NARROW-GAUGE LOCOMOTIVES

BALDWIN LOCOMOTIVE WORKS

BURNHAM, PARRY, WILLIAMS & CO.

Philadelphia, Pa.

DIMENSIONS, WEIGHTS,

AND

TRACTIVE POWER

OF

NARROW-GAUGE LOCOMOTIVES,

MANUFACTURED BY THE

BALDWIN LOCOMOTIVE WORKS.

BURNHAM, PARRY, WILLIAMS & CO.,

PHILADELPHIA, PA.

PRESS OF
J. B. LIPPINCOTT & CO.
1877.

BALDWIN LOCOMOTIVE WORKS.

Burnham, Parry, Williams & Co.,

PHILADELPHIA, PA.,

Manufacturers of

LOCOMOTIVE ENGINES

OF EVERY DESCRIPTION, FOR BOTH

WIDE AND NARROW-GAUGE RAILWAYS.

GEORGE BURNHAM,
CHARLES T. PARRY,

EDWARD H. WILLIAMS,
WILLIAM P. HENSZEY,

EDWARD LONGSTRETH,
JOHN H. CONVERSE.

CIRCULAR.

WE present herewith photographs and figures showing the patterns, dimensions, and tractive power of various classes of locomotives for narrow-gauge railways.

All the classes of locomotives specified can be built for the United States standard narrow gauge of three feet, the South American standard narrow gauge of one metre, the Canadian standard narrow gauge of three and one-half feet, or for any intermediate or wider gauge.

All work is accurately fitted to gauges and templets, which are made from a system of standards kept exclusively for the purpose. Like parts will, therefore, fit accurately in all locomotives of the same class.

This system of manufacture is a distinctive feature of these Works. Its value and importance to the *users of locomotives* cannot be overestimated. By its means the expense of maintenance and repairs is reduced to a minimum. A company whose railroad is equipped with our locomotives may save, almost wholly, all outlays for shops, machinery, drawings, and patterns for their repairs. The necessity of maintaining for the same purpose an organization of skilled workmen at a con-

stant expense is also obviated. Every important part of the locomotive being accurately made to a templet, we can at any time supply a duplicate part, made to the same templet, which is sure to fit in the place of the original. The large number of locomotives at all times in progress, and embracing the principal classes, insures unusual and especial facilities for filling at once, or with the least possible delay, orders for such duplicate parts.

It will also be apparent that a company procuring its equipment of motive power at these Works, can, at the same time, supply itself with a limited stock of duplicate parts sufficient for all repairs likely to be required. An expenditure of a *few hundred dollars* in this manner will provide more fully and perfectly for all ordinary contingencies than would a large investment of capital in shops, machinery, and organization designed for the same purpose.

The important saving possible by this method will manifest itself in two directions:

1. The first cost of the necessary parts for repairs will be from 25 to 50 *per cent.* less than if made in the railroad company's shop. We are constantly producing such parts by workmen trained by long experience in each specialty, and hence with the greatest economy in expenditure both of labor and material.

2. The services of the engine are lost for the shortest possible time while undergoing repairs. Having already on hand the necessary part, the master mechanic can at once apply it.

Otherwise a force of workmen must be maintained at a constant and large expense in order to be in readiness to manufacture the required parts when the occasion arises; and when the demand comes, the use of the engine must be lost for a considerable time while perhaps drawings or patterns are made, and from them the proper parts constructed and fitted in place.

The *loads* given under each class are invariably in gross tons of 2240 pounds, and include both cars and lading. All the locomotives described are sold with the guarantee that they will haul the loads stated on a straight track in good condition, assuming the resistance of the cars not to exceed ten pounds per ton of 2240 pounds of their weight.

Designs and estimates for any other required patterns of locomotives will be submitted on application.

The delivery of locomotives at any point which can be reached by rail or vessel will be included in contracts if desired.

For detailed specifications and further particulars, address

Burnham, Parry, Williams & Co.,

PHILADELPHIA, PA.

EXPLANATION OF CLASS DESIGNATIONS.

Each class of locomotives is designated by two figures, or sets of figures, separated by a hyphen, and combined with the letter C, D, or E.

The figure before the hyphen indicates the whole number of wheels under the locomotive; the figure after the hyphen, the diameter of cylinders, thus:

The figures 10½ are used to designate cylinders 8 inches in diam.

"	11 & 12	"	"	"	9	"	"
"	14	"	"	"	10	"	"
"	16	"	"	"	11	"	"
"	18	"	"	"	12	"	"
"	20	"	"	"	13	"	"
"	22	"	"	"	14	"	"
"	24	"	"	"	15	"	"

[The fraction ¼ added to any of these figures indicates that the locomotive has a truck at each end, making it a "Double-Ender." The fraction ½ indicates a special class.]

The letter C indicates that 4 wheels are connected as driving-wheels.

The letter D indicates that 6 wheels are connected as driving-wheels.

The letter E indicates that 8 wheels are connected as driving-wheels.

Thus, 8–14 C means an 8-wheeled locomotive having cylinders 10 inches in diameter and 4 driving-wheels; 8–16 D, an 8-wheeled locomotive having cylinders 11 inches in diameter and 6 driving-wheels; and 10–22 E, a 10-wheeled locomotive having cylinders 14 inches in diameter and 8 driving-wheels.

NARROW-GAUGE PASSENGER LOCOMOTIVE.

CLASS 8-14 C.

General design illustrated by photograph of the "No. 2," on page 9.

CYLINDERS	10 inches diameter, 16 inches stroke.
DRIVING-WHEELS	38 to 42 inches diameter.
TRUCK-WHEELS	24 inches diameter, with centre-bearing swinging or sliding bolster.
WHEEL-BASE, total	18 feet.
" rigid	(distance between driving-wheel centres) 6 feet 9 inches.
TENDER, four-wheeled	tank capacity, 700 gallons.
" eight-wheeled	" " 1000 "

WEIGHT OF ENGINE IN WORKING ORDER.

On drivers	22,000 pounds.
On truck	11,000 "
Total weight of engine	33,000 "

LOAD.

IN GROSS TONS OF CARS AND LADING.

On a level	525 gross tons.
" 20 feet grade	245 " "
" 40 " "	150 " "
" 60 " "	105 " "
" 80 " "	80 " "
" 100 " "	65 " "

NARROW-GAUGE PASSENGER LOCOMOTIVE.

CLASS 8-16 C.

General design illustrated by photograph of "No. 2," on page 9.

CYLINDERS	11 inches diameter, 16 inches stroke.
DRIVING-WHEELS	38 to 42 inches diameter.
TRUCK-WHEELS	24 inches diameter, with centre-bearing swinging or sliding bolster.
WHEEL-BASE, total	18 feet 5 inches.
" rigid	(distance between driving-wheel centres) 7 feet 2 inches.
TENDER, four-wheeled	tank capacity, 750 gallons.
" eight-wheeled	" " 1100 "

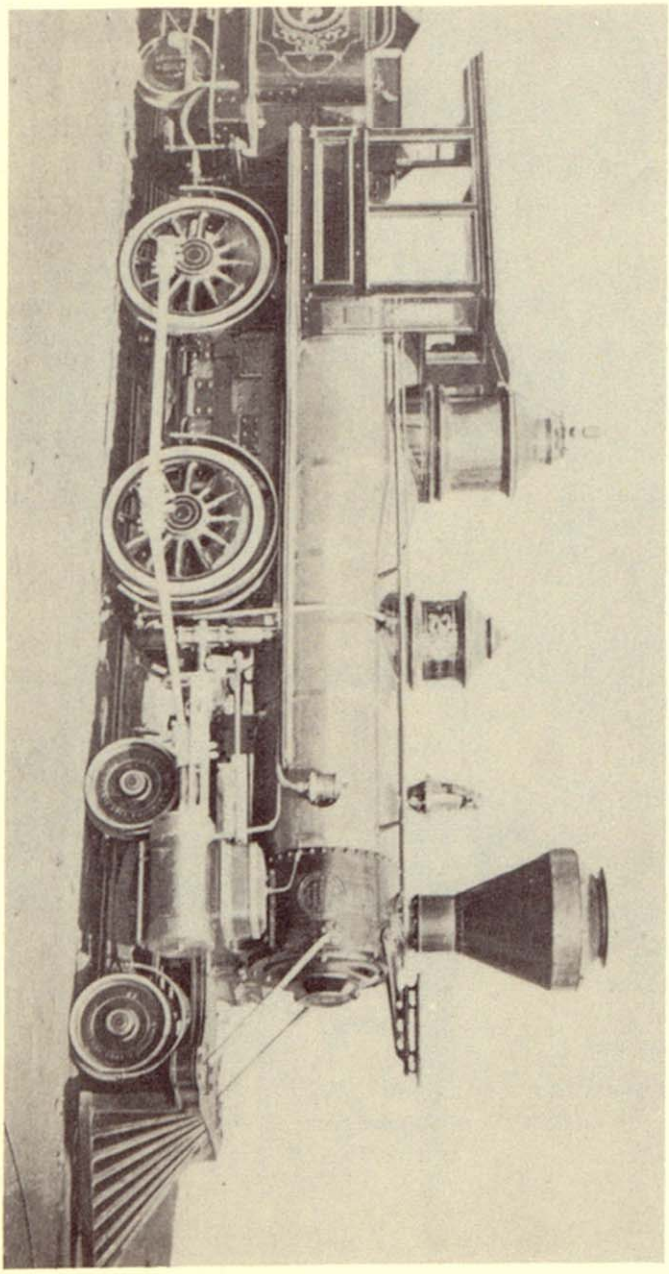
WEIGHT OF ENGINE IN WORKING ORDER.

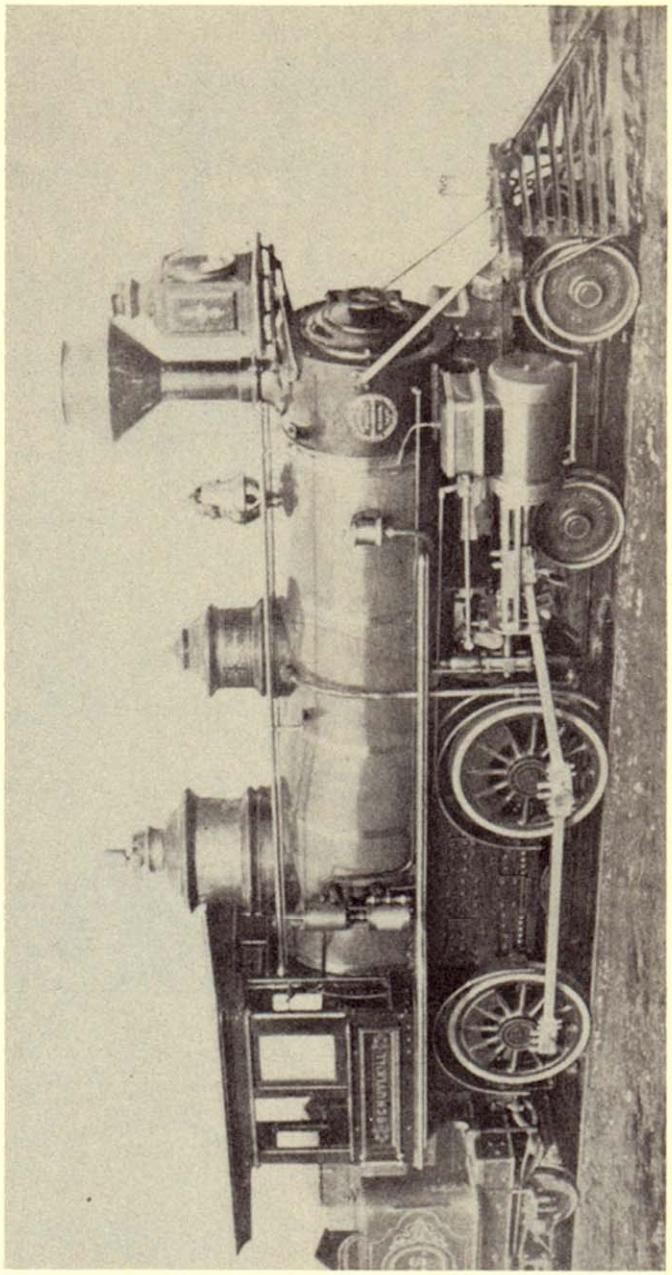
On drivers	24,000 pounds.
On truck	12,000 "
Total weight of engine	36,000 "

LOAD

IN GROSS TONS OF CARS AND LADING.

On a level	600 gross tons.
" 20 feet grade	280 " "
" 40 " "	175 " "
" 60 " "	125 " "
" 80 " "	95 " "
"100 " "	75 " "





NARROW-GAUGE PASSENGER LOCOMOTIVE.

CLASS 8-18 C.

General design illustrated by photograph of the "Schuylkill," on page 10.

CYLINDERS . .	12 inches diameter, 16 inch stroke.
DRIVING-WHEELS . . .	38 to 42 inches diameter.
TRUCK-WHEELS .	24 inches diameter, with centre-bearing swinging or sliding bolster.
WHEEL-BASE, total	18 feet 9 inches.
" rigid .	(distance between driving-wheel centres) . . . 7 feet 6 inches.
TENDER, four-wheeled . .	tank capacity, 800 gallons.
" eight-wheeled . .	" " 1200 "

WEIGHT OF ENGINE IN WORKING ORDER.

On drivers	27,000 pounds.
On truck	13,000 "
Total weight of engine . . .	40,000 "

LOAD.

IN GROSS TONS OF CARS AND LADING.

On a level	670 gross tons.
" 20 feet grade	310 " "
" 40 " "	195 " "
" 60 " "	140 " "
" 80 " "	105 " "
"100 " "	85 " "

NARROW-GAUGE PASSENGER LOCOMOTIVE.

CLASS 8-20 C.

General design illustrated by photograph of the "Schuylkill," on page 10.

CYLINDERS	13 inches diameter, 16 or 18 inches stroke.
DRIVING-WHEELS	42 to 48 inches diameter.
TRUCK-WHEELS	24 to 26 inches diameter, with centre-bearing swinging or sliding bolster.
WHEEL-BASE, total	19 feet 1 inch.
" rigid (distance between driving-wheel centres)	7 feet 10 inches.
TENDER, eight-wheeled	tank capacity, 1400 gallons.

WEIGHT OF ENGINE IN WORKING ORDER.

On drivers	31,000 pounds.
On truck	14,000 "
Total weight of engine	45,000 "

LOAD.

IN GROSS TONS OF CARS AND LADING.

On a level	740 gross tons.
" 20 feet grade	340 " "
" 40 " "	215 " "
" 60 " "	155 " "
" 80 " "	115 " "
" 100 " "	90 " "

REMARKS.

THE four preceding classes of locomotives are designed especially for passenger service, and can be run at speeds of from 25 to 40 miles per hour.

Classes 8–14 C and 8–16 C are adapted for service on light rails weighing from 30 to 35 pounds per yard. For service on tracks laid with heavier rails, Classes 8–18 C and 8–20 C are recommended. It may be noted, however, that the locomotive "Schuylkill" (photograph on page 10), Class 8–18 C, was run on 35 pound rails on the narrow-gauge passenger railway in the Centennial Exhibition grounds, from May to November, 1876.

On the Nevada County (3 feet gauge) Railroad, of California, on which the maximum grade is 116 feet per mile, a locomotive of Class 8–16 C hauls six loaded eight-wheeled cars. Weight of each loaded car, 9 gross tons. Total weight of train, 54 gross tons.

On the Camden, Gloucester and Mount Ephraim Railway, 3 feet gauge (laid with 30 and 35 pound rails), a locomotive of the same class has hauled five loaded eight-wheeled freight cars and two loaded passenger cars up a grade of 110 feet per mile.

The usual train is two passenger cars, with which the run is made from Gloucester to Camden, two miles, in eight minutes, making one intermediate stop, and running slow into the city of Camden. One curve of only 120 feet radius occurs on entering Camden.

On the Denver and Rio Grande Railway, passenger locomotives of Class 8–16 C take the regular passenger trains of three cars at a speed of 20 miles per hour on all grades, the maximum being 75 feet per mile. For full particulars of their performance on this line, see letter of W. W. Borst, Superintendent, on pages 25 and 26.

On the Eureka and Palisade Railroad (3 feet gauge), of Nevada, a locomotive of Class 8–18 C, with one passenger coach attached, has made the run from Palisade to Eureka, 90 miles, in two hours and thirty-eight minutes, nearly all the distance being up grade, viz.: 52 feet per mile for 35 miles, 75 feet per mile for 8 miles, and 105 feet per mile for 3 miles. Average speed, 34.17 miles per hour.

We subjoin copy of a statement by the General Manager of the Centennial Narrow-Gauge Railway, showing the performance of a passenger locomotive of Class 8–18 C, and of a freight locomotive of Class 8–18 D, on the Narrow-Gauge Railway in the Centennial Exhibition grounds from May to November, 1876:

WEST END PASSENGER RAILWAY CO.,

PHILADELPHIA, November 30, 1876.

Messrs. BURNHAM, PARRY, WILLIAMS & CO.,

Baldwin Locomotive Works, Philadelphia.

GENTLEMEN:

During the Centennial Exhibition we have had in use on our three-feet gauge railroad in the Exhibition grounds two of your locomotives, one being Class 8–18 C, and one Class 8–18 D, both of which have given entire satisfaction under such circumstances as locomotives are seldom made to perform.

These engines came under my daily supervision and did their full share in transporting over *four millions* of passengers on this now famous little railway.

The gauge of the line was three feet, with double track three and a half miles long, or seven miles in all. For its length it was probably the most crooked road in the world, being made up almost wholly of curves, in order to run near all the principal buildings on the Exhibition grounds. Many of these curves were on our heaviest grades, some having a radius of 215, 230, and 250 feet on grades of 140 and 155 feet per mile. These are unusually heavy grades and curves, and when *combined* as we had them, with only a 35 pound iron rail, made the task for our engines exceedingly difficult.

Your locomotive "Schuylkill," Class 8–18 C, began service May 13, and made 156 days to the close of Exhibition. The locomotive "Delaware," Class 8–18 D, came into service

June 9, and made 131 days to the close of the Exhibition. The usual load of each engine was five eight-wheeled passenger cars, frequently carrying over 100 passengers per car. On special occasions as many as six and seven loaded cars have been drawn by one of these engines.

Each engine averaged fully sixteen trips daily, equal to fifty-six miles, and, as the stations were but a short distance apart, the Westinghouse air-brake was applied in making 160 daily stops, or a total of 25,000 for each engine. Neither engine was out of service an hour unless from accidents for which they were in no way responsible.

Very respectfully,

(Signed) R. W. FLOWER, Jr.,

General Manager.

[NOTE.—Average weight of each loaded car, about 12 gross tons.]

NARROW-GAUGE FREIGHT LOCOMOTIVE.

CLASS 8-16 D.

General design illustrated by photographs of the "Delaware" and "M. Werk," on pages 19 and 20.

CYLINDERS	11 inches diameter, 16 inches stroke.
DRIVING-WHEELS	36 to 40 inches diameter.
TRUCK-WHEELS	24 inches diameter, with swinging or sliding bolster and radius-bar.
WHEEL-BASE, total	17 feet 4 inches.
" rigid	(distance between centres of front and back driving-wheels) 11 feet 4 inches.
TENDER, eight-wheeled	tank capacity, 1000 gallons.

WEIGHT OF ENGINE IN WORKING ORDER.

On drivers	29,000 pounds.
On truck	6,000 "
Total weight of engine	35,000 "

LOAD.

IN GROSS TONS OF CARS AND LADING.

On a level	720 gross tons.
" 20 feet grade	335 " "
" 40 " "	210 " "
" 60 " "	150 " "
" 80 " "	110 " "
" 100 " "	90 " "

NARROW-GAUGE FREIGHT LOCOMOTIVE.

CLASS 8-18 D.

Illustrated by photographs of the "Delaware" and "M. Werk," on pages 19 and 20.

CYLINDERS	12 inches diameter, 16 or 18 inches stroke.
DRIVING-WHEELS	36 to 40 inches diameter.
TRUCK-WHEELS	24 inches diameter, with swinging or sliding bolster and radius-bar.
WHEEL-BASE, total	17 feet 8 inches.
" rigid	(distance between centres of front and back driving-wheels) 11 feet 8 inches.
TENDER, eight-wheeled	tank capacity, 1200 gallons.

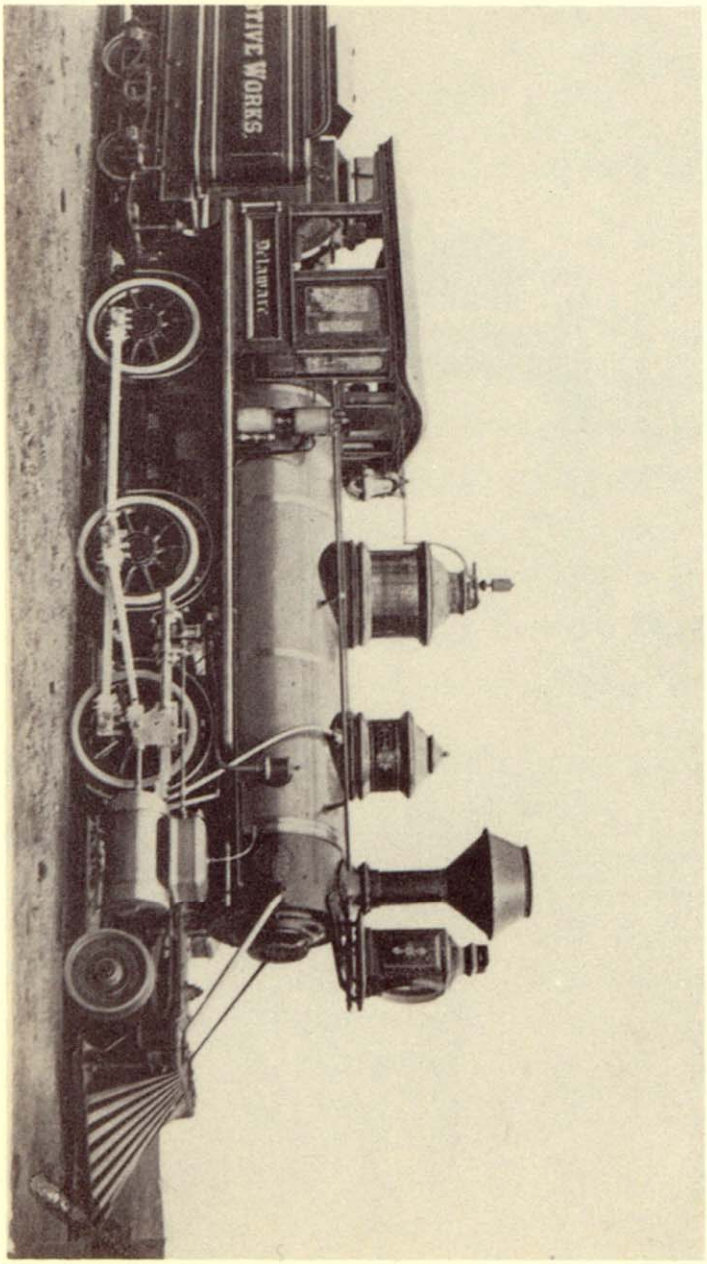
WEIGHT OF ENGINE IN WORKING ORDER.

On drivers	33,000 pounds.
On truck	6,000 "
Total weight of engine	39,000 "

LOAD.

IN GROSS TONS OF CARS AND LADING.

On a level	840 gross tons.
" 20 feet grade	390 " "
" 40 " "	250 " "
" 60 " "	180 " "
" 80 " "	135 " "
" 100 " "	110 " "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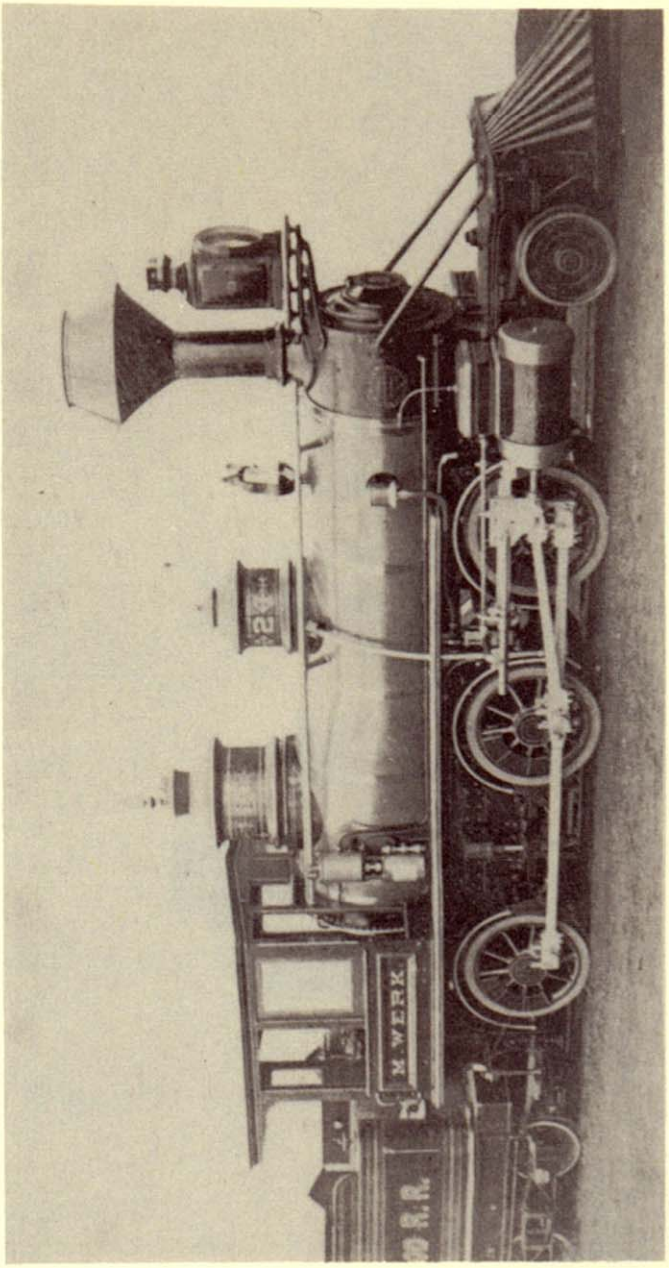
DeLAWARE


M.WERK

NARROW-GAUGE FREIGHT LOCOMOTIVE.

CLASS 8-20 D.

Illustrated by photographs of the "Delaware" and "M. Werk," on pages 19 and 20.

CYLINDERS .	13 inches diameter, 16 or 18 inches stroke.
DRIVING-WHEELS . . .	36 to 40 inches diameter.
TRUCK-WHEELS .	24 inches diameter, with swinging or sliding bolster and radius-bar.
WHEEL-BASE, total	18 feet.
" rigid .	(distance between centres of front and back driving-wheels) 12 feet.
TENDER, eight-wheeled . .	tank capacity, 1400 gallons.

WEIGHT OF ENGINE IN WORKING ORDER.

On drivers	37,000 pounds.
On truck	7,000 "
Total weight of engine . . .	44,000 "

LOAD.

IN GROSS TONS OF CARS AND LADING.

On a level	965 gross tons.
" 20 feet grade	445 " "
" 40 " "	285 " "
" 60 " "	205 " "
" 80 " "	160 " "
" 100 " "	125 " "

NARROW-GAUGE FREIGHT LOCOMOTIVE.

CLASS 8-22 D.

Illustrated by photographs of the "Delaware" and "M. Werk," on pages 19 and 20.

CYLINDERS	14 inches diameter, 16 inches stroke, or 13 inches diameter, 18 inches stroke.
DRIVING-WHEELS	36 to 40 inches diameter.
TRUCK-WHEELS	24 inches diameter, with swinging or sliding bolster and radius-bar.
WHEEL-BASE, total	18 feet 5 inches.
" rigid	(distance between centres of front and back driving-wheels) 12 feet 5 inches.
TENDER, eight-wheeled	tank capacity, 1400 to 1600 gallons.

WEIGHT OF ENGINE IN WORKING ORDER.

On drivers	41,000 pounds.
On truck	7,000 "
Total weight of engine	48,000 "

LOAD.

IN GROSS TONS OF CARS AND LADING.

On a level	1000 gross tons.
" 20 feet grade	470 " "
" 40 " "	300 " "
" 60 " "	215 " "
" 80 " "	165 " "
" 100 " "	130 " "

REMARKS.

The four preceding classes are designed especially for freight service, and can be adapted to the use of either wood or coal as fuel.

Classes 8–16 D and 8–18 D, having a weight on each driving-axle of from 10,000 to 11,000 pounds, are recommended for service on light rails weighing from 30 to 35 pounds per yard. Classes 8–20 D and 8–22 D, with a weight of from 12,000 to 14,000 pounds on each driving-axle, would require heavier rails.

The construction of these engines is such that they will readily pass short curves, the pony-truck having a swing-bolster and radius-bar, and the middle pair of driving-wheels having tires without flanges.

The Bell's Gap Railroad (of Pennsylvania), which is laid with 35 pound rails, and has a maximum grade of 158.4 feet per mile, combined with curves of 204 feet radius, is worked by two locomotives of Class 8–16 D. Thirty-three to thirty-five empty coal cars (weight of each car 2150 to 2200 pounds) can be taken by one engine up the grade and around the curves named

On the Centennial Narrow-Gauge Railway a locomotive of Class 8–18 D, with a rigid wheel-base of 11 feet 8 inches, worked with entire success on curves of 215, 230, and 250 feet radius, combined with grades of 140 and 155 feet per mile. Over this track the regular load (as will be seen from the official statement printed on page 15) was five eight-wheeled passenger cars, each car frequently containing 100 passengers. No test was ever made, however, to show the maximum capacity of the engine in tractive power.

The Lake Tahoe (3 feet gauge) Railway, which has curves of 318 feet radius, is worked with three locomotives of Class 8–20 D. The rigid wheel-base of two of the engines is 12 feet 9 inches, and of the third, 12 feet.

We subjoin a letter giving particulars of the performance of freight locomotives (Class 8–18 D) and passenger locomotives (Class 8–16 C) on the Denver and Rio Grande Railway. The maximum grades on this line between Denver and Colorado Springs are 75 feet per mile, and the track is laid with 30 pound iron rails.