Clay County, Alabama. The so-called Broad Arrow mines were located at this point. In 1883 it was stated the mines thus far developed consisted of four open quarries some 30 to 55 feet in depth, the country rock being mica schist interlaminated with six seams of ore-bearing gneiss, which, however, averaged only some 1½ per cent. of ore. These mines apparently proved unprofitable, as they are no longer in operation. Tin ore is also found at Rockford, Coosa County, in same State.

For many years reports have been current of extensive tin fields in the region of the Black Hills of Dakota.

According to Prof. W. P. Blake there are three well-defined districts of tin-bearing lodes in that region. These are:

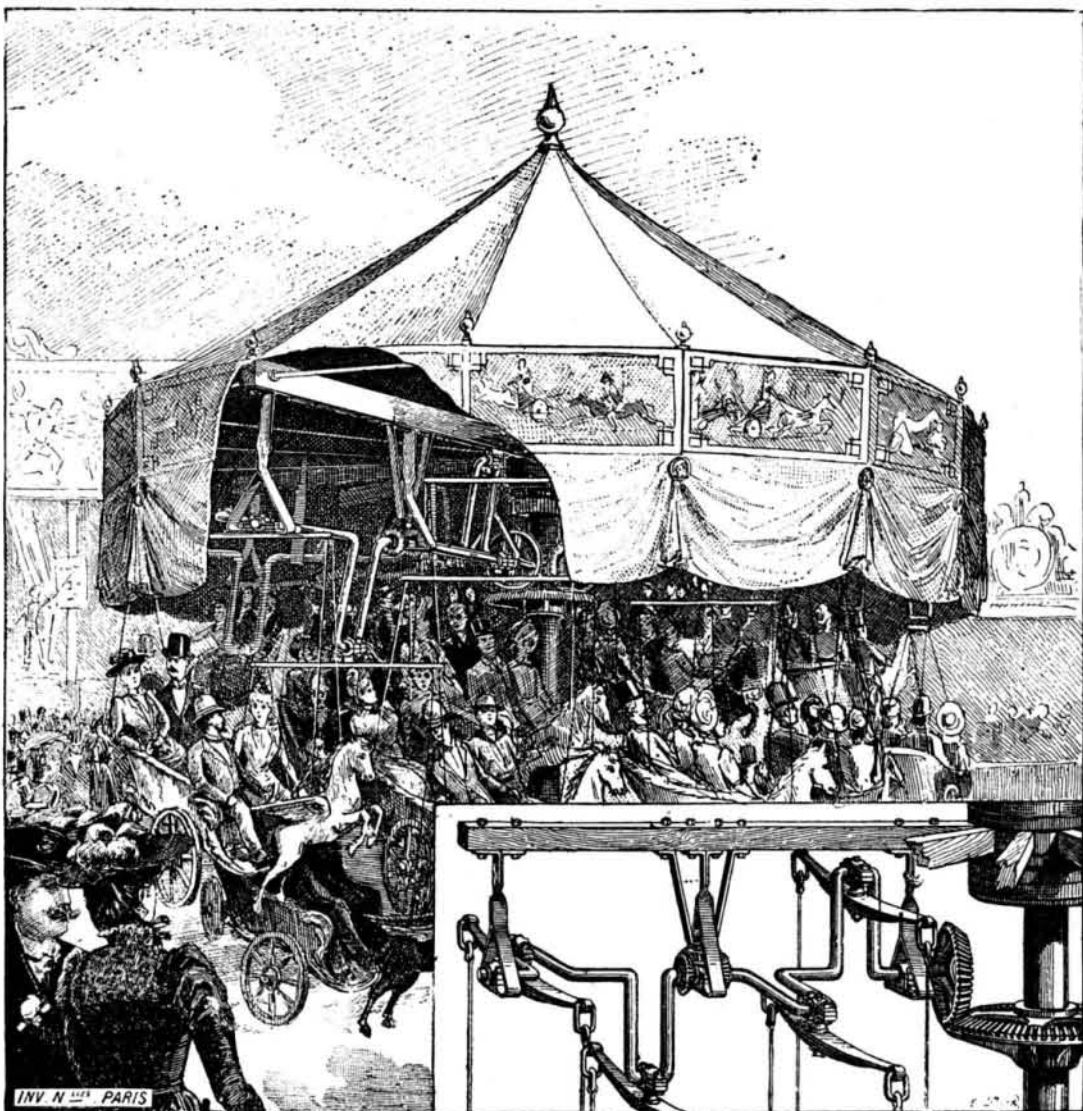
- (1.) On the east side of the Harney range, at the Etta, Ingersoll, Monarch, Peerless and other claims.
- (2.) Near the summit, at Bismarck's ranch, where cassiterite occurs in several narrow veins of quartz.
- (3.) At Hill City, on the western side of the Harney range, where it occurs in both granitic veins and quartz veins.

There is also a tin district in the Wyoming portion of the Black Hills, about twenty miles west of Deadwood, where stream tin has been found and tin-bearing granitic veins are also reported as occurring. The gangue rock at these localities is either mainly quartz, as at Hill City, or more commonly an aggregate of white mica and quartz, together with some albite. With these minerals is commonly associated spodumene, often in crystals of enormous size, and more rarely apatite, tantalite, a small quantity of vitreous copper, and a few other minerals.

The cassiterite is regarded by Professor Blake as originating contemporaneously with the rock in which it occurs. The veins themselves show no indications of having been formed by gradual deposition from lateral solution, but are evidently the result of the gradual cooling of semi-fluid or pasty magmas intruded from below.

The country rock is fine-grained arenaceous slate and quartzite. The mineralization of the ore is stated by Professor Blake to be remarkably even, the greisen rock yielding from 2½ per cent. to 6 per cent. ore, while the general average percentage of six large mines upon the great flat lode of Redruth, Cornwall, in 1876, was but 2.22 per cent., and less than this has been worked with profit in some places.

A large amount of money has recently been invested here, principally by English capitalists, and concentrating plants and smelting furnaces are stated to be



IMPROVED MERRY-GO-ROUND.

But I do say that when we have all this light we still have a larger and denser circumference of darkness. In fact, the more you study the question, the more of a mystery it becomes.

I have watched through a microscope the blood corpuscles circulating through the fins of a fish, and been filled with wonder at the thought of how life commenced and ceased. Tiny cells of life, if you please, yet each cell carrying in itself the substance of all that is law, order and existence.

If we knew what is life, then would we know all things. However, this much is to be said: Wherever life is, there is God. That at least is the poetic view of the question, if we can believe Lord Tennyson:

Flower in the crannied wall:
I pluck you out of the crannies;
Hold you here, root and all in my hand,
Little flower—but if I could understand
What you are, root and all, and all in all,
I should know what God and man is.

NOT PRACTICAL.

The theory of the English scientist, Clodd, that death is not a necessary event, is, it seems to me, not promising or practical. There is a certain natural limit to the life of all organized beings. A tree springs up, withers and dies; an animal is born and in course of time passes away. Such by analogy, it seems to me, must be the case with man. He may be able to live a greater number of years than he does at present; but that number, I think, will not be greatly extended, and he must eventually die. In fact, I don't see anything around me to show that at the present day, with all our advanced medical knowledge, we are living to any greater age than did our forefathers.

If men were to live forever the world would soon be full, but I don't think that their condition would be improved. It would certainly not make an earthly paradise of the world—at least for those who come into it. The struggle for existence is hard enough already without having any more competitors.—*New York Herald.*

pating in the motions, but also for those who are simply spectators.—*Les Inventions Nouvelles.*

OUR SOURCES OF TIN.

By GEORGE P. MERRILL.

THE world's supply of tin amounts to some fifty thousand and odd tons annually, of which nearly one-half comes from the Malayan Peninsula and the adjacent islands, one-sixth from Cornwall, England, one-ninth from Australia, and the remainder from scattering sources, including Saxony and Bohemia, Finland, Spain, Tasmania, Bolivia and Mexico. The United States has, until very recently, produced but little.

The artificial condition of the tin market, due to the passage of the McKinley bill, has awakened an interest in our possible sources of supply, and it may be worth our while to occupy the columns of *Stone* with a brief review of the same.

At the outset it may be well to state that tin stands unique among our common metals, in that it is derived wholly from one type of ore, cassiterite, an oxide of the composition SnO_2 , which is equivalent to tin 78.6 per cent. and oxygen 21.4 per cent. To fully appreciate this peculiarity of the metal, we have but to recall the fact that gold occurs and is mined as native, in at least three sulphurets, and as a telluride; silver as native in two sulphurets, two sulphantimonides, an arsenide, telluride and chloride; copper as native, in the form of three sulphides, a sulphantimonide, sulpharsenide, oxide, carbonate, and silicate; lead as a sulphide, sulphate and carbonate, iron in the form of three oxides, and as carbonate; and zinc as an oxide, silicate, carbonate and sulphide. Indeed, aside from cassiterite there is known but one natural compound in which tin plays a prominent part—this is the sulphide of tin, *stannite*, which however is rare even as a mineral.

Tin is pre-eminently an old metal, that is, found *in situ* only in the older rocks. Its occurrence in more recent deposits, or alluvial formations, is due to the

in process of erection. It is not at all improbable that this may shortly prove an important source of supply.

The national collections show promising samples of stream tin from Ten Miles district in Lewis and Clark county, and Prickly Pear, Jefferson county, Montana.

No systematic mining is, however, carried on at either locality.

Still another tin field which as yet has yielded little but promises, occurs in San Bernardino county, California. This is the now well-known Temescal or San Jacinto field.

According to a writer in the *Engineering and Mining Journal*, the country rock at the San Jacinto mines is "syenitic granite, syenite and slate," cut at various places by veins of porphyry and quartzite. The veins of ore are of a coal black color, varying from 18 inches to 60 in width, and vary in direction from north and south to east and west. Within a distance of three and one-half miles in an east and westerly direction were found upward of seventy croppings, representing, apparently, as many different veins. Comparatively little has as yet been done here in the way of developing the mines, the most substantial development being upon what is known as the "Cajalco Lode." This vein in its entirety averages some six feet in thickness, though the cassiterite bearing or "pay streak" is not over two feet wide. It was estimated that there were here some 2,700 tons of ore in sight which would yield about 4 per cent. tin. The general character of the ores is, however, such that they are expected to improve in depth.

This property has also recently passed into the hands of an English syndicate. It comprises some 45,000 acres or seventy square miles, and is situated in San Bernardino county, within 10 miles of Riverside and some fifty-five miles east of Los Angeles. Smelting furnaces have been erected, and already a shipment of seven tons of pig tin has been exported. A large pig made from the Temescal ore was exhibited at the Centennial Exposition at Philadelphia in 1876, and was thence transported to the National Museum at Washington, where it still remains.

The industrial journals have recently chronicled the discovery of rich tin lodes in Mexico, about forty-five miles south of Durango. This is evidently a rediscovery of an old locality, since tin ores from this or adjacent regions were reported many years ago. It is difficult, in the present condition of the industry, to say how much reliance can be placed upon such accounts as are given of this deposit. As long ago as the time of Humboldt cassiterite was obtained from washings in the province of Guanaxnato and in the state of Zacatecas, and in 1803, according to Whitney, some 58½ quintals of tin were exported.

Tin ore is also included among the mineral productions of Bolivia, South America, although the deposits, according to the latest available information, are not worked to any extent, owing, presumably, to difficulties in the way of transportation. The localities given are Potosi and Oruro.

Below are given the best available statistics regarding the world's output in metallic tin for the year 1888:

Great Britain.....	9,241 tons.
The Malay Peninsula and adjacent islands.....	27,990 "
Australia.....	6,559 "
All other sources.....	12,710 "
Total.....	56,500 tons.

The above, it is believed, includes all the known sources of tin at all important or promising within the limits of the United States. Those which seem at present as likely to assume a prominent part in the world's supply are Dakota and California. That there is here tin in quantities fully equal to that mined in other countries there is little doubt, and were the American content or obliged to work at the wages given the Chinese coolie or even the Cornish miner, there is apparently but little doubt of their becoming permanent sources of supply. What will be the outcome of existing conditions it is as yet too early to say, although it is seemingly apparent that within a few years the United States will not merely manufacture her own tin plate, but produce a considerable share of the metal used as well.—Stone.

THE LAST DAYS OF THE GREAT EASTERN.

By the kindness of Messrs. H. & C. Grayson, ship-builders and engineers, of Liverpool, we are able to give some interesting views of the various stages in the process of breaking up the great leviathan.

The Great Eastern was built in the years 1853-59 by Mr. Scott Russell at Millwall, in the Isle of Dogs, from the designs of Mr. Isambard Brunel. Previous to 1851 the only routes to India were the overland one, which was very expensive, and by sailing vessels via the Cape of Good Hope, which was a long and tedious voyage. In that year the idea of running steamers to India via the Cape was put in force, but did not prove successful, owing principally to the expense of maintaining coal depots at various stations en route. This failure led to the idea of building a steamer large enough to carry sufficient coal for the voyage out and home, and Brunel was intrusted with the solution of this problem. For this purpose he designed a vessel 680 ft. long, 83 ft. broad, 114 ft. broad over the paddle boxes, 58 ft. moulded depth, and 18,915 tons gross register, to be propelled with both screw and paddles, and with a combined nominal horse power of 3,000. These were the smallest dimensions which he considered would suffice for the purpose, the main object of which was to obviate the necessity of stopping to coal on the way, which had caused a delay of twelve to twenty days to those steamers which had previously made the voyage, and also to avoid the greatly increased cost of coal supplied in this manner, as coal which could be purchased in England for 12s. to 14s. per ton would at the Cape and Australia cost from £2 10s. to £5 per ton. In 1853 Mr. Scott Russell got the order to build the ship, and also began the construction of the monster steam paddle engines, with four cylinders 14 ft. stroke and 74 in. diameter, while Messrs. Watt commenced the screw engines with four cylinders 84 in. diameter and 4 ft. stroke. This in 1853 was no mean undertaking, involving a weight of ship and engines, when completed, of between 12,000 and 13,000 tons. Misfortunes early attended her in the process of construction, and

it was not till the 3d of November, 1857, that an attempt was made to launch her, the weight of ship and launching gear being 10,300 tons. This did not succeed, and for three months she defied all attempts to get her off. At last, on the 31st of January, 1858, she was successfully launched, broadside on, into the Thames, and after another eighteen months' work upon her she was so far finished as to commence her career as a show ship on the Thames in the autumn of 1859.

Mr. Scott Russell adopted his wave line principle for the lines of the vessel, but to Mr. Brunel is due the idea of constructing her on the cellular system. She was built throughout of the best quality Lowmoor iron, 30,000 plates, weighing about 10,000 tons, and secured by 3,000,000 rivets, being used in her construction. From the keel to about 6 ft. above the 28 ft. water line she was double from stem to stern, or two perfect hulls one within the other, and about 34 in. apart; above this the outside shell was continued for

one-third of a ton, and the iron deck and bulkheads were of ½ in. plates. The upper deck, like the hull, was double, and formed a system of cells 2 ft. deep.

The cylinders of the oscillating paddle engines were four in number, 74 in. in diameter, 14 ft. stroke, and each one weighed twenty-eight tons when finished. The paddle wheels were 56 ft. in diameter, and steam for the engines was supplied from four double-ended tubular boilers, each 17 ft. 9 in. long, 17 ft. 6 in. wide, and 13 ft. 9 in. high, weighing without water 56 tons, and containing 39 tons of water, with forty furnaces. The chimneys were only 6 ft. in diameter, but being 100 feet high above the grate bars, there was an excellent draught. The cylinders of the screw engines were also four in number, 84 in. in diameter, 48 in. stroke, and each one weighed thirty-nine tons when finished. The propeller was four-bladed, 24 ft. in diameter. The screw propeller shafting was 150 ft. long, and weighed sixty tons, and steam was supplied to the engines by six tubular boilers of nearly the same dimensions, with

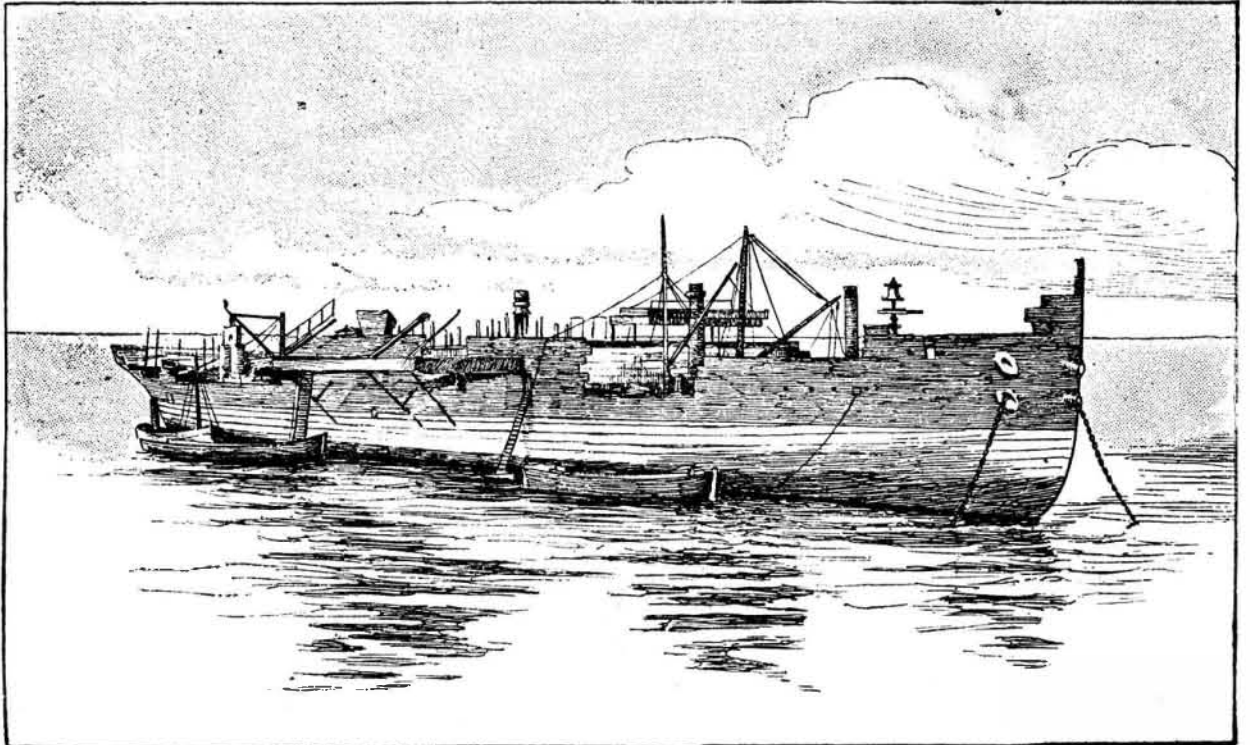


FIG. 1.—THE GAP FORWARD OF THE LADDER IS LEVEL WITH THE THIRTY-FOOT DECK.

a height of 24 ft. till it was connected to the cellular upper deck, the top of which was 30 ft. above the load water line. These two hulls were connected together by thirty-five longitudinal iron girders about 30 in. apart in the flat of the bottom, increased to about 60 in. apart at the bilges and up the sides, and this cellular hull was utilized so as to carry water ballast in any of the compartments when necessary. The interior of the ship and the cellular hull were each divided into eleven separate water-tight compartments by ten transverse iron bulkheads, two of which were 80 ft. and the rest 60 ft. apart; but there was none of the usual transverse framing in her construction. The holds were further subdivided by two water-tight iron longitudinal bulkheads 36 ft. apart, and extending for 350 ft. of the midship length of the vessel. The holds below the lower deck contained the machinery, boilers, stores and coal; and the upper part, three tiers of decks all fore and aft, was appropriated for passengers, the lowest of these decks being about 6 ft. above the water line. Between the machinery and boilers below, and the passengers above, a strong iron deck was fitted, thus cutting off all communication. The boilers occupied five of these central 60 ft. compartments and the engines two others, and the spaces between the longitudinal bulkheads and the cellular sides of the ship were appropriated for carrying the 12,000 tons of coal required for the voyage to India and back. The keel consisted of a flat plate 24 in. wide and 1 in. thick, instead of the usual bar keel. The shell plates were 8 ft. long, 33 in. wide and ¾ in. thick, each weighing

seventy-two furnaces. The working pressure was 25 lb. per square inch, and each of the ten boilers was tested to a pressure of 60 lb. per square inch. Her calculated speed was 15 knots per hour, and it was expected she would make the voyage between England and India in thirty to thirty-three days, instead of eighty days, as taken by previous steamers, and between England and Australia in thirty-three to thirty-six days. She was designed to carry 4,000 passengers, viz., 800 first, 2,000 second, and 1,200 third class, a crew of 400, 5,000 tons of cargo, and 12,000 tons of coal, and if fitted up to carry troops alone, she had accommodation for 10,000. The total weight of ship and engines was over 12,000 tons, and when fully laden with passengers, cargo, and coal, she would weigh 27,000 tons, and be at a draught of 30 ft. She had five funnels and six masts. The actual weights were:

	Tons.
Iron in hull.....	7,296
Timber work and fittings.....	1,576
Masts, rigging, and sails.....	358
Anchor, chains, etc.....	300
Paddle engines, complete.....	519
Boilers to paddle engines (full).....	362
Screw engines, complete.....	607
Boilers to ditto (full).....	632
Paddle wheels.....	185
Paddle boxes and sponson beams.....	350
Screw shaft and bearings.....	153
Screw propeller.....	37
Total.....	12,375

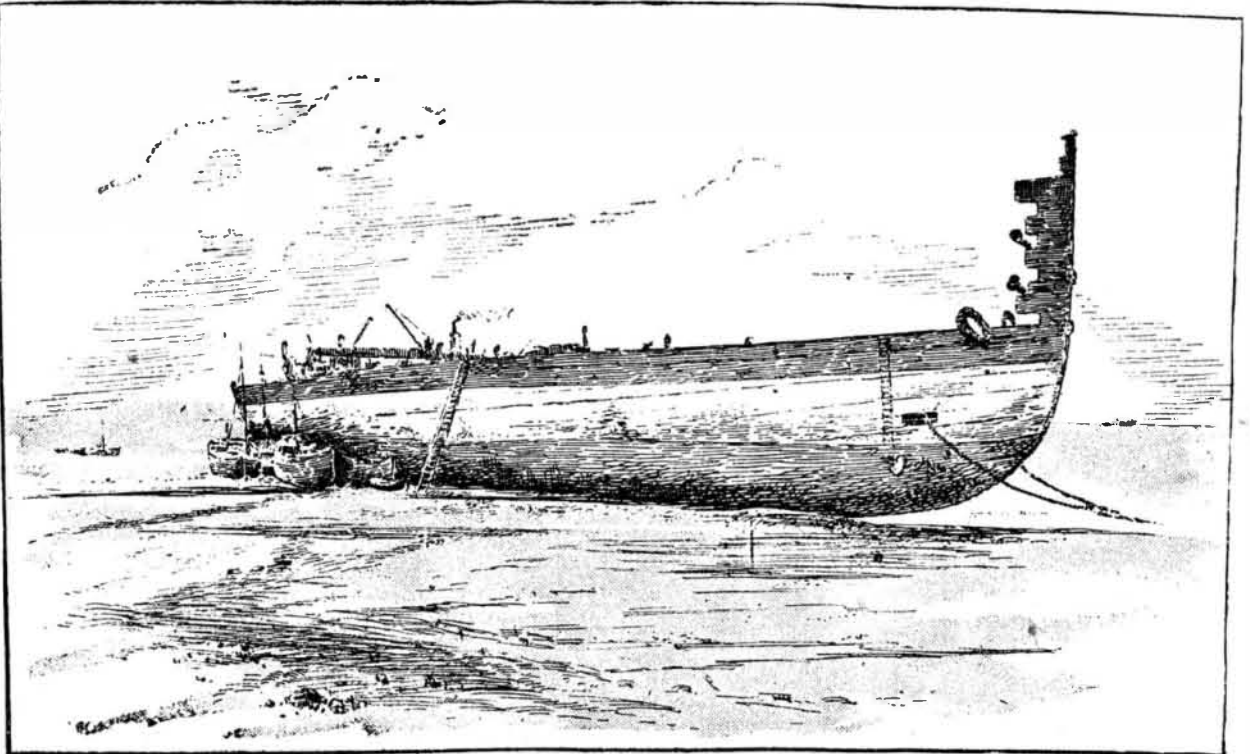


FIG. 2.—STARBOARD SIDE BEFORE DROPPING THE STEM AND HAWSE PIPES.