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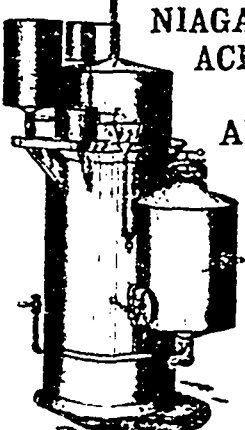
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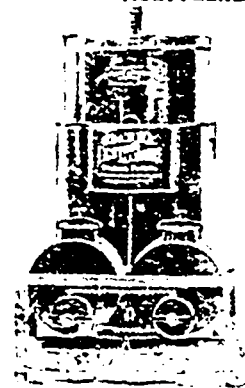
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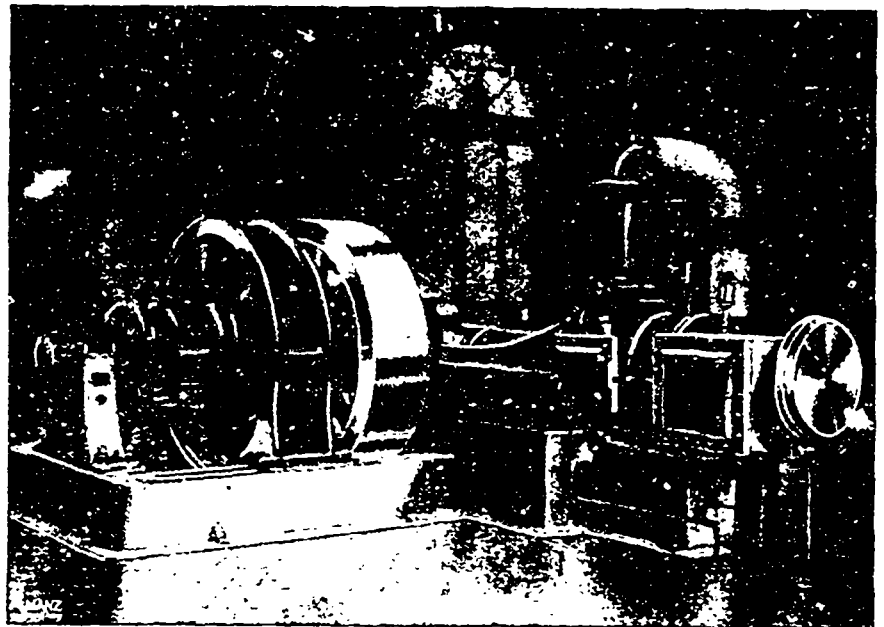
THE  
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### CANADIAN ENGINES IN SPAIN.

In October, 1897, contracts were given for the equipment of electric tramways in Barcelona and Madrid, two of the most important cities in Spain. The work was completed a few months ago, and the lines are now in successful operation. Barcelona, with a population of about 600,000, is the largest city in Spain, and is an important seaport and manufacturing centre. It is an ideal city in many respects, but particularly from the standpoint of the owners of the electric railway, as it is well patronized on account of the climate being too warm for much

dynamoes direct connected. They were put in principally for lighting the extensive car sheds, and driving the machinery in the workshops connected with the tramway systems, but are also used for running part of the cars late at night, or early in the morning when the main engines are shut down.

The high pressure cylinder of these engines is ten inches in diameter, low pressure sixteen inches in diameter, stroke fifteen inches, and are rated at 115 horse-power each. The valves are controlled by the automatic governor in such a way as to divide the work equally between the two



Robb-Armstrong Engine at Madrid.

walking. Madrid is the capital of Spain, and is nearly as large as Barcelona. It is situated inland, and has many parks, broad streets and fine buildings. In the character of its population it resembles a western American city, as not more than forty per cent. of its residents are natives.

Although these systems are owned by British capital and built by British contractors much of the apparatus was purchased on this side of the Atlantic. The main engines were manufactured in the United States, and three smaller engines were supplied by the Robb Engineering Company of Amherst, N.S. These engines, as shown in the accompanying illustrations, are tandem compound, side crank type, with

cylinders. The crank shaft connecting rod and crank pin are of hammered open-hearth steel. The high pressure cylinder is placed next to the frame, the low pressure in the rear, so that the cylinder heads and pistons can be removed without disturbing the cylinders. The throttle consists of a flat valve rotated through one-half revolution by a lever, and as the valve and seat are protected from the steam, whether open or shut, they can neither wear nor rust. The main bearings have a ring-oiling device, the oil being continuously conveyed from a cavity beneath the bearing to the top of the shaft by metal rings which dip in the oil. All bearings are large, and the parts of the engine few and simple, and as strong as

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