INAUDI, THE CALCULATOR.

A few years ago we spoke in these pages of a twelve-year-old child who had been presented to the Society of Anthropology as a prodigy of a new kind, and who performed the longest and most complicated calculations in his head. The name of this child was Jacques Inaudi. After going the rounds of country cafes, where he succeeded in earning his living by amusing the curious with his extraordinary calculations, Inaudi, who is now twenty-four years of age, has put himself under the direction of a manager, who gives public exhibitions of him in one of the concert halls of Paris. The faculties of this young man are extraordinary, and it has appeared to us that his history merits a detailed study. We shall have recourse in great part to a very complete work upon the calculator that has just been published by Dr. Marcel Baudoin.

Inaudi was born on the 13th of October, 1867, at Onorato, in Piedmont. In the country of his nativity, he, like Henri Mondeux, another celebrated calculator, began by guarding sheep. He soon followed his father, who played the organ in the various cities of the south of France, and it was by instinct, and without any one having taught him anything, that the faculty of making mental calculations came to him.

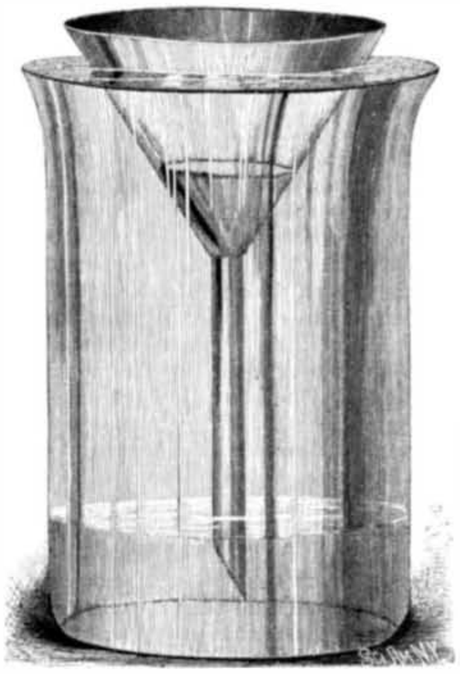
He began to exhibit himself in a cafe at Marseilles. His reputation soon increased, and in 1880 he came to Paris. He was then twelve and a half years of age. He was submitted to examination by Broca in the session of the Society of Anthropology of the 4th of March. After this epoch he made the tour of the country, as we have said, and it was brt a short time since that he returned to Paris. He was presented to the Academy of Sciences at the session of the 8th of February, 1892.

Dr. Marcel Baudoin, who has submitted Inaudi to a special examination, describes the latter's astonishing operations in the following words:

We must now make known what extraordinary feats Inaudi is capable of performing. Standing upon the stage near the prompter's box, he turns his back to the blackboards placed in the rear of the stage, and upon which the manager writes the known quantities of the problems given, in order to permit the audience to take account of the calculations effected. With his hands crossed upon his chest, he listens with extreme attention to the question addressed to him, repeats it, and has it repeated, if necessary, until he understands it perfectly. He furnishes a correct solution almost immediately, without ceasing to look straight into the faces of the spectators, without writing anything (he never writes in calculating), and without being disturbed, whatever noise be made. Do you wish an example? He adds in a few seconds seven numbers of from eight to ten figures, and all this mentally, through means peculiar to him. He subtracts two numbers of twenty-one figures in a few minutes, and as quickly finds the square root or the cubic root of a number of from eight to twelve figures, if such number is a perfect square. It takes him a little more time calculation that he made amid the noise and while he was talking. Errors on his part are not frequent, as Dr. Baudoin remarks.

He is rarely deceived, and when he states a result it has many chances of being accurate. If he is deceived, he quickly recognizes his error, for he says that he always proves the operations that he has had to perform.

Broca, in 1880, was unable to get an insight into his processes of multiplication, and this he confessed without any circumlocution. Now that Inaudi possesses a



A HYDROSTATIC PARADOX.

well developed intelligence, he explains them without trouble. While we begin to reckon from right to left in multiplication, he proceeds, on the contrary, from left to right.

Say we have to multiply 345 by 527. The series of operations performed by Inaudi is as follows:

1.	300 × 500 = 150,000
2.	300 × 27 = 8,100
3.	527 × 40 = 21,080
4.	527 × 5 = 2,635
	Total, 181,815

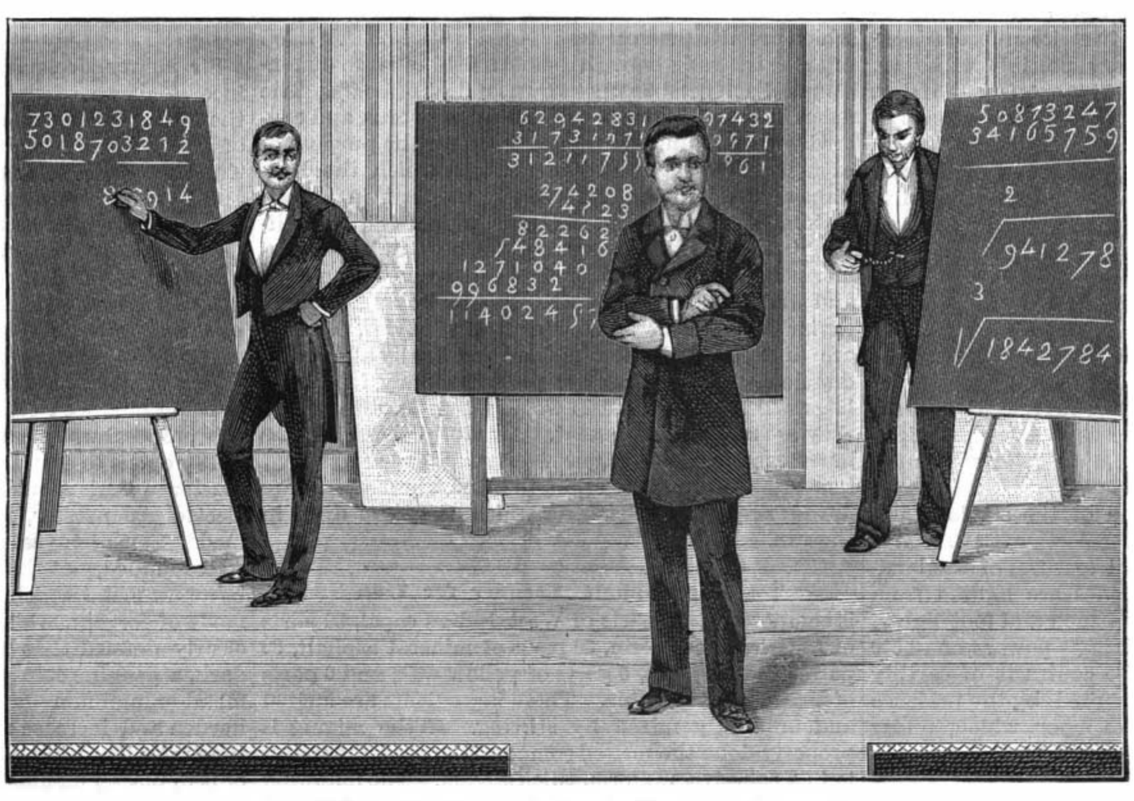
Altogether, four multiplications and one addition. All this is done in a few seconds; much more rapidly than if a skilled mathematician had taken the pen. But Inaudi is not merely a calculating machine, for he is also capable of doing the work of a true mathematician and of finding by arithmetic and tentative methods the solution of problems that are usually solved only by algebra. The manager insists upon this point, and he is right, and he adds that it has been thus only for the last two years. From this point of view, Inaudi has solved in our presence quite complex problems, which, worked out in this way, necessitated more than sixty successive operations that seem to pass before his eyes with amazing rapidity, like the figures of a kaleidoscope incessantly in motion. The difficulties that he has recently surmounted in this sort of exercises at the Academy of Sciences before the eyes of Messrs. Darboux, Bertrand, and Poincaré, at the Sorbonne, and at the minister's office in the presence of the minister of public instruction, Mr. Bourgeois, are truly colossal. The strongest mathematicians of our time, even Mr. Poincaré, whose competency in such matters is well known, have been obliged to recognize the fact. Let us add, further, that he is capable of retaining figures for months, provided that it is profitable to do so, or that he wishes to for any reason whatever. Then he classifies them in a special manner. It takes him a minute to commit to memory a number of twenty-four figures. Inaudi has had several predecessors, and it is not the first time that the members of the Academy of Sciences have studied analogous prodigies. As long ago as 1840, Henri Mondeux, a young calculator, was presented to them. Like Inaudi, he was a young shepherd. Born in the neighborhood of Tours, of poor parents, Mondeux from his earliest childhood had amused himself in counting pebbles while guarding sheep. He combined with them the numbers that he represented in this way, but he was unacquainted with figures. After having for a long time practiced alone in the fields, he offered to those whom he met to solve various problems. Mr. Jacoby, a teacher, remarked him and had him instructed, and a short time afterward took him to Paris and presented him to the Academy of Sciences. The mathematician Cauchy made a report upon him, in which he expressed his admiration to the highest degree. Mondeux was exhibited to the public in his shepherd's costume. He wore a blue blouse, a soft hat, and wooden shoes. A little before this the Academy had examined a twelve-year-old child, Vito Mangiamel, who was born in Sicily. Arago proposed some difficult problems to this child, who solved them mentally with the greatest ease.

"Lightning" calculators may claim as their ancestor the Englishman, J. Buxton, who toward the middle of the last century enjoyed a great celebrity. He, too, was an illiterate person, who began his reputation in his childhood. He calculated the longest and most complicated interest accounts.

Prof. Charcot, who submitted Inaudi to a close examination, was struck with the almost absolute identity of the conditions of birth and precocious development exhibited by "lightning" calculators. Almost all of them have drawn their extraordinary aptitudes from themselves, and have been illiterate. There is here a natural gift, as is, in a way, that wonderful gift that we call genius, and which inspires great artists or great mathematicians.—*La Nature.*

when in this extraction of square or cubic roots there is a remainder. He finds, too, with incredible celerity, the sixth or seventh root of a number of several figures. He performs an example in division or multiplication in less time than it takes to state it. What is still more astonishing, an hour after performing all these mental operations, and after finding a solution of problems that are very difficult to solve by arithmetic, he recalls, with most remarkable precision, all the figures that he has had to operate upon.

Our figure represents Inaudi at the moment of his experiments. While the calculators standing behind him are performing upon the blackboards the examples given by the spectators, Inaudi, without ever looking at the boards, talks with the spectators and immediately solves other small problems. Some one asks him, for example, "On what day did the 11th of January, 1787, fall?" He answers at once: "On Thursday." And the answer is correct, as is verified by the spectator who asked the question and who has brought an old almanac with him. At moments, Inaudi stops his conversation, and, with his arms folded, he is observed to reckon upon one of his arms with his fingers, as shown in our engraving. He then asks for a few minutes of silence, in order that he may verify the



JACQUES INAUDI, THE RAPID CALCULATOR.

A HYDROSTATIC PARADOX.

R. W. WOOD.

A very pretty and instructive experiment, which I have never seen described, consists in floating a vessel with a hole in the bottom in a fluid specificially lighter than the material of the vessel.

An ordinary glass funnel, open at both ends, is made to swim in what appears to be pure water.

The effect is very startling, and even after the conditions are told, the exact cause may not appear to every one. To perform the experiment, fill a beaker six inches high to within an inch of the top with pure water. By means of the funnel, which should be of the same height as the beaker, pour ordinary sulphuric acid (the c. p. is better, being clearer) into the beaker until the water reaches the rim. The funnel should reach to the bottom while the acid is being poured in, and the heavy fluid will remain in a layer underneath the water. The surface of the acid should be stirred a little, so as to cause a partial mixing and render the dividing line more obscure. Then remove the funnel. By placing the glass in a suitable light, it will be next to impossible for a person to see the dense layer at the bottom. Call attention to the fact that there is nothing in the neck of the funnel to prevent the entrance of the water, and lower it into the beaker, where it will float in a most curious manner, and if pressed down a little, will bob up like a cork. The reason is obvious. As the funnel is lowered into the glass, the water rises in the tube and the level remains constant inside and outside, but as soon as the stem of the funnel dips into the heavy acid a change of level commences, for the downward pressure of the water outside will not support a column of acid its own height, and consequently the level of the liquid within the funnel falls below the level of the liquid outside. This difference of level has practically the same effect that a plug in the bottom of the stem would have; the head of the funnel being nearly full of air, it floats just as any hollow glass vessel would. In a beaker filled with sulphuric acid alone the funnel would sink, the glass being heavier than the acid.

The experiment is a very pretty one for the lecture table, and the exact cause of the phenomenon will prove rather a severe test for an elementary class.

A tubulated champagne glass, with the bottom cut off, may be used instead of the funnel, and I think likely that a saturated solution of hyposulphite of sodium could be used instead of the acid. It certainly would be safer.

If, while the funnel be floating, one pours sulphuric acid into it slowly, it does not sink, but *rises higher out of the water*, for the acid expels the water that entered during immersion, from the stem, and consequently decreases the length of the column necessary to support the funnel. If, on the other hand, water be poured into the funnel, it will sink at once, for the water cannot get down past the heavy acid in the bottom of the stem, and consequently fills up the head.

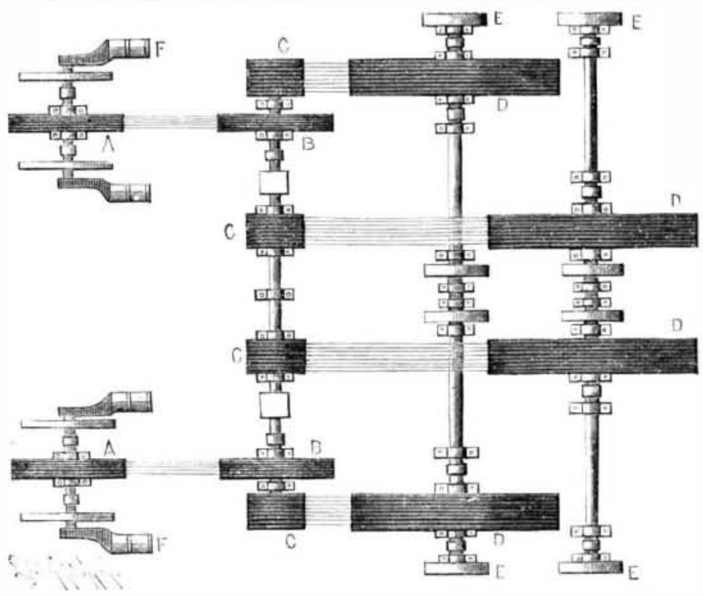
Baltimore, Md., March 14, 1892.

ROPE TRACTION FOR CABLE RAILROAD PLANTS.

The great rope drive wheel shown in the accompanying illustration is one of four of the same size made by the Walker Manufacturing Co., of Cleveland, Ohio, for the Third Avenue Cable Railroad. These wheels are each 32 feet in diameter, 6 feet 1 inch wide on the face, and provided with 22 grooves each suitable for a 2¼ inch cotton or hemp rope. The finished weight of each wheel is 75 tons.

The connecting flanges of the segments of the rim are placed in line with the arms, and turned bolts fitted into reamed holes serve to secure these segments together. The arm ends are secured to the flanges on the segmental rim by through bolts, a portion of which are turned, fitted into reamed holes.

The centers, which present a very massive appearance, are accurately faced to receive the flanges of the arms, the connection being made by through bolts, half of which are turned bolts fitted into reamed holes. The wheel is shown in the lathe in which it was held for the making of the grooves in its face, the wheel being turned by a supplemental wheel clamped to its hub, while the supplemental wheel was turned by bevel gear connections. Other wheels of various sizes, ranging in diameter from 9 feet up to 22 feet, are being made by the company for the same work. The down town power house of the Third Avenue Cable road will be at the corner of the Bowery and Bayard Street, and at each of the power stations the entire plant will be duplicated to prevent any possible delay from breakdowns.

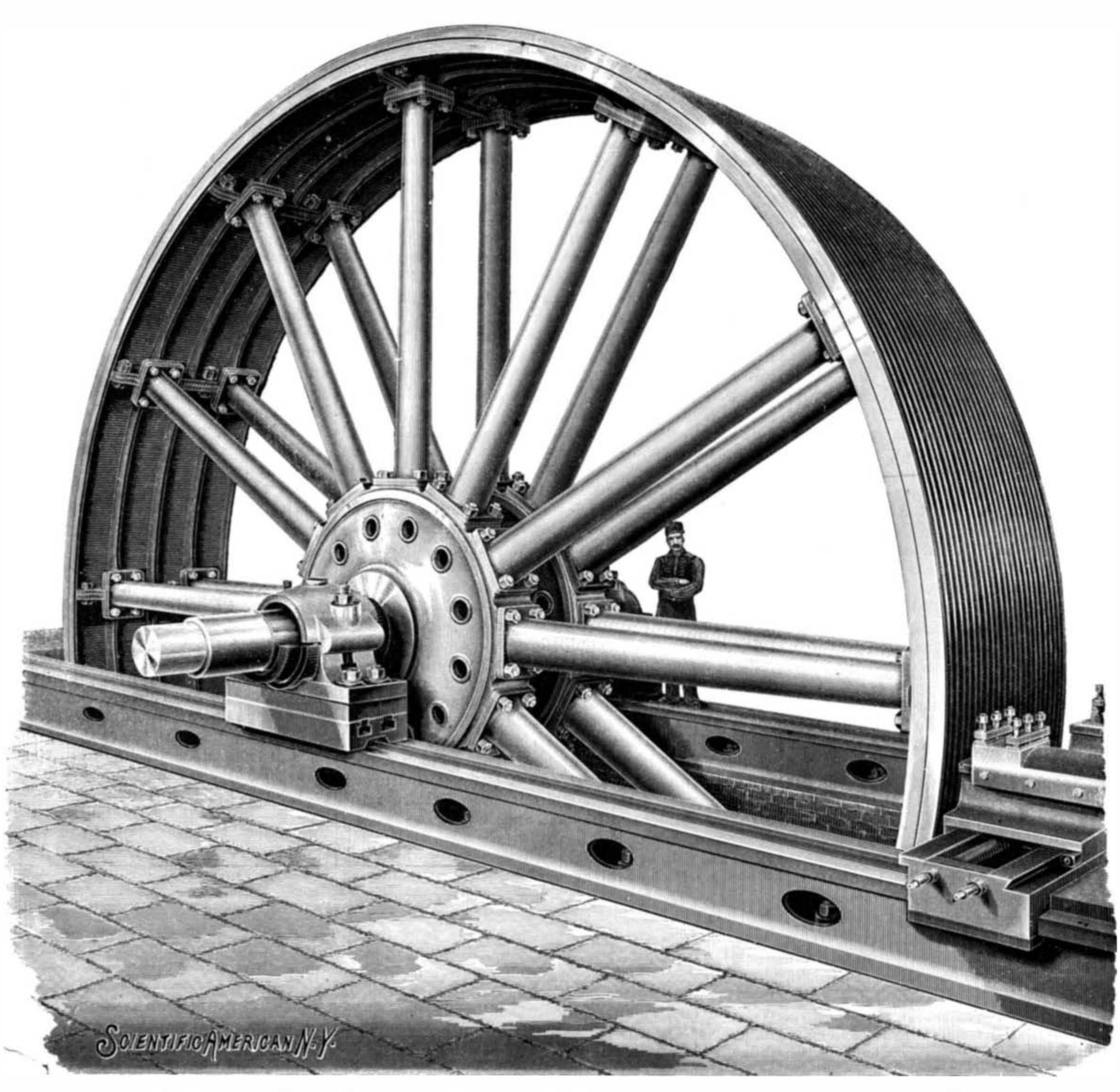


A, B, C, D, Rope Pulleys from Engine, F, to Cable Drum, E.

POWER TRANSMISSION BY ROPE PULLEYS TO CABLE DRUMS.

The Walker Manufacturing Company are also now making some similar rope wheels for the Broadway Railway Company, but these wheels will be still larger, being 32 feet in diamater and 8 feet 4 inches wide over the face, weighing over 100 tons each. The accompanying diagram of the Houston Street power station of the Broadway road, work on the foundations for which is now progressing, shows how these rope traction wheels are employed. The power plant is to be on one floor, all beneath the street level, and it has been necessary to excavate to a depth of 40 feet to obtain the room which will be required for the machinery. There are to be four engines of 1,000 horse power each, arranged in pairs. Each pair of engines, F, operates a shaft on which is a rope traction wheel, A, but a clutch mechanism allows either of the engines to be disconnected. A series of ropes transmits the power from A to the similar wheel, B, on a transverse shaft, this shaft also being similarly connected with the other pair of engines, and the arrangement being such that either one of the four engines may be employed to operate the shaft.

The smaller rope traction wheels, C, on the transverse shaft, are connected by a similar series of ropes with the large wheels, D, on shafts carrying the cable drums, E, on their outer ends. This means of conveying power from the engines to the cable drum shafts is not as rigid as would be a system of gears, and runs with far less friction, while some decided advantages are claimed for it over belt traction. The portion of the cable coming in is always under a higher tension than the portion of the cable which is going out, and this arrangement of rope-driving wheels is designed to give a certain elasticity to the system which will better accommodate the differences of tension than would be accomplished with either leather belt or cog wheel power transmission. There will be two entirely separate cables laid, the cars being provided with duplex grips, by means of which a change can be quickly made from one cable to another, should any accident occur by which the running cable is disabled.



A GREAT ROPE TRACTION WHEEL FOR THE THIRD AVENUE CABLE RAILROAD.