metres," but my tongue was, as it were, paralysed. Suddenly I shut my eyes and I fell senseless in a complete trance." At this moment it was about 1 30 p.m., and their distance from the earth was about 26,150ft, or something over five miles. When M Tissandier opened his eyes again, it was 2.8. p.m. They were descending rapidly; he was just able to cut off a bag of ballast to stay the rapidity, and to write a note on his register:—"We are descending; I throw out ballast; barometrical height, 315. We descend; Sivel and Crocé still fainting in the bottom of the car. We descend very quickly." He had hardly written this when a kind of trembling seized him, and he fainted again. A few minutes later he was roused by his arm being shaken, and recognised Crocé, who was throwing out ballast. "He said to me, 'We are descending;" but I could scarcely open my eyes, and did not see whether Sivel was awake I remember that Crocé unhooked the aspirateur, which he threw overboard, as well as ballast coverings. Of all this I have a very confused recollection, for I fell again into a state of coma even more completely than before, and seemed as though I was wrapped in eternal sleep." With his two companions that eternal sleep was more than a seeming, M. Crocé's act—done, of course, after his brain had become partially obscured—in fact doomed himself and M. Sivel. The aspirateur was an iron instrument for observations with carbonic acid, and weighed about 80lb—*i.e.*, about as much as one whole ballast bag and a half, and thus lightened, the descending balloon started on a second ascent, in which two of the three voyagers died. When M. Tissandier finally regained consciousness it was 3.15 p.m. "I felt giddy and dejected, but my brain was clearer. The balloon was descending with frightful rapidity, the car swaying about violently and oscillating to and fro. I dragged myself up and took Sivel and Crocé by the arms. "Sivel! Crocé!" I cried, "Rouse yourselves." My two companions were huddled up in the car, their heads hidden in their cloaks. I collected my strength and tried to raise them up. Sivel's face was black, his eyes dull, his mouth open and full of blood. Crocé-Spinelli's eyes were shut, and his mouth was covered with blood. . . . Soon earth drew nearer. I wanted to find my knife to cut the rope of the anchor; it was impossible to find it. I was like a madman, and kept calling out, "Sivel! Sivel!" By good fortune I found the knife at last, and cut the anchor adrift at the right moment"

WIRE ROPE STREET TRAMWAYS.

We publish on pages 176 and 177, illustrations of a new and very successful mode of working street tramways especially adapted to localities where the gradients are such as to render it impossible to employ horses, and where interference with the existing traffic cannot be permitted.

This system, designed by Mr. A. S. Hallidie, of San Francisco, California, has been adopted by the Clay-street Hill Railroad Company in that city.

It consists of an endless wire-rope placed in a tube below the surface of the ground, between the tracks of the line and kept in position by means of sheaves, upon and beneath which the rope is kept in constant motion during the hours the traffic is running, by a stationary engine, the power being transmitted from the motor to the rope by means of grip pulleys, and from the rope to the cars on the street by means of a gripping attachment fastened to the car, and which passes through a narrow slot in the upper side of the tube.

A description of this system, as adopted in San Francisco, will best explain its mode of working.

Clay-street is a central street in the city of San Francisco, and for a number of blocks near the lower terminus of the road is very densely populated, the street is only 49 ft wide from house to house, and between the sidewalks are laid two lines of gas pipe, one line of water pipe, a street sewer, and at the cross street are water cisterns.

The lower terminus of the road is at the intersection of Kearny-street and Clay-street. The summit of the hill is 307 ft. above Kearny-street. The incline runs on Clay-street, has a double track, and is 2800 ft. long; the rope then runs down over the summit 500 ft. with an incline of 15 ft., to the engine house on Leavenworth-street This makes the entire length operated by steam 3300 ft. The grades are as follows: from Kearny to Dupont, 45 ft.; from Dupont to Stockton, 45 ft.; from Stockton to Powell, 62 ft.; from Powell to Mason, 42 ft.; from Mason to Taylor, 48 ft.; from Taylor to Jones, 67 ft. The average grade is 580 ft. per mile. Clay-street runs at right angles to the above streets which have widths varying from 15 ft to 68 ft. 9 in. The steepest grade is 1 in 6¼.

The system submitted by Mr. Hallidie, and determined on by the company, was that of a constantly travelling endless steel-wire rope, and the conditions to be met were, that the road should present no more serious impediment to ordinary travel than the usual street railroad; that the rope should be below the surface of the street; that the car could be instantly stopped on any part of the road; that it should be worked more economically than with horses, that its mechanical construction and management must be simple and easily controlled, and that no motor should be used in the more populous portion of the street that would frighten horses or endanger lives.

The general arrangement is as follows. an endless steel wire rope, 3 in in circumference, 6,800 ft. long, weighing 9,600 pounds, and made of 114 No, 16 gauge patent steel wire, hardened and tempered, is stretched the whole distance of Clay-street, lying in iron tubes, supported every 39 ft. on 11 in. sheaves This rope is supported at every change of angle at the lower crossings on sheaves 4 ft. in diameter, passing around a sheave 8 ft. in diameter at the lower end of the line, and at the engine house around two inclined sheaves, each 8 ft. in diameter, which lead the rope on the grip pulleys, also 8 ft. in diameter, which are driven by an engine with 12 in. cylinder and 24 in. stroke.

The grip pulleys being furnished at their circumference with jaws that grip and release the rope automatically by the pressure of the rope in the jaws, the rope is prevented from slipping; and the pulleys driven by the engine actuate the endless rope, one part of course travelling up one tube, and the other down the other tube.

In addition to the sheaves that support the rope in the tubes at each upper side of each crossing where the incline makes an angle upwards, there are sheaves in the tubes that keep the rope down and from striking the upper part of the tube From the cut showing the cross section of the tube (Figs 2, 3) it will be seen that there is an opening in the upper side of the tube. This opening runs the entire length of each tube, forming a long slot seven-eighths of an inch wide. This slot is not immediately over the centre of the tube but on one side, so as to clear the upper sheaves and to enable the foot of the gripping attachment to pass by and under the upper sheaves, and over the lower sheaves in the tube. The connexion between the cars on the street, and the travelling rope, is made by means of this gripping attachment, which plays an important part in this system, and is shown in Figs. 1, 4. The cars are made to seat about 14 passengers, but not seldom as many as 44 have ridden in them, and 9 on the dummy—53 in all. The traction car, or "dummy," with the gripping attachment, is shown in the perspective sketch on page 176 This car is attached to the passenger car, so that there can be no danger of accident The passenger car is amply provided with brakes. In addition to the usual car brake, there is another attachment operated in the same manner as ordinary brakes, which forces a broad band of wood down on each track immediately under the car. This arrangement is also shown in the drawings, page 177 Strong iron drags are provided, so that if an accident should occur in going up the hill, they will immediately catch in the street planking, and prevent the car from going backwards.

Since the road has been in operation, owing to some poor material furnished, the connexion between the "dummy" and the passenger car broke, on the steepest grade. Before the car went more than a few feet the brakes effectually stopped its further backward progress, showing conclusively that the precautions adopted were effectual. The car was crowded at that time. The "dummy" is also provided with a powerful brake. By this means the car can be stopped at any place on the route, stoppages not being confined to street crossings where it is level The "dummy" and car are connected with "bumpers," so that the weight of the car going down comes on the rope and is utilised to draw up the other cars on the other track The brakes are not generally used when coming down except when it is necessary to stop, the car running down with the same speed as the rope, since the gripping attachment is in connexion with it. Fig. 1 shows a perspective view of the screw gear gripping attachment, and Fig. 4 shows it to a