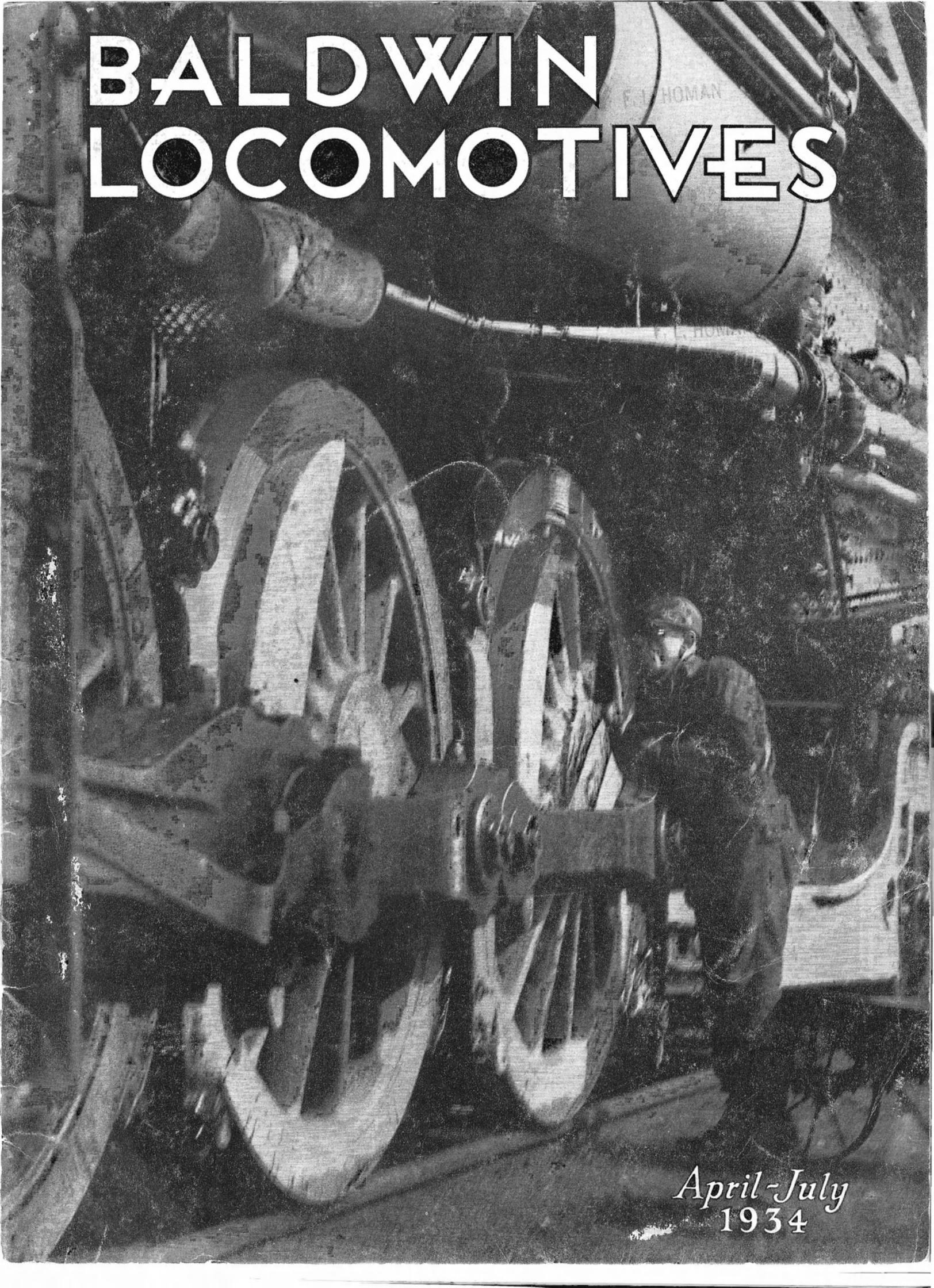
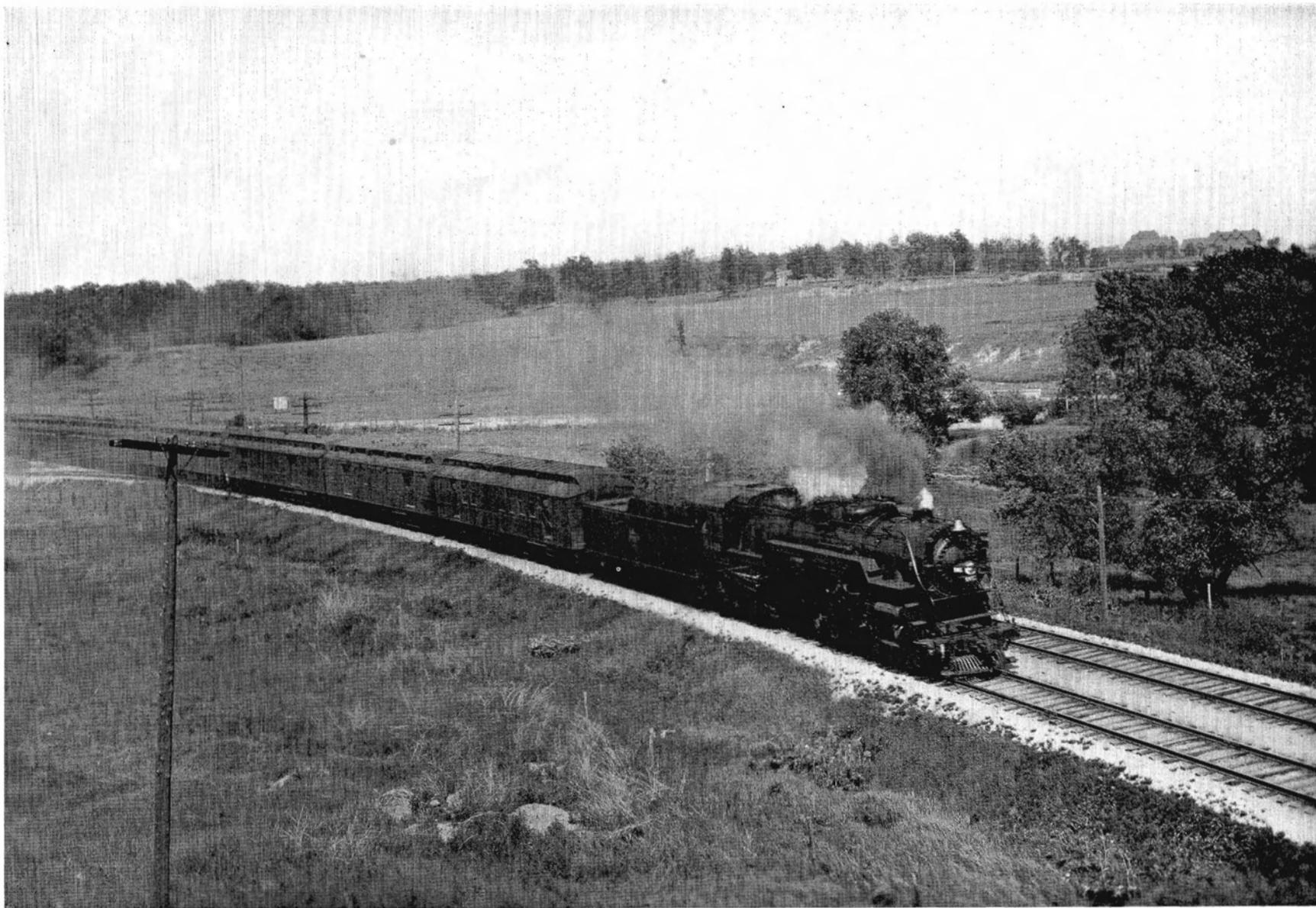


BALDWIN LOCOMOTIVES



April-July
1934



A 4-6-4 Type Locomotive, Class F-6, in Service on the Chicago, Milwaukee, St. Paul & Pacific Railroad

High Mileage Performance on the Milwaukee Road

BY V. E. RENNIX

Chicago Office, The Baldwin Locomotive Works

It is a pleasure to acknowledge the courtesy of the Mechanical Officers of the Chicago, Milwaukee, St. Paul & Pacific Railroad in furnishing data used in the preparation of this article.—EDITOR.



A PERFORMANCE of 18,390 miles in a single thirty-day period is the remarkable record achieved by Engine 6415 during the month of November, 1933. It is believed to be the highest mileage made by a locomotive in such a period. This was accomplished without the aid of any special arrangements. The locomotive simply made

ten regular round trips between Minneapolis and Harlowton, a distance of 1839 miles per round trip. The locomotive received only ordinary attention at Minneapolis and Harlowton and was not given special attention by the Traveling Engineer or other special men during the month of November when the record mileage was made.

Engine 6415 is one of a fleet of 22 modern passenger locomotives which were built by The Baldwin Locomotive Works and delivered to the Milwaukee in 1930 and 1931. The following four-month record of mileage made by this engine is of interest:

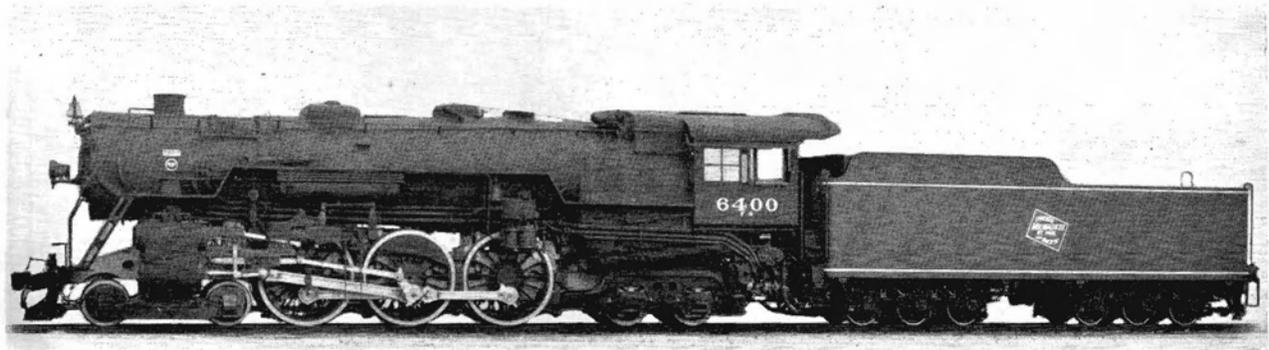
October, 1933.....	14,705 miles
November, 1933.....	18,390 miles
December, 1933.....	12,834 miles
January, 1934.....	13,453 miles

While Engine 6415 has taken the honors, mention should be made that the entire fleet of locomotives has made a creditable record. Up to and including January 31, 1934, the 22 locomotives totaled 9,234,074 miles, a monthly average of 10,399 miles per locomotive.

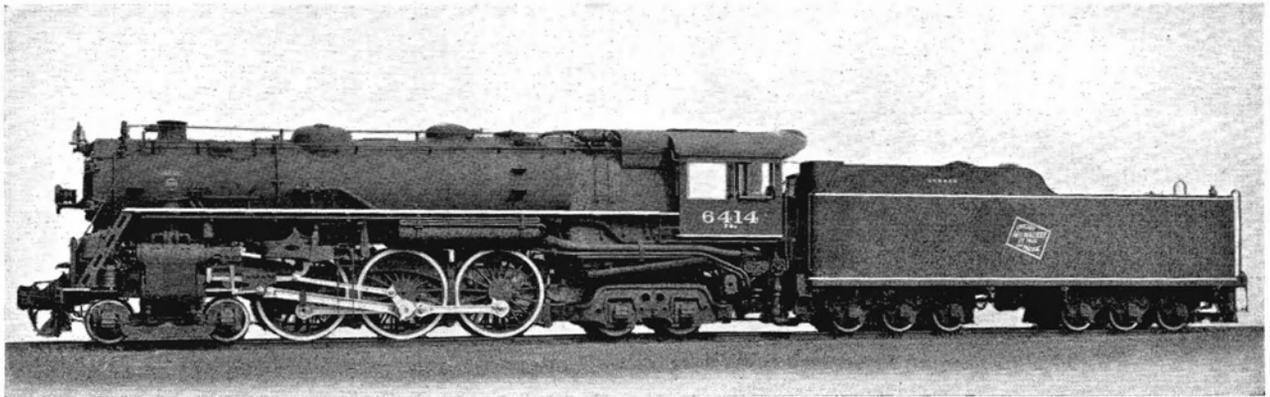
These locomotives are all of the 4-6-4 type with big wheels, big boilers and ample steaming capacity for sustained high speed work. Fourteen of them are known as Railway Company's Class F-6, Nos. 6400 to 6413. These were placed in service between January and March of 1930 and assigned to passenger service between Chicago and Minneapolis.

The very satisfactory performance of these locomotives resulted in the purchase of eight more of the same type which were built by The Baldwin Locomotive Works and placed in service during October and November, 1931.

The principal dimensions of the F-6 engines are as follows:



Chicago, Milwaukee, St. Paul & Pacific Railroad Locomotive, Class F-6, One of Fourteen Built by The Baldwin Locomotive Works in 1929



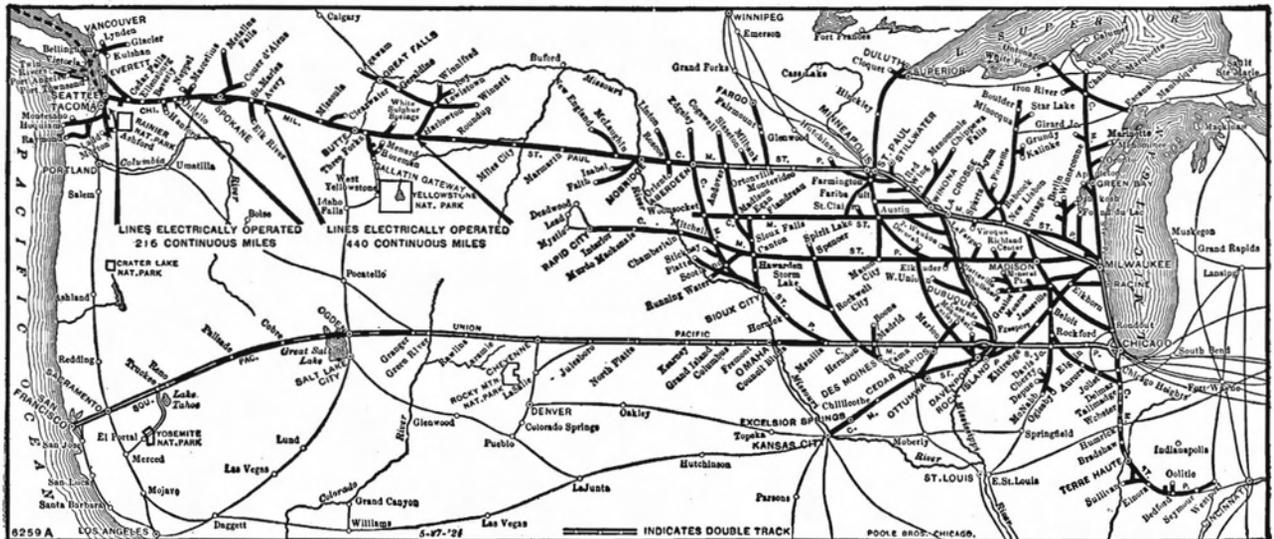
One of Eight Class F-6a Locomotives Built by The Baldwin Locomotive Works for the Chicago, Milwaukee, St. Paul & Pacific Railroad in 1931

Locomotive numbers.....	6400 to 6413 incl.
Locomotive class.....	F-6
Locomotive type.....	4-6-4
Cylinders.....	26" x 28"
Valves.....	14" piston
Driving wheels, diameter.....	80" over 4" tires
Steam pressure.....	225 lb.
Tubes.....	58—2 1/4"
Superheater flues.....	182—3 1/2"
Grate area.....	80 sq. ft.
Total heating surface (evaporating)	4205 sq. ft.
Weight on drivers.....	189,720 lb.
Weight on trailing truck.....	106,200 lb.
Weight on leading truck.....	79,930 lb.
Weight in working order.....	375,850 lb.
Weight of tender.....	277,800 lb.
Weight of engine and tender.....	653,650 lb.
Tractive effort.....	45,822 lb.
Factor of adhesion.....	4.14
Tender water capacity.....	15,000 gal.
Tender coal capacity.....	20 tons

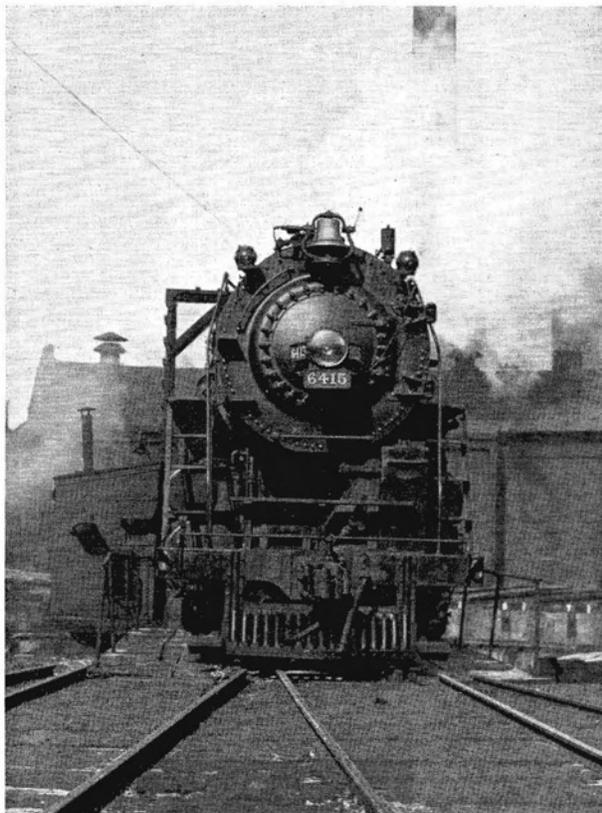
substitution of the Wilson Engineering Company water conditioner for feed water heater on the entire eight; substitution of Cyclone front end for Master Mechanic type on four; and the addition of Cleveland low water alarm and Wilson Engineering Corporation blow-off cock mufflers to the eight locomotives. A change was made in the location of the air pump on the F-6a locomotives, it being located on the front deck instead of at the side of the boiler, the bracket being integral with the locomotive bed. The motion work bed and reverse gear bracket were cast integral with the locomotive bed. The weight of engine and tender was increased 14,350 pounds and the factor of adhesion of the locomotive was increased from 4.14 to 4.25.

The new locomotives were numbered 6414 to 6421 inclusive, classed as F-6a, and were substantially the same as the fourteen F-6, the principal differences being in the

Engine number 6415 is equipped with the same specialties as the other F-6a locomotives, except that the Milwaukee Road design of circular spark arrester has been



Map of the Chicago, Milwaukee, St. Paul & Pacific Railroad



Locomotive Number 6415 That Made a Record of 18,390 Miles in a Single Month

substituted for the original application.

The average age of the first 14 engines on January 31st was four years and in this period they have averaged 464,646 miles each or 9,680 miles per locomotive per month. The average cost per mile for maintenance, running and classified repairs from date of receipt of the F-6 locomotives to January 31st was 14.7 cents. All 14 engines have received heavy repairs. Mileage before general shopping ranged between 350,000 and 450,000 miles. The average expected mileage between general repairs for the 22 engines is estimated at 436,000 miles.

The average age of the last eight locomotives, F-6a Class, up to January 31st was 27 months during which time each locomotive averaged 294,854 miles or 10,920 miles per locomotive per month. The average cost in this period was 12.7 cents per mile. The difference in cost per mile between the two groups is primarily due to the F-6 locomotives having been given

heavy repairs whereas the F-6a locomotives have not completed this cycle of work.

The regular assignment calls for 16 engines for the Minneapolis-Chicago-Omaha service. Three are for the Minneapolis-Harlowton (Montana) service and three to protect the service in both directions out of Minneapolis, and to handle trains Nos. 5 and 6 between Minneapolis, Minnesota and Aberdeen, South Dakota.

Trains 15 and 16 regularly consist of nine or ten cars, but frequently eleven to fourteen, and occasionally fifteen or more cars are handled.

The following tabulation contains data to illustrate where coal and water are taken, where engine crews change, where ash pan is cleaned and where crank pins are lubricated on the locomotives assigned to this run.

Station	Take Water	Take Coal	Change Eng. Crews	Clean Ash Pan	Lubricate Pins
Minneapolis, Minn.	x	x	—	x	All
Montevideo, Minn.	x	—	x	x	Main
Milbank, S. D.	x	x	—	—	—
Aberdeen, S. D.	x	—	x	x	Main
Roscoe, S. D.	—	x	—	—	—
Mobridge, S. D.	x	—	x	x	All Crank
Hettinger, N. D.	x	x	—	—	—
Bowman, N. D.	x	—	—	—	—
Marmarth, N. D.	—	—	x	x	Main
Mildred, Mont.	x	x	—	—	—
Miles City, Mont.	—	—	x	x	All Crank
Carterville, Mont.	x	—	—	—	—
Roundup, Mont.	x	x	—	—	—
Harlowton, Mont.	x	x	—	x	All



Side View of Locomotive Number 6415



Typical Scenery in the Cascade Mountains Along the Line of the Chicago, Milwaukee, St. Paul & Pacific Railroad

The run between Minneapolis and Harlowton, Montana, and return is a long one (1839 miles per round trip), but only one locomotive is used in each direction for the entire distance.

While the table shows that water is taken at eleven stations, it is not necessary to make stops at all the intermediate stations shown for the purpose of taking water only. However, where time at these stations permits, a part tank of water is taken in order to keep to a minimum the time required at what would ordinarily be necessary stops for water.

Six different engine crews have charge of the locomotive in each direction. All bearings or wearing surfaces are lubricated at Minneapolis and Harlowton, the main pins are lubricated at five intermediate stations, and other crank pins are lubricated at two intermediate stations.

Westbound there is a one per cent continuous grade for $17\frac{1}{2}$ miles. Before receipt of the F-6 and F-6a locomotives, it was necessary to provide helper service at this point. No helper locomotives are used now except in severe blizzards. Westbound between Roundup and Harlowton, a distance of 69 miles, locomotives are worked very hard due to a ruling grade of .4 per cent.

Eleven different kinds of water are used between Minneapolis and Harlowton. The content ranges from 16 to 360 grains of dissolved solids per U. S. gallon. The latter, however, is only used in cases of

emergency. No difficulty is experienced with boiler foaming. Anti-foaming compound is used in districts where the water is high in alkaline solids, which starts in at Milbank, South Dakota, on the westbound trip. Eastward it is necessary to use anti-foaming compound for the entire distance from Harlowton, Montana, to Minneapolis. Soda ash is used as a water softener in the territory between Minneapolis and Chicago; also, Chicago to Omaha.

A representative analysis of the Montana coal used on the Minneapolis-Harlowton run shows the following: Moisture, 10 per cent; volatile matter, 33 per cent; fixed carbon, 47 per cent; ash, 10 per cent; B.T.U., 10,700; sulphur, .7 per cent.

From tests conducted, the evaporation rate was found to be 6.40 pounds of water per pound of coal as fired. On trains 15 and

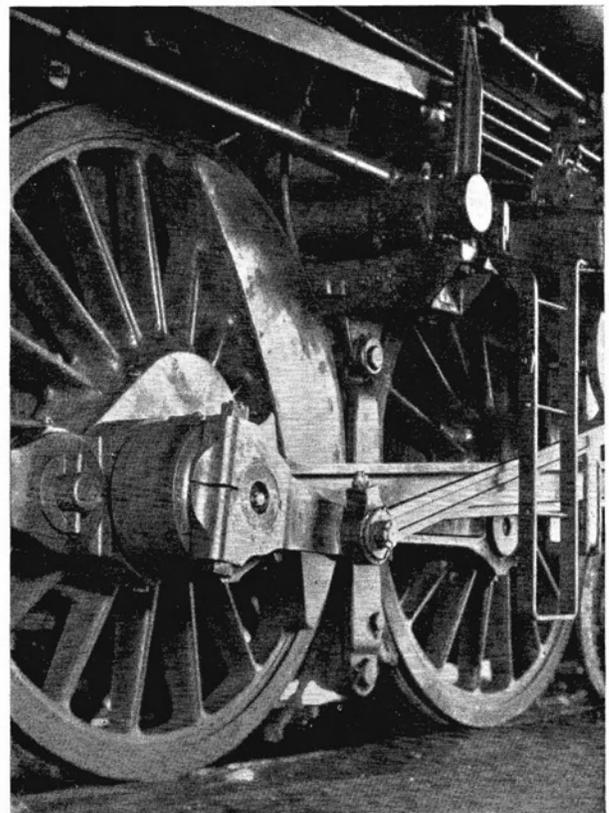
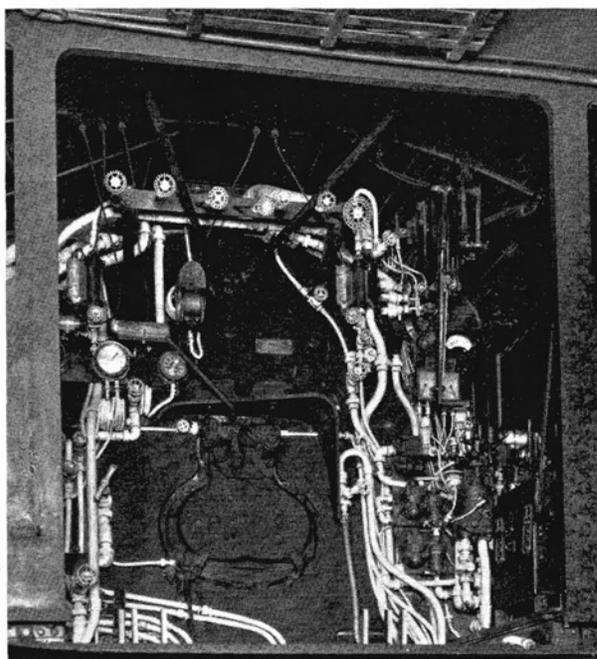
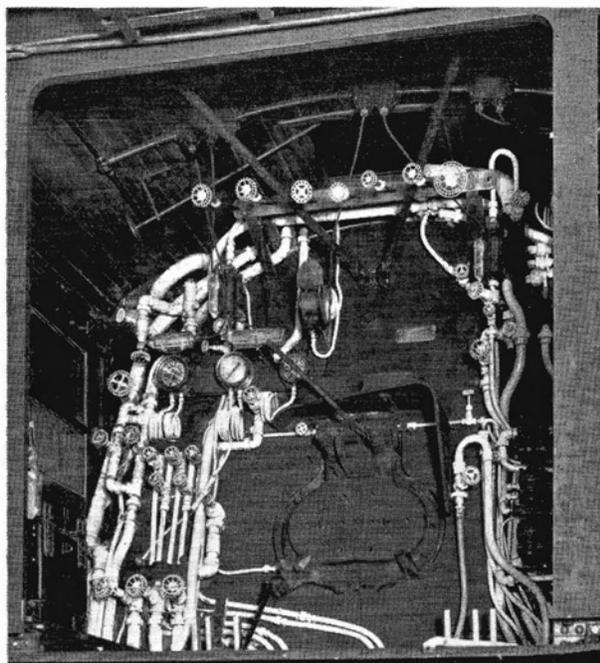


Photo by Fletcher A. Webster

Wheels and Rods of a Milwaukee Class F-6 Locomotive



Interior Views of the Cab of One of the Milwaukee F-6a Locomotives

16, the amount of coal used ranged from 90.32 to 123.20 pounds per thousand gross ton miles, excluding the weight of the locomotive and tender.

By properly blowing down the boilers, it is possible to use the feed water pump for the entire distance in both directions between Minneapolis and Harlowton. This is accomplished by blowing approximately 6 per cent to 7 per cent of all the water fed to the boiler out through the blow-off cocks. This not only rids the boiler of foaming solids but also clears it of sludge accumulation. These engines are all equipped with Wilson air-operated combined steam separator and sludge removers.

The boilers of both the F-6 and F-6a locomotives are washed out after every

round trip between Minneapolis and Harlowton. Between Minneapolis and Chicago they are washed out after two round trips, a total of 1684 miles.

At the first flue renewal period, when the F-6 engines were approximately four years old, very little scale accumulation was found on either flues or sheets and the boilers were found to be in excellent condition.

The high average mileage made by these 22 locomotives—coupled with low costs per mile for maintenance—is a good example of the ability of modern power to deliver efficient, economical transportation. It is in just such intensive use of modern locomotives that the railroads are finding a means of reducing locomotive operating expenses and increasing net income.

