boring settlement. He never returned. Search parties were sent in every direction, but no trace of him could be found. His footsteps were followed to the edge of a dangerous glacier, and a number of his specimens were discovered, but nothing more. There seems little doubt that he must have fallen into one of the deep

any appearance of a keel, as the outer planking will lie even with its base, so that there will not be any projection below water that the ice can get hold of.

The cross section of the vessel thus resembles a bowl cut in halves. The engines, manufactured at the Akers Works, Christiania, are of 169 indicated horse

NANSEN'S NORTH POLE EXPEDITION.

By O. DAHL, Ph.D., New Haven, Ct.*

THE exploration of unknown parts of the globe has of late made rapid progress. But few regions now remain unexplored. Two parts of our earth, however, in spite of numerous attempts, have not been explored. These two parts lie around the poles. As regards most unknown regions which have hitherto been explored there has been this peculiarity, or rather lack of peculiarity, that there was nothing unusual about their geographic position, as other regions were already known which lay in the same latitude and had the same physical conditions. One could thus, with some degree of certainty at least, form an idea of the conditions in these regions even before they were traversed. Nevertheless no considerable area of the globe has been explored without rewarding us liberally in a scientific way.

The polar regions, however, have this peculiarity, that we know no region of the globe which lies in a corresponding latitude or under the same physical conditions.

As investigation and science have advanced, scientific problems whose solution can be found only in the Arctic and Antarctic regions have arisen. We can study scarcely any branch of the physical sciences, whether meteorology, geology, or physical geography, without meeting great and important problems which await their solution up in the polar regions and concerning which we now can offer only the vaguest hypotheses.

Those regions which we have hitherto explored have, as a rule, been inhabited, and the foot of the explorer was not the first to tread on its soil. Often, through story and tradition, originating with people who lived in the country, we had arrived at some idea of its conditions and appearance. In the polar regions, on the contrary, no human foot has set its mark on the white snow, and no human eye has penetrated the icy mists. Since so many scientific problems await their solution in these northern regions, the question as to the value of polar exploration is synonymous with inquiring about the value of any scientific investigation.

The two polar regions, the Arctic and the Antarctic, have both their peculiar interests. While it is the Arctic region that has most attracted the attention of men, this is due solely to its situation on our hemisphere. As it is this region which specially concerns us, I shall limit myself to its consideration, and first mention the routes by which attempts have been made to reach the north pole.

The most successful attempts have been by way of Smith's Sound. For a long time after the American explorers Kane, Hayes, and Hall had reached the highest latitude in this region it was thought that here was the way. Here it was thought they had seen the open polar sea stretching to the north. It was not long, however, before it was found that here also the usual hindrance was encountered: the impenetrable ice, coming from the north, carried by a strong polar current.

By this route, Admiral Markham, who took part in the English polar expedition under Nares, reached the highest latitude then attained, proceeding by means of sledges over the drift ice as far as 83° 20'. The Greeley expedition of 1882 has since surpassed this, as Lockwood reached 84° 24' along the northwest coast of Greenland.

Also along the east coast of Greenland attempts have been made to reach the pole. This route has not been so successful, the northernmost point reached being Cape Bismarck, lat. 77°, the limit of the Germania expedition of 1869-70.

Farther to the east we have Spitzbergen, from which point numerous attempts have been made to reach the pole. Here the noted English explorer Parry, in 1827, reached the highest latitude, 82° 45'. Parry did not come so far by his vessel, but finding that he could not proceed farther in the open sea, he abandoned the ship and transported boats across the ice. He was soon

MAP SHOWING THE ROUTE OF THE PEARY EXPEDITION.

crevasses on the glacier. He was only twenty-five years old, and was much liked by his colleagues.

DR. NANSEN'S NEW ARCTIC EXPEDITION.

DR. NANSEN'S ship for Arctic discovery, which has been built at Laurvik, Norway, at the works of Mr. Colin Archer, a gentleman of Scotch descent, is designed specially to withstand the buffetings of Arctic storms. This will be effected, it is hoped, not only by its solid construction, but also from the shape of the vessel's hull, which, being much rounded and flat, it is thought will enable the vessel to rise when nipped by ice, possibly to such an extent as to rest entirely on the ice surface, when the ice by its presumed movement will form the means of further locomotion, convey the vessel from the neighborhood of the Liakov Islands, past the north pole, and eventually launch it on the waters of the Greenland Sea. Probably no vessel has ever been built for the purpose of Arctic exploration with greater foresight or care, or, indeed, of stouter or better materials. In form Dr. Nansen's ship resembles a Scotch buckie boat, only that it is carved built and rigged as a three-masted schooner.

Both stem and stern are considerably curved, as in the buckie boats, but by an ingenious arrangement the rudder will be entirely submerged, and both it and the screw may be raised when necessary and protected from damage in a well. The stern is furnished with two perpendicular stern posts—one a propeller post, the other a rudder post. Outside these on both sides are bolted curved oak timbers, which give the vessel its whaleboat appearance. Between them is the well for both screw and rudder. The frame timbers are of the best materials, free from defects, about 13 in. thick at the keel and 8½ in. at the deck, ranged in couples, squared and bolted together, all joints being bound with iron. Between each pair is a space of about 2 in. which is filled in with asphalt, so that, if the outer planking were chafed away the vessel would still remain watertight. Above the frame timbers are placed two keelsons, one 17 in. and the other 12 in. in height, both being bolted together to the timbers and keel, which latter is in two pieces, composed of balks of elm 14 in. square. The stem is composed of four balks, 15 in. broad and 13 in. thick, bolted together with oak tierails. The inner sternpost is of larger dimensions than the keel, the outer one being the same as the keel, both attached to the latter by strong cross and longitudinal iron clamps, and outside the after sternpost is a "stern stem," or cut-water, 10½ in. by 21 in. thick. The planking consists of a 3½ in. oak skin, over which another of 4½ in., and finally an outer planking or "ice sheathing" of from 3¼ in. to 6½ in. greenheart. The ceiling consists of pitch pine planks, alternately 4¼ in. and 8½ in. in thickness. There are two decks, an upper and lower one, each of 4 in. pine. The deck beams are of oak and pitch pine 11½ in. square. Upright stanchions are placed as supports to the beams, and united to them by large knees. A half deck or poop, three feet in height, covers the cabins and engine room. Externally there will not be

power, and, with a consumption of about 2¾ tons of coal a day, give her a speed of about 6 knots. She will carry enough coal for about three and a half months' constant steaming. Rigged as a three-masted schooner, she will make most use of her sail power, which will have an area of 600 square meters. The mainmast is 82 ft. in length and the topmast 49 ft., the view from the barrel being thus about 105 ft. above the water. She carries seven boats, of which two, somewhat larger than the others, are fitted out so as to be able to carry the entire crew, if necessary, with provisions for several months, as well as a warm tent or covering.

The principal dimensions are as follows: Length of keel, 31·00 meters; length at water line, 34·50 meters; length over all, 39·00 meters; beam at water line amid-

THE NEW SHIP FOR DR. NANSEN'S EXPEDITION TO THE NORTH POLE.

ships, excluding the "ice sheathing," 10·40 meters; greatest beam, excluding the "ice sheathing," 11·00 meters; depth moulded, 5·25 meters; draught, with light cargo, 3·75 meters; displacement with light cargo, 530 tons; displacement at draught of 4·75 meters, 800 tons. The hull, with engines and boilers filled, weighs about 420 tons. With a draught of 4·75 meters she has one meter's freeboard. Thus she has a bearing capacity for 380 tons of coal and cargo. Dr. Nansen and his brother explorers intend to leave Norway in February next.—*London Daily Graphic*.

baffled in this attempt, as the ice was driven faster southward than he could advance northward. Still farther to the east we find Fr. Joseph Land, discovered by Payer and Weyprecht in 1874, on a polar expedition. Here the same hindrance was met, namely, drift ice. In this case it did not come from the north, as in the cases previously mentioned.

There remains to be mentioned the route through

*His plan as outlined by himself before the Students' Union of the Royal Fredericks University, Christiania, Norway, September 17, 1892.

Behring Strait. This was first attempted by Cook in the last century, and, in our times, by the unfortunate Jeannette expedition, 1879-81.

It might seem to be a sad inference which can be derived from all these attempts. The chief cause of failure has been drift ice, driven southward by mighty currents. To transport boats across the ice has been found impossible. A third alternative might be to go by land. There are, however, only two masses of land whose northern boundary we have not known, Fr. Joseph Land and Greenland. As regards the first, it has been established by the Austrian expedition of 1874 that it consists of a group of small islands.

The route over Greenland remains, but the explorations of Peary seem to show that it does not extend far beyond 82°, and hence cannot come into consideration as a basis for a polar expedition. The land along Independence Bay—discovered on the 4th of July, 1892—seems to be the northernmost point of Greenland, and would thus prove that the land seen by Lockwood was not a part of Greenland, but islands separated from it.

From what has been said it would seem impossible to reach the pole by land, by the open polar sea or by transporting boats across the drift ice. There remain two methods which might be thought possible: to go through the air or under water. To go by balloon, though it cannot be considered impossible, must be subject to great danger, and the scientific results would be very limited.

The plan of going under the water has also been proposed. Such a plan must surely be abandoned as long as we are not more thoroughly acquainted with

certainly conclude that the current flows toward the pole. Let us consider briefly the conditions of the currents on the borders of the unknown polar regions. The current which, first of all, attracts our attention is that which flows along the east coast of Greenland, and which is so broad that it almost extends over the whole ocean between Greenland and Spitzbergen. This current carries immense masses of drift ice almost to the coast of Norway, and we often hear it stated that the weather is cold because drift ice has been encountered near the coast. It is this same current which flows between Greenland and Iceland, around Cape Farewell, and up along the west coast again. From the limited knowledge which we have of its swiftness, extent and depth, we come to the conclusion that it carries an immense mass of water. But where does all this water come from?

Going eastward, we encounter the well known current to which we owe so much—the Gulf Stream. North of Norway, this stream sends a branch northwesterly along the west coast of Spitzbergen; it then turns to the south and unites with the polar current. Here, then, is a tribute to this mighty current, but it is so unimportant that we may leave it out of consideration. The main body of the Gulf Stream continues to its course eastward, past North Cape and the White Sea, and toward the coast of Nova Zembla, then along the north point of this land and eastward into the unknown polar sea.

The amount of water which is here brought into the polar sea we cannot definitely determine, but from what we know of its rapidity and depth, must be very

this immense channel, which measures as much as 2,600 fathoms in depth. True, part of the water flows out through Smith's Sound, Jones' Sound and Lancaster Sound, but this is of so small importance, because of the shallowness of these sounds, that we can for this reason leave them out of consideration.

What interests us most, next in order to our knowledge of the existence of such a current, is to know what direction it takes. The Gulf Stream, as we have seen, flows eastward along Nova Zembla; the Behring current flows northward and divides into several branches, but the bulk of the water takes a northwesterly direction. These currents, it would seem, must unite somewhere north of the New Siberian Islands. If to this we add the Siberian rivers, the result must be a current which from the New Siberian Islands flows northward through the ocean by way of the pole and then out into the ocean between Greenland and Spitzbergen, where it forms the well known East Greenland polar current.

Now there is yet one question which presents itself: Are there not other conditions, and especially conditions of the weather, which may change the direction of the current? If, in the meantime, we examine the condition of the winds, or rather the pressure of the atmosphere, in the polar sea, we shall find that this can hardly be the case. We have already mentioned the fact that a large branch of the Gulf Stream flows along the north coast of Nova Zembla and eastward. Now we know that over so warm a current the air becoming warmed will rise. As a result the air will rush in from all sides, as the pressure of the atmosphere is here at a minimum; the air from the south will form a northerly current and the air from the north a southerly current. Now we know also that, because of the rotation of the earth, every current of the air of a northerly direction will tend to the northeast and every current having a southerly direction will tend to the southwest. It is just this influence that we could desire.

We cannot think, then, as a result of this method of reasoning, that the wind should present formidable obstacles in the way of the polar current taking the course which from other considerations we should expect it to take. The German geographer Prof. Supan has lately arrived at conclusions with regard to the condition of the winds in the polar sea which favor our theory with regard to the prevailing winds in these regions.

I have now endeavored to show that what little we know of the conditions of the currents on the borders of the unknown polar region must drive us to the conclusion that an ocean current crosses it.

Now it might be asked, Is there no proof that this current actually exists? Can we not produce objects that have been carried over this region by the current? Yes; we can. I will first and foremost direct attention to the Jeannette expedition, which went up through Behring Strait and was caught in the ice the 6th of September, 1879, at a point east of Wrangel's Island, latitude 71° north and 175° west long. It was then carried by the ice two years until the 13th of June, 1881, when the vessel was crushed to pieces and sunk north of the New Siberian Islands, latitude 77° 15' and longitude 155° west. From this point the crew attempted to find their way down to the mouth of the Lena River or some other place on the Siberian coast. The current carried them northward, however, with such speed that after a ten days' struggle, making their way over the ice southward, they found themselves seven miles north of the place where they started from. This was a very sad discovery, and it was also kept secret by the leader of the expedition, as he thought the knowledge of this fact would make them lose every hope. They continued to make their way southward with difficulty, and finally they succeeded in making their way to an island which they discovered for the first time, and which they called Bennett's Island. From this place they worked their way further south. Finally they took to their three boats, going from the southwest of the New Siberian Islands over the open sea to the mouth of the Lena River. During the passage one of the boats was lost. The second one reached land and soon found people. The third, in which was the leader of the expedition, De Long, also came ashore only a day's journey from where there were natives. This they did not know, however. They entered the mouth of the Lena, and De Long arrived with all his men excepting two, Louis Noros and Sindemann, who were sent on in advance to seek the natives. They met a party of natives about a day's journey from where the others starved to death. They could not make themselves understood and so did not get any help for their comrades.

A number of articles from the Jeannette were found three years afterward on the west coast of Greenland. Among the fifty-eight articles was a ship's list, a number of garments that were marked. These articles had been carried across the polar sea by the current down the east coast of Greenland, around Cape Farewell and up along the west coast. In all probability these objects had been carried by the current and the ice by the very route that we desire to go on our expedition.

A javelin belonging to an ethnographic collection from the east coast of Greenland and presented to our university by the Danish scholar Dr. Rink has been proved to belong among the Eskimos of Alaska. It was ornamented with Chinese glass beads, quite common in Alaska. This had been carried by the drift ice from Alaska to Greenland.

There are no forests in Greenland. Their wood all comes from the sea; an immense amount of drift wood is every year brought thither by the currents from Siberia and from North America. The kinds of wood are fir, birch and ash, just the kind of timber we find in Siberia. Some show the form of the bit of the ax where it has been cut down.

From this we can infer that there is a lively communication between the opposite sides of the pole. The thickness of the ice, the character of the sand and dirt that it conveys, show that it is brought from Siberia.

The most natural way, then, to attain the end in view will be to make use of the "Jeannette current" where it flows northward, and surrender one's self to fate. Either build a vessel so strong that the ice cannot crush it or else, if the vessel must be abandoned, seek safety on the ice. Both these purposes can be kept in mind in constructing the vessel. We are build-

PLANS AND SECTIONS OF THE SHIP IN WHICH DR. NANSEN PROPOSES TO REACH THE NORTH POLE.

the depths of the sea, the conditions of the ice and the directions of the currents.

In view of all these difficulties, is there, then, no possibility of reaching the pole?

It will be seen that most expeditions failed because they met polar ice driven southward by a mighty current. It would seem reasonable to conclude, however, that if they failed because of the currents, we ought to succeed by means of the currents by approaching from another point. A current coming from a certain point must have been carried thither from another direction.

If we take into consideration the experiences we have with regard to the condition of the currents on both sides of the pole, we shall find that there is quite a marked difference in this respect. We may refer to the experiences of whale fishers and sealers. It often happens that their vessels are caught in the ice, in the sea, between Spitzbergen and Greenland. This was also our experience in going to Greenland. We were caught in the ice and carried southward. As a rule there is no risk connected with this experience, for, even if the vessel is crushed in the ice, one can resort to the boats or take refuge on the ice, by which he may be carried southward. If, however, we attempt to cross over by way of the pole to the other side, the situation is much worse. American whale fishers who are caught in the ice north of Behring Strait are carried northward, and unless they are set free, or can take refuge in their boats, perish in the unknown polar sea.

To every careful observer, it must appear that here are conditions which might possibly be to the advantage of a polar expedition if we let ourselves be carried along willingly by the current. We must, in this case, as in so many other cases, seek the method by which we take advantage of the forces of nature rather than oppose them.

We must, therefore, find the way where we can with

great, probably three-quarters of the volume of the polar current. If we go still farther to the east, we come to the Behring Strait. Through this there is also a current going northward. This is not so large, as the strait is quite narrow and also quite shallow—only about 50 to 60 fathoms at the greatest depth.

As a tribute to the polar basin we must mention the rivers which flow into it. The volume of water which they carry is not so inconsiderable, as all the rivers of Northern Asia and some large rivers of North America empty into this basin. In comparison with the immense volume of the polar current, the sum total of all these rivers is not large. There is, however, this circumstance to be noted, that it is during the summer mainly that this water is brought into the ocean, as the snow accumulates during the winter, and during the spring and summer is melted and flows out into the polar basin as warm water, the rivers flowing through the Siberian plains which have been warmed by the summer sun. We must bear in mind that many of these rivers come from the interior of Asia, from the Altai Mountains, and the water can thus become heated during the course. The warm, fresh water which in this way reaches the polar sea stays on the surface for some time and produces currents flowing northerly and northeasterly along the whole Siberian coast. The amount of rain which produces these rivers cannot come from the polar sea itself, because it is, for the most part, covered with ice, and, furthermore, too cold to produce much evaporation. The rain which falls throughout Siberia must, therefore, come mostly from either the Atlantic or the Pacific.

We have seen that the polar sea receives large volumes of water, and even if we did not know of the current which flows out between Greenland and Spitzbergen, an examination of the map ought to make it probable that the water would flow out through

ing a vessel carrying provisions for twelve men for five years together with a large supply of coal, etc. It is to be provided with machinery that can attain a speed of six knots, together with sails. The form of the vessel is to be such that it will be lifted up by the ice. One thing about our preparation is that we take sufficient time for it. Next spring is the time for sailing. The original plan was to go through Behring Strait around Asia. This plan has been abandoned, and we shall now go by way of the Carian Sea. In any case we expect to come through by the New Siberian Islands near the mouth of the Jenisei River. Here the current flows northward and we can undoubtedly reach a high latitude. When we see everything closed by the drift ice, all that we can do will be to let the vessel be carried along.

There is a possibility that unlooked for circumstances may occur, and that, even with the best preparation, the vessel may be sunk or crushed. We shall then take to the boats, which are watertight and cannot sink. We take along two quite large boats and a number of unusually warm tents, in which we can live on the ice.

We may also think it possible that we would be driven to land. This might be quite profitable, as far as observation is concerned. In this case we should have to make our way on sledges.

How long a time may we think it will require to meet our destination?

With the same speed that the articles from the Jeannette were carried, we may hope to accomplish the journey in two years. We may, however, hope to increase the speed by use of the machinery, some of the time, at least.

The aim of the expedition is to explore unknown regions. We are not bound to reach a definite mathe-

As originally designed and constructed, the Sfax was full rigged as a frigate, but recently the rig has been radically changed and reduced, until, at the present time, the sail area is comparatively insignificant. One military top is fitted on each of the three masts, and in each of these there are two Hotchkiss revolver machine guns as a defense against torpedo boat attack.

The Sfax is the only vessel of the design which the French government has considered it advisable to build, and for her tonnage she is well armed. There are six 16 cm. (63 in.) 5 ton breech-loading rifle guns, four mounted on sponsons, two on each side, and two in recessed ports forward, one on each side of the ship. In the battery on the main deck there are, in addition, ten 14 cm. (5.5 in.) 3 ton breech-loading rifle guns, five firing on each broadside. The armament of light artillery consists of three quick-firing Hotchkiss guns and eight machine guns by the same maker. Six of these, as mentioned, are mounted two in each of the three tops and the remaining two are fitted aft on the poop deck. Five torpedo firing tubes complete the armament, four being situated, two on each side, and the fifth being arranged to fire right astern. Three electric light projectors are fitted, one being mounted at the bow on the forecastle deck and two on the bridge between the funnels, one at each end.

The Sfax is sheathed with copper below the water line, which greatly adds to her efficiency for work on a foreign station. The cost is estimated to have been about \$1,000,000.—*Engineering.*

THE "ALLEY" ELEVATED ROAD, CHICAGO.

The development of the Alley elevated road in Chicago, owned and operated by the Chicago & South Side Rapid Transit Railroad Co. and built by the Rapid

are quite ornamental. The platforms are reached by staircases and arranged on each side of the track, as in New York. Each platform has a platform man who looks after the safety of the passengers and answers inquiries. There is a porter in each station to help passengers. There are also one ticket seller and one ticket collector; all of whom are relieved at regular intervals, thus making in all, for an average station, four platform men, one porter, three ticket sellers, and two ticket collectors. The platform men, the conductors and guards on trains, and all officers of the company are invested with police authority and can arrest disorderly persons.

Equipment.—The more special novelties in equipment are the heavy compound engines, of special design, the Westinghouse air brake, and the means for preventing water and oil from dripping into the streets. There are no drip pans under this structure, as in New York, but instead every precaution is taken to prevent water from dripping into the streets by the use of drip pans and tanks under cars and locomotives. The cars, which are equipped with the Gold heating system, have a special arrangement for collecting condensation in tanks at their ends, from which it is drained at the terminal stations. The locomotives have specially arranged drip pans which collect all the water and oil from the engine.

The ash pans are made tight and water is carried in their bottoms to quench sparks. Water is also carried into the smokebox to quench cinders. So little condensation from the steam heating system reaches the couplings between cars that leakage at these points will consist mostly of steam. If the automatic couplings leak, a solid coupling with a screwed joint will be substituted. This will cause no serious inconvenience, as the trains are seldom broken; the cars re-

THE FRENCH DECK-PROTECTED CRUISER SFAX.

matical point. If it can be reached, so much the better.

The unknown regions around the poles are like to rooms in our house whose contents we do not know, but which we, for that very reason, wish to know. May it be the good fortune of the Northmen to take away the locks from these doors!

THE FRENCH CRUISER SFAX.

LAUNCHED in the year 1884, the deck-protected cruiser Sfax now forms part of the French Mediterranean squadron, being, with the exception of the Cecille and the Tage, its largest cruiser.

The Sfax, which is built of steel and wood, has a displacement of 4,488 tons, a length of 288 ft. 9 in., a beam of 49 ft. 3 in., and a draught of 24 ft. 9 in.

The protective deck extends the entire length of the hull, the safety of the ship being further insured by minute subdivision into water-tight compartments by means of longitudinal and transverse bulkheads.

Two horizontal compound two-cylinder engines, driving two screws, form the propelling machinery of the ship. During the steam trials made off Brest in the spring of 1887, these engines collectively indicated 4,333 horse power under natural draught, giving a speed of 15.9 knots per hour; while under forced draught 6,084 horse power was indicated, and a speed of 16.84 knots was obtained. At a speed of 10 knots it is calculated that, with the coal supply of 800 tons carried, this cruiser could make a voyage of 6,000 miles without replenishing her supply of fuel.

Transit & Bridge Construction Company, is full of interesting detail. The original scheme for this road was projected by Col. Alfred F. Walcott, of New York City, now President of the Metropolitan & West Side Elevated, of Chicago. The late Col. Calvin F. Goddard was formerly president of the "Alley road," and took an active part in its construction until his death in the early part of this year. Colonel Goddard supervised the building of the road as far as Thirty-ninth street, but the extension and the completion of the line, and the method of its operation, have been supervised and arranged by his successor, Dr. W. T. Barnard, who for many years was closely connected with the management of the Baltimore & Ohio road. Mr. R. I. Sloan, for some years chief engineer of the Manhattan Elevated road, has been chief engineer of this road since the resignation of Mr. G. B. Cornell. The line is now completed as far as Sixty-third street, and will be finished to the World's Fair grounds before the first of next year. There are in contemplation several branches and extensions, which may be started before the line to the fair grounds is finished.

The whole scheme of running this road and the plan of dealing with the employees are novel in many respects, and so far have proved very efficient. The equipment, method of operation, and the arrangement of stations, etc., are different from other elevated roads.

Stations.—The stations are under the structure, with the entrance on the level of the street, and are fitted up in a very complete way, having all modern conveniences. They are built of brick with tile roofs, and

maintaining together almost constantly, and the time required to make a solid joint will not interfere with the movement of trains.

Cars.—The cars seat 58 passengers, and are finished in light colored mahogany with carved ornamentation. The seats are of rattan, arranged on the sides at the ends and crosswise at the centers. The window and door glass is plain at the bottom, with a slight ornament at the top. The end doors are double and arranged to open together; that is, whenever one door is opened the other opens automatically. The platforms are wider than those of the cars in New York, which naturally facilitates the movement of passengers. Two passengers can pass in and out of the cars abreast without the least inconvenience. The cars have the Vauclain wrought iron truck wheels, and are strong and complete in all their appointments. The couplers between cars are made to couple almost automatically, and are especially designed for eight-car trains. These drawbars couple together with taper keys, which take up the slack, instead of the ordinary round, straight pins, and there is no free slack between cars. This makes the cars ride with great steadiness and there is no disagreeable motion when the brakes are applied, as is the case when the round links and pins become worn. All of the safety gates and platform gates have been especially constructed for the safety of the passengers and for durability, the bearings having hardened bushings. They are so arranged that it is practically impossible for a passenger to be injured, but as an additional safeguard the station platforms have been provided with railings