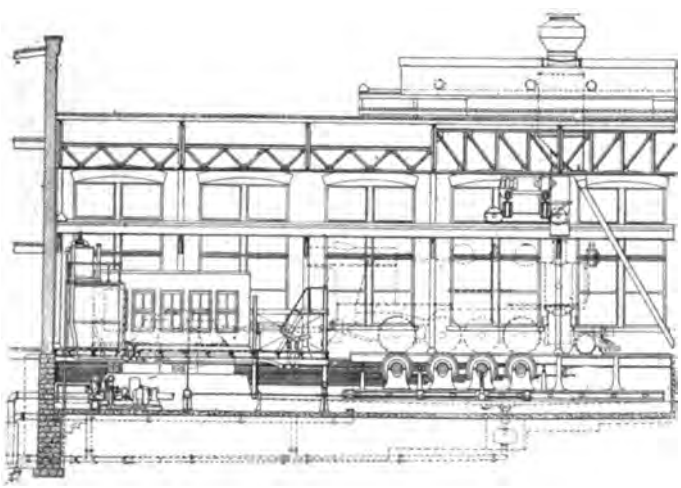
Locomotive Testing Plant at Altoona

Pennsylvania Railroad

SINCE November 19, 1906, the locomotive testing plant at Altoona has been in continuous operation, and the force of sixteen men have made on an average of about three complete tests each week. Certain portions of the apparatus were temporarily installed at the Louisiana Purchase Exposition, and experience gained through operation there has been embodied in the plant at Altoona.

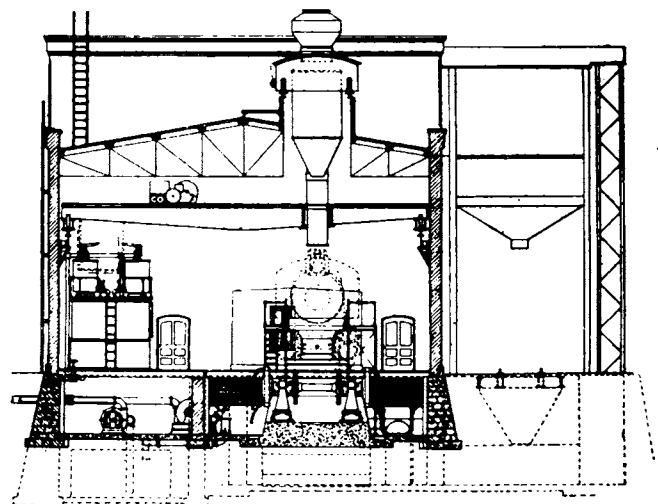
A separate building of steel and brick has been erected for housing the apparatus. The general appearance of the building is shown by the photograph, which also indicates clearly the coal handling arrangement outside of it, with the bin for ashes directly over the track used for bringing in coal.



LONGITUDINAL SECTION OF LOCOMOTIVE TESTING PLANT AT ALTOONA—PENNSYLVANIA R. R.

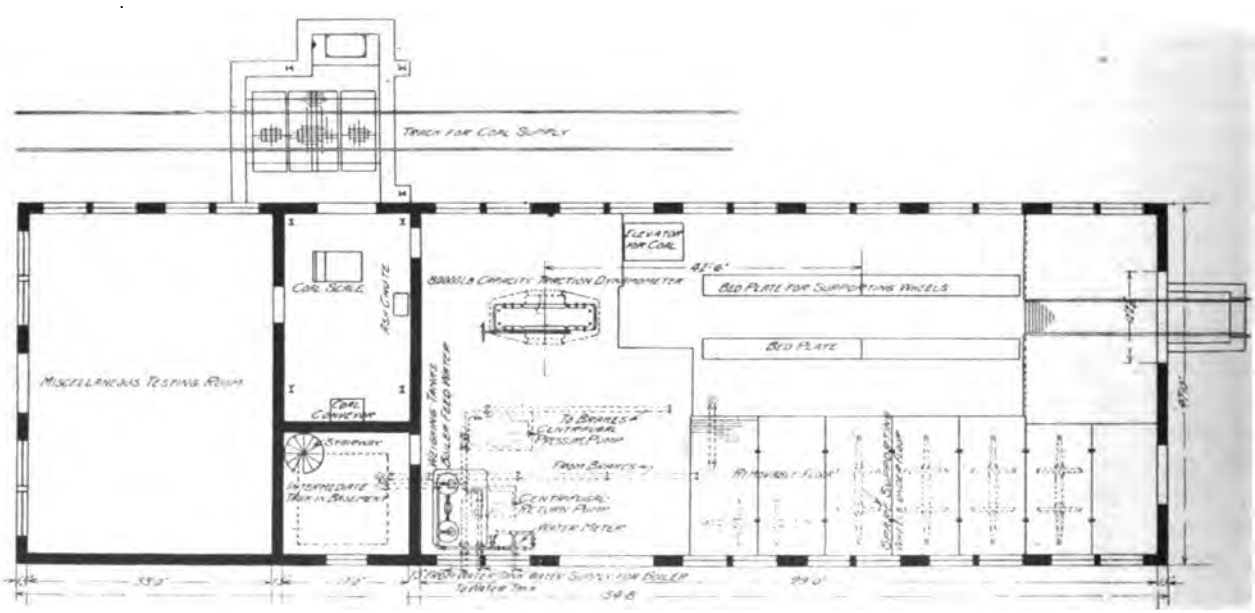
The floor of the laboratory is on the track level and is made in sections which can be removed by the traveling crane. The space between the removable floor is used for storing absorption brakes, supporting wheels and other parts when not in use. On the same level as the storage space and below the main floor is all the apparatus for water supply used in controling the brakes.

The driving wheels of the locomotive under test rest upon supporting wheels with rims shaped to correspond with the head of the rail. The axles of these supporting wheels are extended and carry absorption brakes. The turning of the driving wheels causes the supporting wheels to revolve, but these are retarded to any extent

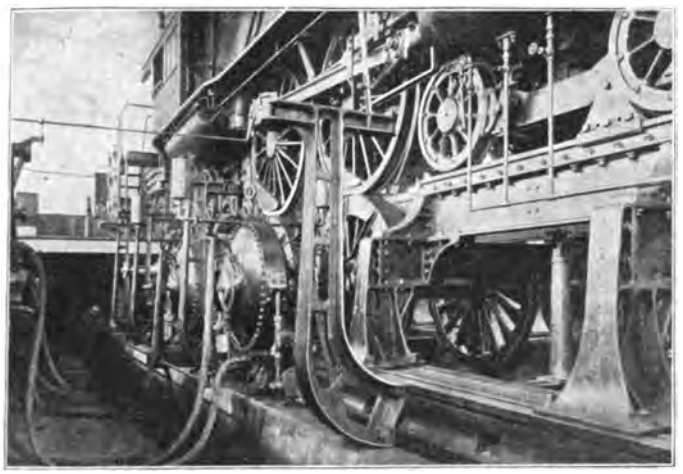


CROSS-SECTION OF LOCOMOTIVE TESTING PLANT AT ALTOONA—PENNSYLVANIA R. R.

desired. The work actually done by the locomotive consists in overcoming the friction resistance of the supporting wheels and brakes, the resulting force exerted at the drawbar being measured by a traction dynamometer. The axles of the supporting wheels run in heavy pedestals secured to cast iron bed plates resting upon a concrete foundation. There are two bed plates running parallel with the track, and in order that the supporting wheels may be directly beneath the locomotive drivers,



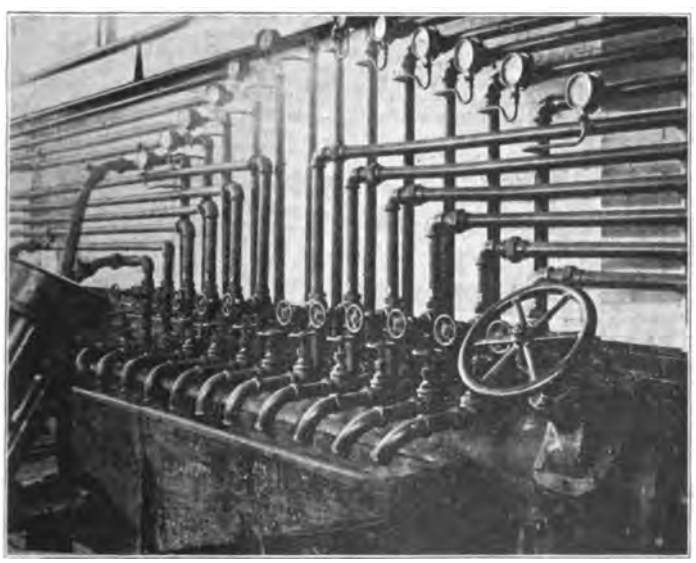
PLAN OF LOCOMOTIVE TESTING PLANT AT ALTOONA— PENNSYLVANIA R. R.



VIEW OF SUB-STRUCTURE SHOWING CONSTRUCTION OF SUPPORTS, ABSORPTION BRAKES, ETC., WITH LOCOMOTIVE READY FOR TEST—LOCOMOTIVE TESTING PLANT AT ALTOONA—PENNSYLVANIA R. R.

these bed plates are provided with T-slots, so that the pedestals can be moved along parallel to the track and secured in any position to suit the particular engine under test. The only wheels of the locomotive which move during a test are the drivers. The wheels of the leading truck rest upon rails secured to I-beams and supported upon the same bed plates which carry the pedestals. The wheels of the trailing truck rest upon supporting wheels (which remain stationary during the test) and are carried by pedestals secured to the longitudinal bed plates.

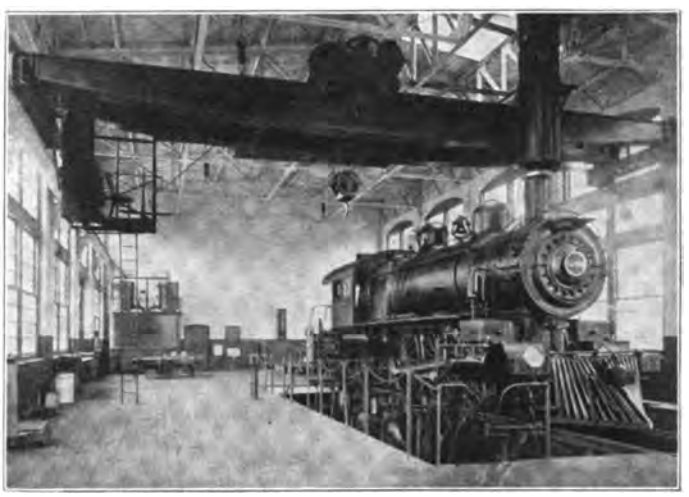
The axle for each pair of supporting wheels carries upon each of its over-hung ends an Alden absorption brake. Each of these brakes consists of two smooth circular cast iron disks, keyed to the supporting wheel axle. On each side of each one of these disks is a thin copper diaphragm secured at its periphery, and also at its inner edge to a housing which does not revolve and has its bearings upon the hubs of the circular revolving disks. The stationary housing is so designed that when it is filled with water under pressure the copper disks are forced against the revolving disks, creating friction.



ARRANGEMENT OF REGULATING VALVES, GAUGES AND PIPING TO ABSORPTION BRAKES—LOCOMOTIVE TESTING PLANT AT ALTOONA, PENNSYLVANIA R. R.

Provision is made for securing continuous and uniform lubrication of the surfaces of these revolving disks, and the water is caused to flow through the housing in order to carry away the heat generated. The water thus performs two functions; first, in supplying pressure to cause the friction, and, second, in carrying away the heat generated by the friction.

Each brake is connected with the source of water supply by a flexible hose. It is also connected with the discharge pipes by another flexible hose. The discharge pipes for all the brakes empty into an iron trough, and each pipe is provided with a valve located adjacent to the valve in the supply pipe for the same brake. In placing the load upon the locomotive these valves are adjusted until the individual brakes each absorb their share of the work. After this preliminary adjustment has been secured the power absorbed by all of the brakes may be increased or decreased by operating a large valve in the supply main.



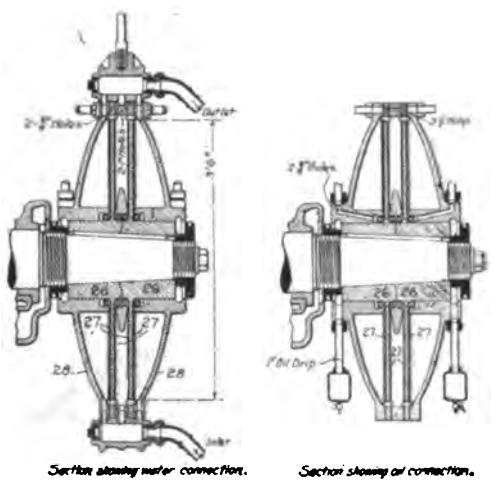
INTERIOR OF LOCOMOTIVE TESTING PLANT AT ALTOONA, SHOWING LOCOMOTIVE IN POSITION FOR TEST—PENNSYLVANIA R. R.

The locomotive is connected to the dynamometer by an adjustable drawbar, and the dynamometer housing is provided with means for raising and lowering the dynamometer proper to bring this drawbar truly horizontal for various heights of locomotive drawbar attachments in the tailpiece, varying from 30 to 42 inches above the track. To decrease the vibration transmitted to the dynamometer through the drawbar, the two safety bars are provided between the locomotive and the dynamometer frame. At their ends these bars have universal joints to insure perfect freedom of adjustment, and each bar is provided with an oil dash pot near the dynamometer end.

The traction dynamometer, which measures the drawbar pull of the locomotive is of the lever type. The weighing mechanism is supported by a frame which slides up and down in ways formed by the housings. These housings are very massive, rigidly secured together and anchored to a heavy foundation. The lever system is constructed upon the Emery principle in which flexible steel fulcrum plates take the place of knife edges used in ordinary scales.

An endless strip of paper 18 inches wide is mechanically drawn over the recording table upon which a continuous record of the test is made. The paper is driven by direct connection with one of the supporting wheels upon which the locomotive drivers rest. The speed reduction is so arranged that when the locomotive under test travels one mile on the supporting wheels the paper moves 52.8 inches, giving a scale of 100 feet to the inch upon the diagram. In order to secure the accurate movement of the paper it passes between a finely corrugated brass roller and another roller covered with rubber. The winding drum to which the paper is finally delivered is arranged to slip upon its shaft in order to accommodate its constantly increasing diameter as the test progresses.

There are several recording instruments, the first a datum pen marks a continuous straight line upon the paper.. A traction recording pen moves across the paper perpendicular to the datum line, its distance from the datum line being dependent upon the force transmitted by the drawbar from the locomotive. The maximum



CROSS-SECTION THROUGH ALDEN ABSORPTION BRAKE HOUSINGS, SHOWING INTERNAL CONSTRUCTION—LOCOMOTIVE TESTING PLANT AT ALTOONA, PENNSYLVANIA R. R.

travel for this pen away from the datum line is eight inches. Two sets of springs are provided. With the heaviest set the eight-inch movement of the traction pen corresponds to a load of 80,000 pounds upon the drawbar, which represents the maximum capacity of the dynamometer. With the other set of springs the eight-inch movement of the traction pen corresponds to a pull of 40,000 pounds upon the drawbar, and with all the flat springs removed, the eight-inch motion corresponds to a 16,000-pound load upon the drawbar. The multiplication of the recording and weighing mechanism is 200 to 1. An integrator is provided and attached to the traction recording mechanism, so that the foot-pounds of work performed by the locomotive is automatically summed up. Five additional electrically operated pens are provided. They normally draw continuous straight lines. One of them is electrically connected with a clock, so that each second is indicated by a jog in the straight line which this pen normally draws. Another pen is electrically connected to a roller which is rotated by the recording paper, causing the pen to make a jog in the line for every thousand feet which the locomotive travels. Another pen is electrically connected to the integrator and makes a jog in its line every time the integrator measures one square inch. The remaining electrically operated pens are used for recording such features of the test as taking indicator cards, etc.

A complete coal handling plant has been installed, which enables a few men to handle a large amount of coal with little labor. Ashes from the locomotive are discharged at the pit level, placed in a wagon, raised on the hydraulic elevator to the level of the main floor and run into a chute leading to a conveyor which delivers the ashes to cars on track outside. Water used by the locomotive is taken from a supply tank located in the corner of the laboratory. The water passes through a meter, the reading of which is used as a check on the weighing tanks. The smoke-jack for carrying away the smoke from the locomotive allows free passage for the gases, but deflects all the sparks into a hopper, from which they are taken and weighed. The jack is adjustable over a distance of 16 feet 6 inches, which allows the locomotive under test to be placed in any position and still be under the jack.

Personal Mention

Mr. C. Setzckorn has resigned as general foreman of the American Refrigerator Transit Co., and has accepted the position of superintendent of the American Car & Foundry Co., at Madison, Ill.

Mr. H. C. Pearce heretofore general foreman of the car department of the Illinois Central R. R. at East St. Louis, Ill., has been appointed general foreman of the American Refrigerator Transit Co., with headquarters at St. Louis, Mo. Mr. Pearce has been in the service of the Illinois Central R. R. for thirteen years.

Mr. W. H. Chambers, assistant master mechanic of the Denver & Rio Grande at Helper, Utah, has been appointed master mechanic of that road, the Rio Grande Western and the Colorado Midland at Grand Junction, Colo.

Mr. James Macbeth, master car builder of the New York Central Hudson River at East Buffalo, N. Y., died on July 7 at his home in Buffalo, aged 61 years. Mr. Macbeth was born in Aberdeen, Scotland, and came to America in 1855. He entered railway service in 1859 as apprentice in the machine shops of the Great Western of Canada. From 1864 to 1867, he was foreman of the New York Central Railroad, in charge of repairing and rebuilding locomotives, and was then until 1875 successively engineer on the Southern Central and the New York Central. In the latter year he was made master mechanic of the Ithaca Geneva & Sayre, which position he held until 1878, when he was appointed superintendent of construction and machinery of the Elmira Cortland & Northern. From 1880 to 1887 he was locomotive engineer on the Lake Shore & Michigan Southern, and was subsequently until June, 1891, in charge of the motive power and car department of the West Shore. In June, 1891, he became superintendent of transportation, motive power and rolling stock of the Adirondack & St. Lawrence, which position he held until January 1,