large scale. A vertical slide works in a standard, and is moved up and down by a screw and hand-wheel, Fig. 1. This screw is shown in the drawings on page 177. The small upper screw going down through the larger one operates it. At the lower end of this slide is a wedge-shaped block. The wedge actuates two jaws horizontally, which open and close according to the direction in which the slide is moved, closing when the slide is moved upwards. These jaws have pieces of soft cast iron placed in them, which are easily removed when worn out. These pieces of iron are of proper shape and size inside to grip the rope when they are closed over it.

On both sides of these jaws and attached to them, are two small sheaves. These sheaves are held by means of rubber cushions sufficiently in advance of the jaws to keep the rope off from them, and at the same time to lead the rope fairly between them, allowing it to travel freely between the jaws, when they are separated, without touching them. When it is required to grip the rope, this slide is drawn up by means of the small screw before described, and the wedge at the lower end closes the jaws over the rope, at the same time forcing back the small guide sheaves on to the rubber cushions. The standard containing the slide, &c., is enclosed and retained in a cast-iron bracket, and can be raised and lowered bodily through an opening in the end of the tube from above the surface of the street to the rope by means of a screw and nut, or rack and pinion. As carried out the former mode is employed. The cast-iron bracket is secured to the dummy, as shown in Fig 1, which is coupled to the passenger cars at the bottom of the incline, and uncoupled at the top, and *vice versâ*, horses then being attached to the car for the level road. At first the connexion between the dummy and car was made by means of spiral springs, to prevent any jar in starting, but this was found unnecessary. The arrangements made at the bottom of the incline for keeping the rope at the proper tension, and taking up the slack, prevent any noticeable jar in starting. As before stated, the rope is constantly in motion running between sheaves placed in the tube. The slot of the tube is on one side of a vertical line drawn through the centre of the tube, and referring to Fig. 4, it will be seen that the foot of the gripping attachment projects on one side, giving it an L shape, enabling the jaws to pass under and over the rope sheaves in the tube. In order to stop the car, the jaws of the gripping attachment are opened slightly; when they release the rope, the guide sheaves take it, and the car stops. The shank of the standard containing the slide which works in the slot of the tube, is one-half of an inch thick and 5½ in. wide, there being one-eighth play on each side; all the essential parts of the gripping attachment are made of steel.

The turntable at the foot of the incline is double. The available space at this point was very limited, and in view of this, some ingenuity had to be employed. When the traction car reaches the foot of the incline, it is uncoupled from the car and run on to the turntable, the slot in the latter allowing the shank of the grip to pass freely down. The table is then turned around one quarter of its circumference, and the track and slots are then brought in the same line. The traction car is then run on the other table, which is turned back and it is run on the up track. The car is then brought on the turntable, transferred in the same manner and coupled to the traction car, ready for the ascent. This course is necessary, as there are double tracks; and the travelling wire rope runs down beneath one pair and up under the other. As the gripping attachment passes down under the street through the slot, it is necessary to have a slot in both turntables to allow the traction car to be turned.

The method adopted at the upper end of the road is more simple. A turnout is made for the car and it runs down to a common single turntable. The dummy is turned as follows. A circular table connects both tracks with a slot described around a centre. A small iron triangle connects the dummy at two points with the centre of the slot and tube. By pushing on the dummy, the centre of this iron triangle being held in position by appropriate means, the dummy turns around in a very small circle, and is ready for the return trip when attached to the car, which has already been turned on the turntable.

The road has a gauge of 3 ft 6 in. An ordinary 20 lb. T rail is used, which is set flush with the street and presents a smooth appearance. The rope runs at the rate of about 4 miles per hour, and the ascent is made, including stoppages, in about 11 minutes, the distance being 3300 ft. The stretching arrangement at the lower end has a counterbalance of 3300 lb. weight on a double purchase, which keeps a constant strain on the rope under all circumstances. The motive power is supplied by a steam engine of 30 horse-power.

The rope runs around an inclined pulley, then down under one of the grip pulleys, over it to a plain pulley, and back again to another grip pulley fastened on the same shaft on the first grip pulley, being then guided back to a second horizontal pulley in the street again. This machinery is so arranged that the wire rope passes for some distance in open view of the engineer, so that it can readily be examined at any minute.

The cost of building and equipping the road has been about $100,000, the inclined portion costing $60,000.—*Engineering*.

PLAN FOR CONNECTING ENGLAND AND FRANCE.

We have already frequently drawn the attention of our readers to some of these plans which are now engaging the attention of the leading engineers of the old world. In this issue we give on pages 180 and 181 illustrations of the last two projects that have been devised. That on page 181, is that of the famous French engineer Dupuy de Lome. It consists of two parts. First, to build a harbor in which neither storms nor the undue ebb or flow of the tides shall have any influence on the entrance or exit of vessels. Secondly, to build a vessel in which railway carriages can be transported. The harbor A, has the shape of a mussel shell ... its opening so disposed that the waves break on the inte..r mason work, on the offside of which are three small cavities or wharves (D D D), having the form of a ship's stern and where the vessel can be fitted to the proper height for loading. Along the dyke B, is laid a railway C, to the farthest end, where a semaphore lights each of three cavities or shipping wharves. By means of the drawbridge D, the carriages back into the vessel, the locomotive remaining on the dyke. The vessel then takes the sea along EE. The ship is fitted to carry two trains of 14 cars each, one on each side. There is a waiting saloon on board, to which passengers can retire during the crossing, but they may retain their seats in the carriage if they choose and thus make the whole trip by rail. At Dover, a locomotive hooks on the train, and in a few moments, steams off to London.

The second project is that of a submarine tunnel imagined by Thomée de Gamond. This tunnel is cylinder-shaped, 9 metres wide, 7 metres high, with a slight grade at both ends. It has two parallel railway tracks, and two footpaths, and extends from Cape Gris Nez to Eastware, between Dover and Folkestone. Halfway lies the cliff of Varne where there will be a sea station. The cliff will be transformed into an island with mole, harbor and a gigantic tower. At both ends, where the submarine tunnel becomes a subterranean tunnel, there will be towers fitted up with pumps and ventilating apparatus.

GOLD QUARTZ CRUSHING MACHINERY, NEW ZEALAND.

Our illustration on page 185, is of interest as indicating the progress of a sister colony.

The machinery, as shown in this illustration, is not actually working, but has been thrown out of gear for the moment, to allow of the photograph being taken. Its motive power is derived from the revolving of the horizontal shaft, which is driven by means of a band, worked either by steam or by water power. The water power, where used, is most frequently that of the stream in a leat or mill-race, but in some instances, as in Goodall's establishment, it is got by raising water to a certain height, by means of the Californian pump.

A glance at our engraving will show that the main or upper shaft, which is seen extending across the front view, communicates its revolving motion by the band working over two driving wheels, at the left hand side, to a second horizontal shaft, parallel with the first, placed across the row of perpendicular shaft of "stampers," in the rear of this view. The stampers, of which twenty are here shown, ranged at intervals one foot or fifteen inches apart, are lifted in rapid succession by the revolving action of the second horizontal shaft, which