THE SNAG BOATS OF THE SOUTH.

BY DAY ALLEN WILLEY.

One of the greatest obstacles to navigating the streams of the South and Southwest are the snags. Watercourses like the Mississippi and its tributaries which are subject to extreme changes in depth during the year, and which pass through the dense forests of the West and Southwest, contain so many snags that one of the most important duties of the government engineers in charge of these streams consists of keeping the waterway free from such obstructions. While there are several different methods of removing snags, "snag boats" have recently been designed which are especially adapted for freeing the channels of obstacles to navigation, and are equipped with labor-saving appliances of no little interest.

The inundations of the woodland adjacent to the Mississippi and its tributaries, are at times so great that trees of the largest size are washed out of the formation. They naturally drift toward the center of the watercourse, where the current is strongest, and may be carried hundreds of miles before finding a resting place on some shoal or before they are deposited by the lowering of the water. At times they remain submerged for such a period that they become water-logged. As some of the trees are four and five feet in diameter above the root mass, powerful mechanism is required to remove and destroy them. The force of the flood current in such rivers as the Mississippi, the Red, the Arkansas, and the Missouri is so great that snags ranging thirty to fifty feet in length and having a mass of roots actually twenty feet in diameter, have been lodged in the center of the river bed, the lower end being driven deep into the sand and mud with such force that it has been necessary to employ divers to dislodge it before it could be pulled out. As the trunk or log is often carried down stream in an oblique position, many of the snags are driven into the bottom pointing upstream at such an angle that they form a menace to the lightly built steamers and barges which ply upon these inland waterways.

One of the most powerful types of snag boats used by the government is the "Macomb," which is illustrated by the accompanying photographs. The "Macomb" is employed in the St. Louis district under the supervision of Major Thomas L. Casey, of the corps of engineers, and performs such valuable service in keeping the channels in this district free from obstruction that it is really indispensable to river commerce. The boat is constructed with a hull of iron and steel, 178 feet in length, 62 feet beam, not counting the paddle boxes, with 8 feet depth of hold. Despite its displacement of 1,100 tons it draws less than four feet of water, and consequently can be operated on shoals and in other shallow spots. Two non-condensing engines of a combined capacity of 600 horse-power furnish motive power, giving a speed ranging between five miles and six miles an hour upstream against a strong current.

The interesting features of the boat, as will be noted by the illustrations, are the double or twin bows. These are separated by what is termed a well which is 12 feet in width, each bow being 65 feet in length. At the forward end what is termed a "butting beam" extends from bow to bow. This is a heavy steel beam 22 feet in length, 7 feet wide, and no less than 16 inches thick, greatly strengthening the framework of the boat. As the name implies it is used to ram or butt a snag when necessary to dislodge it from the bottom before pulling it out of the water. Attached to this beam, however, is a sweep chain which drags beneath the water and is designed to grip the lower portion of the snag and aid in lifting it to the surface. This chain is lowered over the bows by a capstan placed at one end, and raised in the same manner. Its purpose is principally to lift the upper end of the snag high enough to push the butting beam under it.

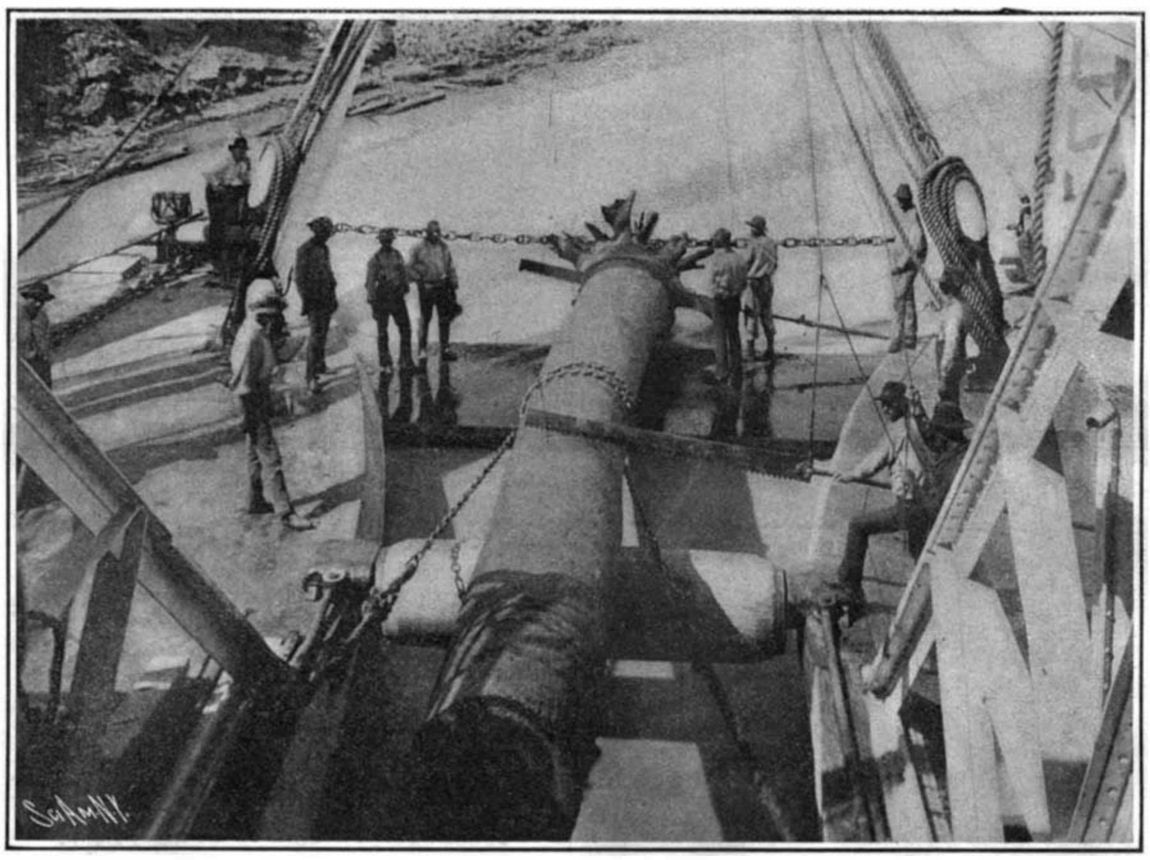
Installed upon the bows are three shear legs, one being utilized to pull out small snags after they have been loosened by the sweep chain and butting beam. Those on the sides are intended to pull up obstructions which can be readily removed by means of block and tackle. The center shear legs are by far the largest. The lower end of the tackle they support, consisting of a heavy chain, is looped around the snag to be handled. The most powerful appliance employed is the so-called Sampson chain. This is composed of 2¼-inch links and winds in and out on a cast-iron drum which is mounted on the forward end of the boat. The chain is used for direct pulling after the snag has been sufficiently dislodged to raise it to the surface, and has a breaking strength of no less than 75 tons. Some of the obstructions, however, are of such a size that this chain has actually been broken in attempting to remove them.

The power for operating the various hoisting appliances and for pulling the snag upon the beam consists of four steam capstans each having a direct pull of 35 tons and a maximum speed of 30 feet per minute. Including the purchase which actuates the Sampson chain, the combined tractive force exerted is 215 tons, while the butting force when ramming the snag is no less than 800 tons.

When a snag is located of such a size that the chain and center shears are required, the boat is placed in such a position that the sweep chain engages the under side of the obstruction. The capstan connected with this chain is then started, and as it tightens, the upper end of the snag is lifted above the surface so that the Sampson chain can be made fast around it as well as the chains connected with the center shears. If necessary the snag boat is driven ahead at full speed, butting the tree with its heavy steel beam while at the same time the capstans and purchase exert their combined lifting power. As soon as the snag is dislodged the propelling engines are stopped and the obstruction lifted upon the butting beam. Here it is lowered upon a roller and cut into logs by steam crosscut saws working horizontally, the portions cut off dropping into the well and floating away. This part of the work is easily accomplished, but as it is impossible to separate the root into sections this is generally held between the bows, carried to some deep spot in the channel, and deposited where it can form no obstruction. As the photographs show, each saw is guided by one man, being attached to metal bars which in turn are connected with axles designed on the eccentric principle, which gives them the necessary forward and backward motion.

As already stated the "Macomb" includes divers in its crew of forty officers and men. At times the snag is of such dimensions and so firmly imbedded that it is utterly impossible even with the powerful equipment to remove it. Then dynamite is placed in holes in the trunk and it is blown out of its position. The boat is also equipped with powerful hydraulic pumps for washing out the mass of mud, gravel, and other detritus which frequently accumulates on snag roots, greatly increasing the weight. At times the lower part of the snag may be so covered with this material that it cannot be sawed into pieces until thus cleansed.

Another large snag boat in use on the Mississippi and tributary waters is the "Charles R. Suter." This craft is 187 feet in length, 52 feet beam over the hull, and can operate in water 3½ feet in depth. It is also constructed with a hull of steel and iron and driven by two oscillating engines, steam being furnished by five 42-inch boilers giving it a total horse-power of about 500. The snagging apparatus consists of two pairs of friction capstans placed in the forward hold and six Providence capstans installed on the deck. The Suter carries a butting beam of oak plated with iron, also a series of five iron shear legs in addition to supporting blocks and tackle, a Sampson chain of 2½-inch links, and a sweep chain.



Sawing Off the Roots So That They Cannot Secure a Hold On the Bottom.

THE SNAG BOATS OF THE SOUTH.

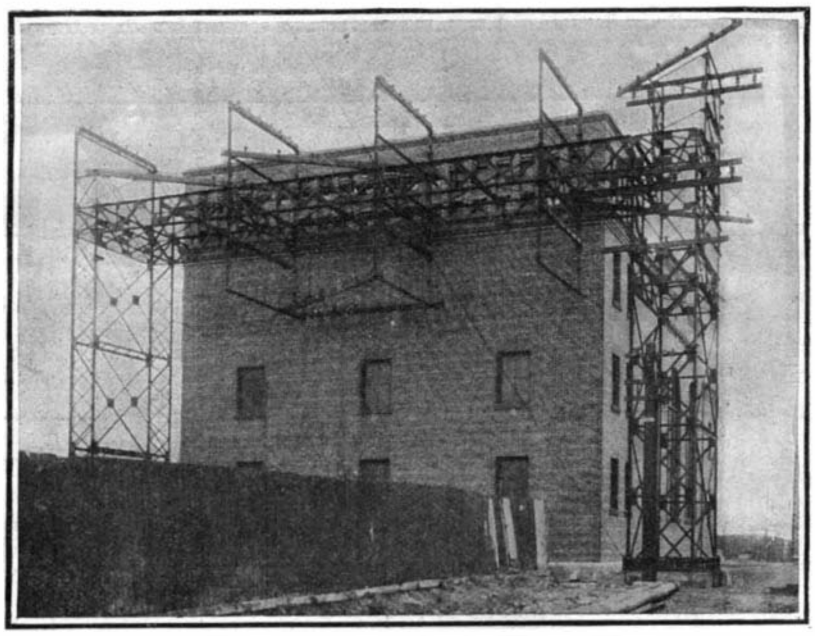
POWER TRANSMISSION LINE OF THE LONG ISLAND RAILROAD.

In our issue of April 28, 1906, we published a description of the new Long Island City power station, which was built to supply power to the Pennsylvania tunnel under the East River and to the Long Island Railroad system. A portion of this power has already been put to use on the suburban lines of the Long Island Railway, and we have just received a detailed description of the electrification of this system. The system is supplied with six sub-stations and two portable sub-stations, the latter to be used for supplying current for the heavy periodic traffic to and from the Metropolitan race track and the new Belmont Park race track. These loads occur for two hours each day for a period of two weeks, twice a year.

In reaching a decision as to whether the overhead or underground type of construction should be used for the transmission lines, a very careful study was made of the operation of lines of great length and of large carrying capacity. The troubles in overhead lines were found to be due to wind, lightning, sleet storms, structural weaknesses of poles, crossarms, pins, and insulators, or outside interferences either from branches of trees or thieves, and very rarely by heat from a fire close to the route. In the underground construction, on the other hand, it was found that breakdowns were generally due either to capacity effects causing extraordinary voltages, or to depreciation of cable sheaths from electrolysis, or to short circuits by reason of mechanical injury, imperfect insulation, and occasionally to overloading or gas explosions in manholes. A comparison of the causes and effects of the troubles in these two classes of construction led to the conclusion that although overhead lines are liable to more frequent interruption through minor troubles than underground lines, yet the interferences with continuous operation on an underground line, when they do happen, are likely to be of a far more serious character and of longer duration. Overhead construction was, therefore, adopted wherever it was usable. Owing to the topography of the system, the sub-station at Woodhaven Junction became a natural distributing center between the power house and the other sub-stations, and for this reason a main power-transmission trunk line was led directly to this point, to distribute the entire output of the power station among the different sub-stations. The impracticability of constructing high-tension overhead lines in thickly populated sections of Brooklyn and Queens required the construction of conduits in two sections of the line, one running from the power station to Dutchkills Street, and the other between the Flatbush terminal and Dunton, just west of Jamaica. Except where submarine cables were used at the Broad Channel and Beach Channel drawbridges in the Jamaica Bay trestle, the remainder of the transmission line is of the overhead type of construction.

Much of the underground construction leading from the power station to Dutchkills Street involved serious complications, owing to the fact that it is situated below the level of the ground water, so that special provision for drainage was necessary. The manholes in this part of the line are connected by a line of 8 inch sewer pipe laid beneath the ducts and entering the manholes about 18 inches from the bottom, thus forming catch basins to prevent silt or other foreign matter from getting into and clogging the pipe. The line is so pitched as to bring all the drainage into three sumps, which are kept pumped out by electrically-driven, submerged, centrifugal pumps, automatically controlled and discharging into the city sewer system. During the construction of this conduit line it was necessary to line the trench with 3-inch tongued and grooved sheathing, and to use the sump pumps continuously to remove water. The line is constructed of single vitrified clay ducts, which were used in preference to multiple ducts because of the thicker walls between them. Manholes for drawing in and splicing the cables were located 400 feet apart on straight work, and at shorter distances on curves. On the Atlantic Avenue line four-way vitrified clay ducts were used.

The underground high-tension cables are of the three-conductor type, each conductor having a cross section of 250,000 circular mils and being composed of 37 copper wires. The cables were tested at the factory by applying 30,000 volts between each pair of conductors and between each conductor and the sheath. At the drawbridge in the Jamaica Bay trestle the cables are of the armored submarine type, the insulation being composed of 30 per cent pure Para rubber covered with a sheathing of lead and tin. Over this is an armor of galvanized-iron wires laid spirally on the outside of the lead covering, with a layer of jute between the lead and the armor. The cables were laid across the channels and allowed to settle to the bottom, after which they were properly separated by a diver, and were then sunk into the mud by means of a water jet to a depth of 4 feet below the bottom of the channel. There are in all about 25 miles of high-tension ground cable installed besides 0.418 mile of armored submarine cable.

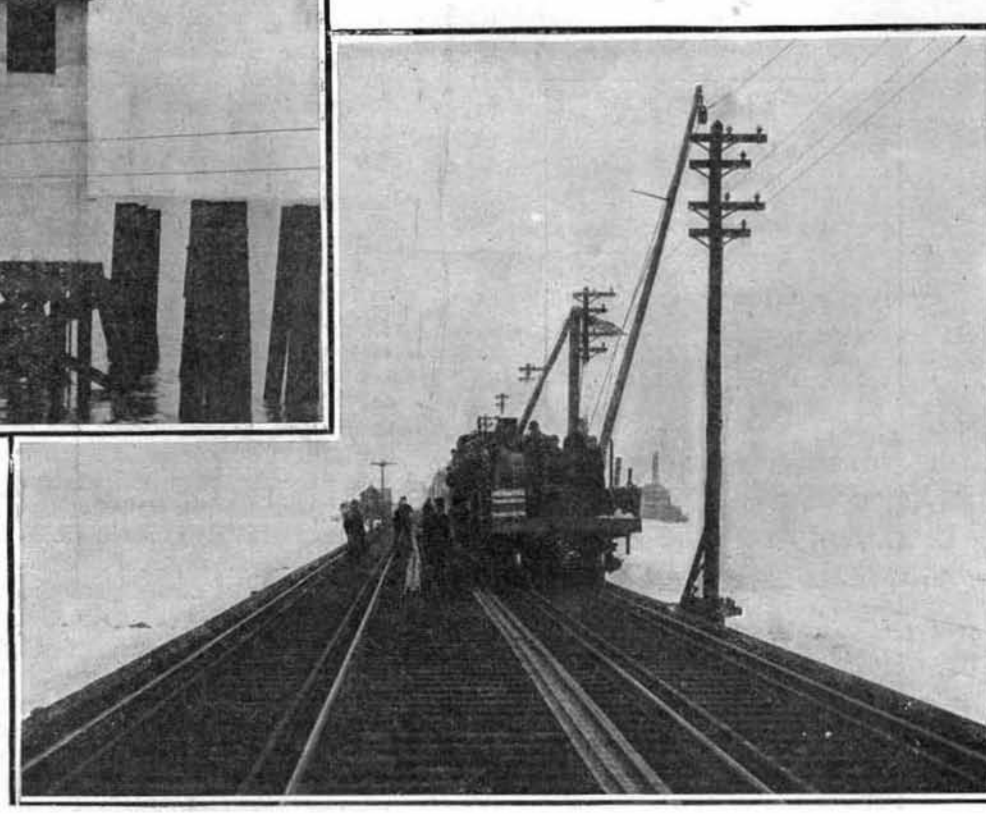


The Terminal Rack at Rockaway Junction.

The vulnerability of underground cables to lightning and to other static disturbances which may be set up in the transmission line required that the outlying ends of transmission cables exposed to lightning charges be provided with protective apparatus. Wherever the underground cable section of the transmission line is joined with the overhead system, lightning arresters and choke coils are installed, suitable houses being provided to shelter this apparatus. One of these houses is located on the main transmission line at Dutchkills Street, and another at Dunton on the branch line running east of Woodhaven. Smaller houses are also provided for the same purpose at the two drawbridges. These houses are entirely fireproof. The incoming cables are carried through the floor by means of ducts reaching to the last manhole in the conduit line, and are arranged along the wall running through switches and through the choke coils to the various outlets along the various portions of the outside walls. The arresters are mounted on either side of the steel framework in the center of the building, and the ground connections all run to a single ground lead, consisting of 5½ square feet of copper plate buried between layers of crushed coke. The outgoing cables on each side are anchored on a strain pole after leaving the racks upon the sides of the building, which, in themselves, are not intended to carry the longitudinal stresses of the overhead cables. The protection afforded by this system seems to have been very effective, as, although a number of lightning discharges are known to have been taken by the arresters at various times and places, no damage is known to have resulted to the cables.

Arrester House at Jamaica Bay Drawbridge.

The overhead line construction is of a very substantial character. The trunk line is carried on steel poles which are designed to support twenty-four 250,000 circular mil cables on their upper portions, and underneath them an additional load of eight 500,000-circular mil low-tension cables, which local regulations require to be at least 25 feet above the ground. The steel poles are built of four corner angles, connected by angles and plates, forming a lattice type of construction. The poles are designed to withstand a wind pressure at right angles to the line corresponding to a wind velocity of 100 miles per hour. This was calculated from data obtained in the Berlin-Zossen high-speed railway tests, which showed the pressure on a flat surface due to a wind velocity of 100 miles per hour to be 27 pounds per square foot, which applies to the flat surfaces of poles and cross-arms. For the projected area of the cylindrical conductors one-half of this value, or 13½ pounds per square foot, was the factor used for the above-named velocity. An extra heavy pole, called a strain pole, is used for turning sharp corners, and for anchoring the line at special points. The ability of the steel pole to act as a lightning rod is turned to advantage. Each pole is thoroughly grounded to a copper plate buried beneath the foundation, and connected to one of the anchor bolts by a copper wire. The transmission cables were strung for the most part by means of teams of horses and running lines of 1,000 feet or more in length, the cable reels being mounted on stationary stands. On the trestle, however, this method could not be so readily followed, and the cables were strung in the following manner: The reel of wire was carried on a flat car, upon which was mounted a boom capable of being swung to one side to the position which would be occupied by the wires. At the end of this boom was a snatch block, through which the wire passed and by which it was guided onto the cross-arm. The car was moved along slowly by a locomotive, and wire paid out, and the boom was raised at each cross-arm, so that the wire would drop onto the arm. Wherever the power-transmission circuits cross the highways or railroad tracks, special precautions are taken to insure against the possibility of the cable falling off a cross-arm and hanging down in position to endanger passing traffic. At the Woodhaven and Rockaway junction sub-stations, special terminal poles or racks are provided to distribute the overhead circuits along the face of the building parallel to the high-tension switching galleries in such a manner that the disposition of the cables after entering the building will be most convenient. At Rockaway junction the location of the sub-station is such that the entering circuits coming from the west had to be taken to the east side of the building, and distributed from the rack there situated. The entering circuits are kept on the west side of the cable rack next the building, while the outgoing circuits which continue eastward are kept on the east side of the rack, thus preventing crosses and making it possible for either set of circuits to be repaired independently of the other set.



Stringing a Transmission Cable at the Jamaica Bay Trestle.

POWER TRANSMISSION LINE OF THE LONG ISLAND RAILROAD.

The use of concrete masonry probably begins with the Romans, who employed it in road building and foundation work. Coming down from the time of the Romans, the ancient city of Ciudad Rodrigo has walls existing at the present day in which are buried large bowlders of stone. These walls are in a good state of preservation at the present time; in fact, so much so that they still bear the prints of the boards which made up the forms which held the concrete in its semi-liquid state at the time it was put in. It is an interesting matter to note that the modern practice of putting large masses of stone in concrete masonry follows exactly the scheme used in building these ancient walls of Ciudad Rodrigo. This method not only reduces the cost of the resulting fabric, but also makes it stronger.

Typhoid fever deaths in New York State numbered 1,554 during 1905, according to the report of Dr. Eugene H. Porter, State Commissioner of Health. Dr. Porter says that it is no exaggeration to attribute almost every one of these deaths to infected water. While there may be some doubts as to this statement, unquestionably many of the deaths were so caused, and there is no doubt that his recommendations for a better sanitary control of the potable water of the State should be heeded. He recommends legislation "providing that all plans for public water supplies be approved by the State Commissioner of Health, and also to secure inspection of proposed and existing sewer systems and water supplies."