

**MODERN POWER  
FOR TODAY'S TRAINS**

**PENNSYLVANIA  
RAILROAD**



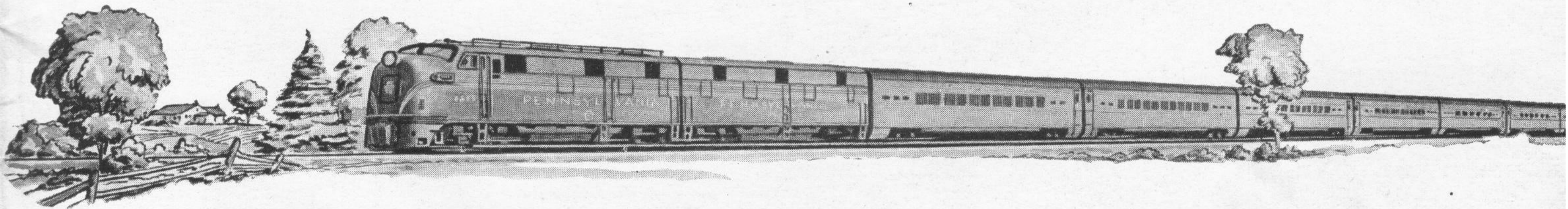


# MODERN POWER FOR TODAY'S TRAINS

Fleets of modern Diesel-electric, steam, and electric locomotives power the sleek passenger and heavy-duty freight trains which provide year-around fast and dependable transportation service on the far-flung lines of the Pennsylvania Railroad in 13 eastern and midwestern states.

The Pennsylvania, long a pioneer in

the development of new and improved types of locomotives, each assigned to the services for which best adapted, now utilizes steam locomotives to provide half its transportation service, Diesel-electric locomotives to provide 32 per cent, and electric locomotives to provide 18 per cent. With its 4142 locomotives, the railroad is the largest operator of steam,

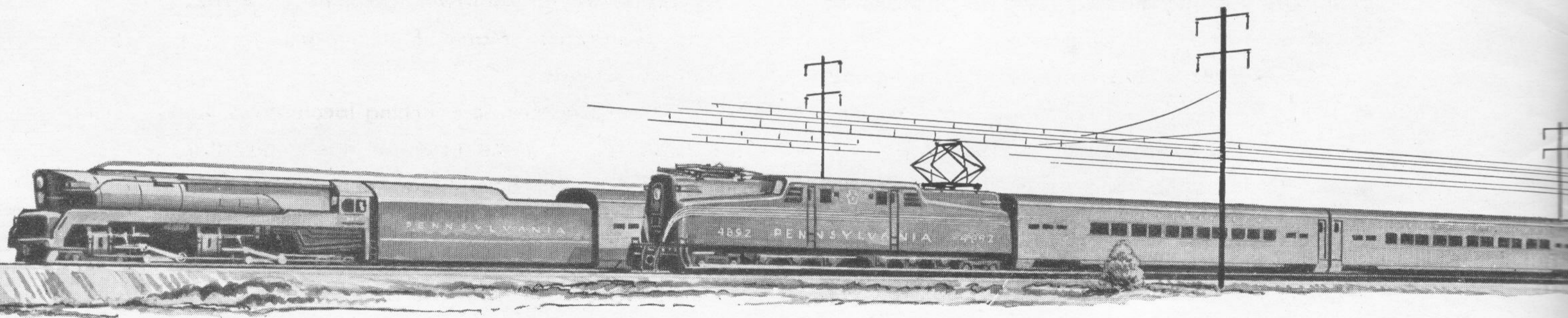


Diesel-electric, and electric motive power.

The Pennsylvania operates 26,000 miles of trackage connecting the eastern seaboard, from New York City to Norfolk, with the Great Lakes and the Mississippi Valley, and serving a host of important intermediate industrial and farming areas. Its main lines, and supplementary freight lines, are completely electrified between New York, Philadelphia, Baltimore and Washington, and between Philadelphia

and Harrisburg. West of Harrisburg and Baltimore trains are operated by steam or Diesel-electric power.

This booklet illustrates and briefly describes representative locomotives used in passenger and in freight service. It depicts the wide range of the latest type of motive power installed by the Pennsylvania to provide modern transportation service for the traveling public, industry, business and agriculture.



# HOW LOCOMOTIVES ARE CLASSIFIED

Steam and electric locomotives, and one type Diesel-electric, are classified in this booklet according to the generally accepted Whyte system. In addition, the Pennsylvania Railroad classifications are shown.

The Whyte system represents by numerals the number and arrangement of the wheels, from the front. For example, a steam freight locomotive with a two-wheel leading truck, five pairs of driving wheels, and a four-wheel trailing truck, is designated as a 2-10-4 type.

In the case of all Diesel-electric locomotives with wheels arranged in trucks, the Whyte system is not used in this booklet, but the number of wheels in each truck is indicated.

In the Pennsylvania classifications, steam and electric locomotives are grouped according to the wheel arrangement, using a primary letter to designate the type. Successive designs of the same type are designated by numerals following the primary class letter. For example, the above locomotive classified 2-10-4 under the Whyte

system, is known as a J-1 under the Pennsylvania classification, signifying that it is the first design of the J class.

In the case of Diesel-electric locomotives, two primary letters are used. The first is the initial of the builder, and the second the initial of the passenger, freight or switching service to which assigned. The numeral following indicates the number of units. For example, a class EF-4 locomotive was built by the Electro-Motive Division of General Motors, is used in freight service, and has four units. The other builders are represented by initials as follows: A for American Locomotive Company; B for Baldwin Locomotive Works; F for Fairbanks, Morse & Company; G for General Electric.

For Diesel-electric switching locomotives, the numeral following the primary letters indicates, in hundreds, the horsepower. For example, a class AS-10 locomotive was built by the American Locomotive Company, is used in switching service, and develops 1000 horsepower.



## INSIDE A DIESEL-ELECTRIC LOCOMOTIVE CAB

1. Air Brake Control (locomotive and cars)
2. Engineman's Seat
3. Safety Control Foot Pedal, pressed by engine-man when he releases pressure of his hand on air brake control. If both are released, emergency brakes go on automatically
4. Throttle Lever
5. Reverse Lever
6. Speed Recorder
7. Train Telephone
8. Horn Cord
9. Electrical Load Meter
10. Air Pressure Gauges
11. Independent Brake Control (locomotive only)
12. Bell Valve
13. Wheel Slip Indicator Light
14. Fire Alarm Warning
15. Windshield Wiper
16. Sun Visor

**THREE-UNIT DIESEL-ELECTRIC  
LOCOMOTIVE**

For fast, through passenger service. Wheels  
arranged in six wheel trucks. Pennsylvania  
Class AP-3.

Coupled Length .....194 feet, 10 inches  
Driving Wheel Diameter.....40 inches  
Weight on Driving Wheels.....620,800 pounds  
Total Weight in Working Order.....931,300 pounds  
Starting Tractive Force.....155,200 pounds  
Horsepower.....6,000



**TWO-UNIT PERMANENTLY COUPLED  
DIESEL-ELECTRIC LOCOMOTIVE**

For fast, through passenger service. Wheel  
arrangement: 4-8-8-4 each unit. Pennsylvania  
Class BP-1.

Coupled Length.....	183 feet, 0 inches
Driving Wheel Diameter.....	42 inches
Weight on Driving Wheels.....	818,000 pounds
Total Weight in Working Order.....	1,187,420 pounds
Starting Tractive Force.....	204,500 pounds
Horsepower.....	6,000





**FOUR-UNIT DIESEL-ELECTRIC  
LOCOMOTIVE**

For through freight service. Wheels arranged  
in four wheel trucks. Pennsylvania Class EF-4.

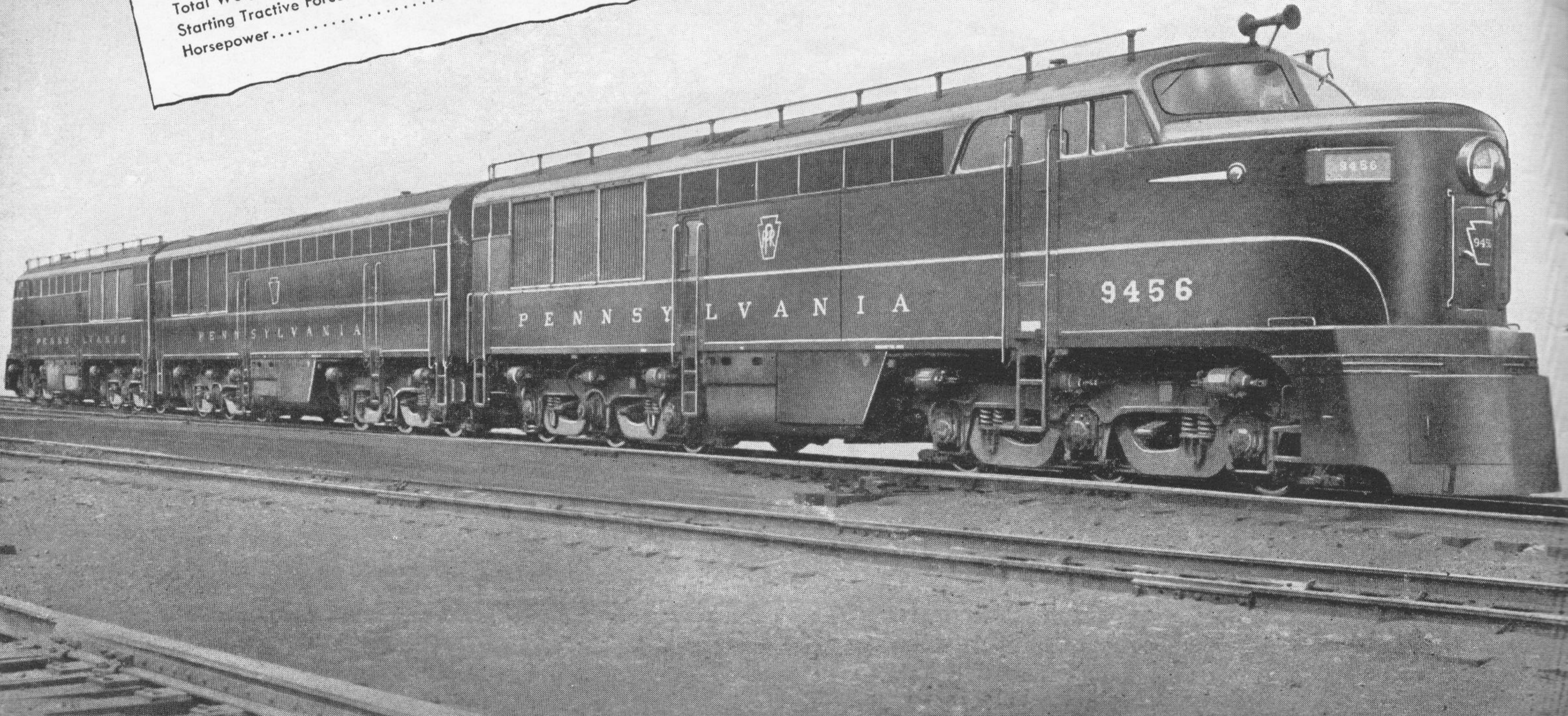
Coupled Length.....	201 feet, 6 1/4 inches
Driving Wheel Diameter.....	40 inches
Weight on Driving Wheels, and Total.....	930,000 pounds
Starting Tractive Force.....	232,500 pounds
Horsepower.....	6,000



**THREE-UNIT DIESEL-ELECTRIC  
LOCOMOTIVE**

For through freight service. Wheels arranged in  
six wheel trucks. Pennsylvania Class FF-3.

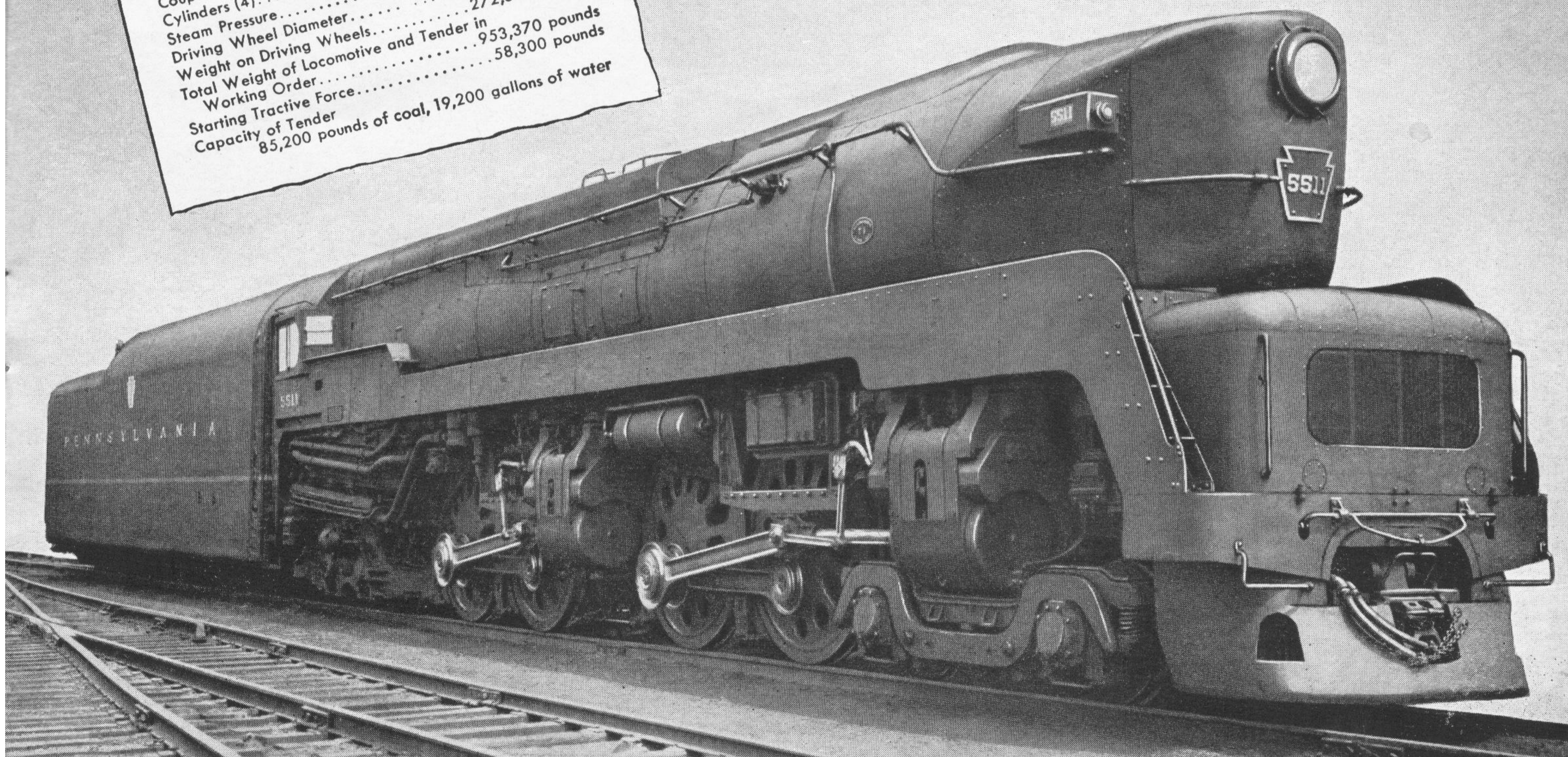
Coupled Length.....194 feet 6 inches  
Driving Wheel Diameter.....42 inches  
Weight on Driving Wheels.....736,580 pounds  
Total Weight in Working Order.....1,064,420 pounds  
Starting Tractive Force.....184,145 pounds  
Horsepower.....6,000



# STEAM PASSENGER LOCOMOTIVE

For fast, through service. Four cylinders, two on each side. Wheel arrangement: 4-4-4-4. Pennsylvania Class T-1.

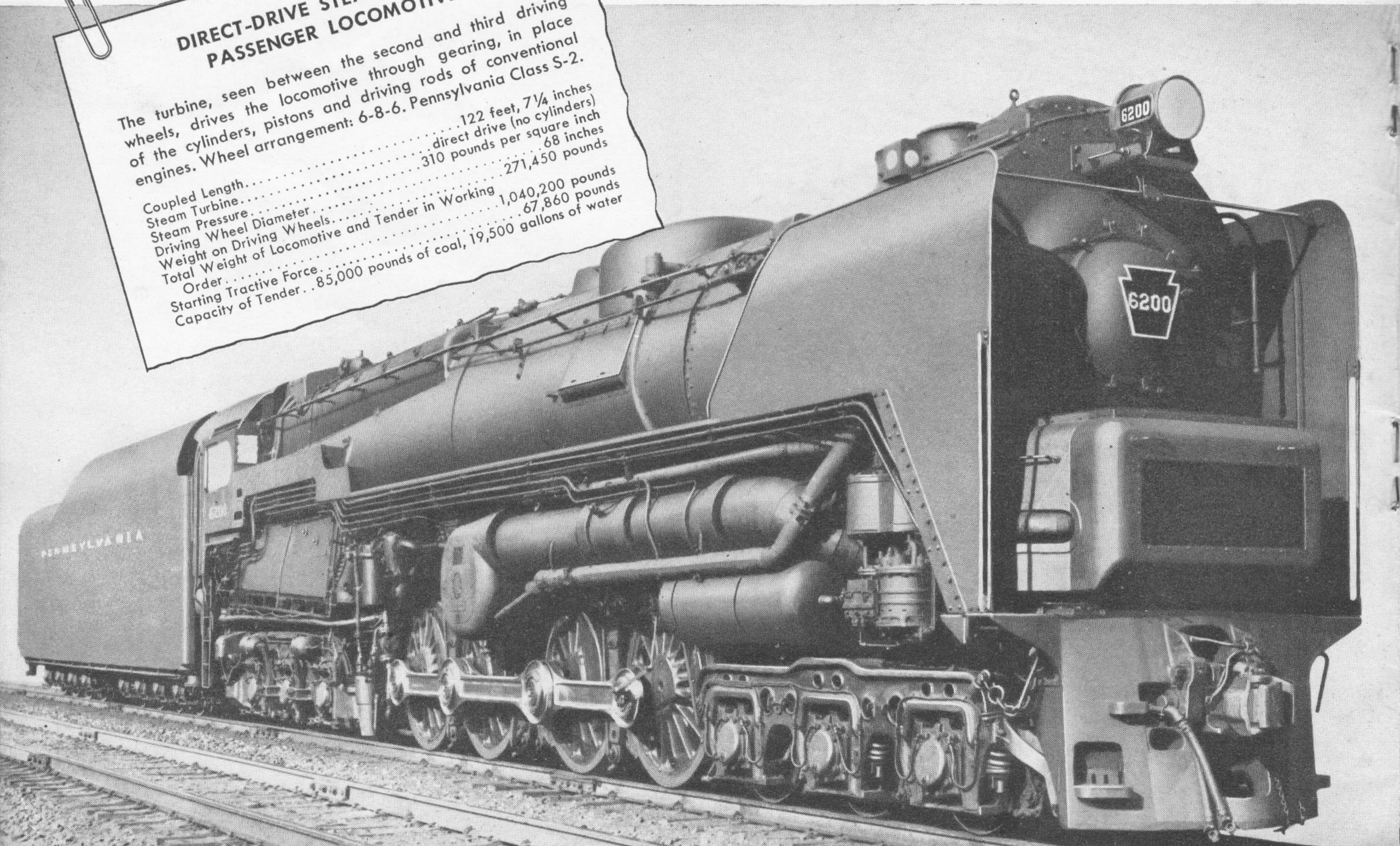
- Coupled Length.....122 feet, 9<sup>3</sup>/<sub>4</sub> inches
- Cylinders (4).....18<sup>3</sup>/<sub>4</sub>-inch diameter, 26-inch stroke
- Steam Pressure.....300 pounds per square inch
- Driving Wheel Diameter.....80 inches
- Weight on Driving Wheels.....272,365 pounds
- Total Weight of Locomotive and Tender in Working Order.....953,370 pounds
- Starting Tractive Force.....58,300 pounds
- Capacity of Tender  
85,200 pounds of coal, 19,200 gallons of water




## DIRECT-DRIVE STEAM TURBINE PASSENGER LOCOMOTIVE

The turbine, seen between the second and third driving wheels, drives the locomotive through gearing, in place of the cylinders, pistons and driving rods of conventional engines. Wheel arrangement: 6-8-6. Pennsylvania Class S-2.

Coupled Length.....	122 feet, 7 1/4 inches
Steam Turbine.....	direct drive (no cylinders)
Steam Pressure.....	310 pounds per square inch
Driving Wheel Diameter.....	68 inches
Weight on Driving Wheels.....	271,450 pounds
Total Weight of Locomotive and Tender in Working Order.....	1,040,200 pounds
Starting Tractive Force.....	67,860 pounds
Capacity of Tender.....	85,000 pounds of coal, 19,500 gallons of water





## MULTI-CYLINDER STEAM FREIGHT LOCOMOTIVE

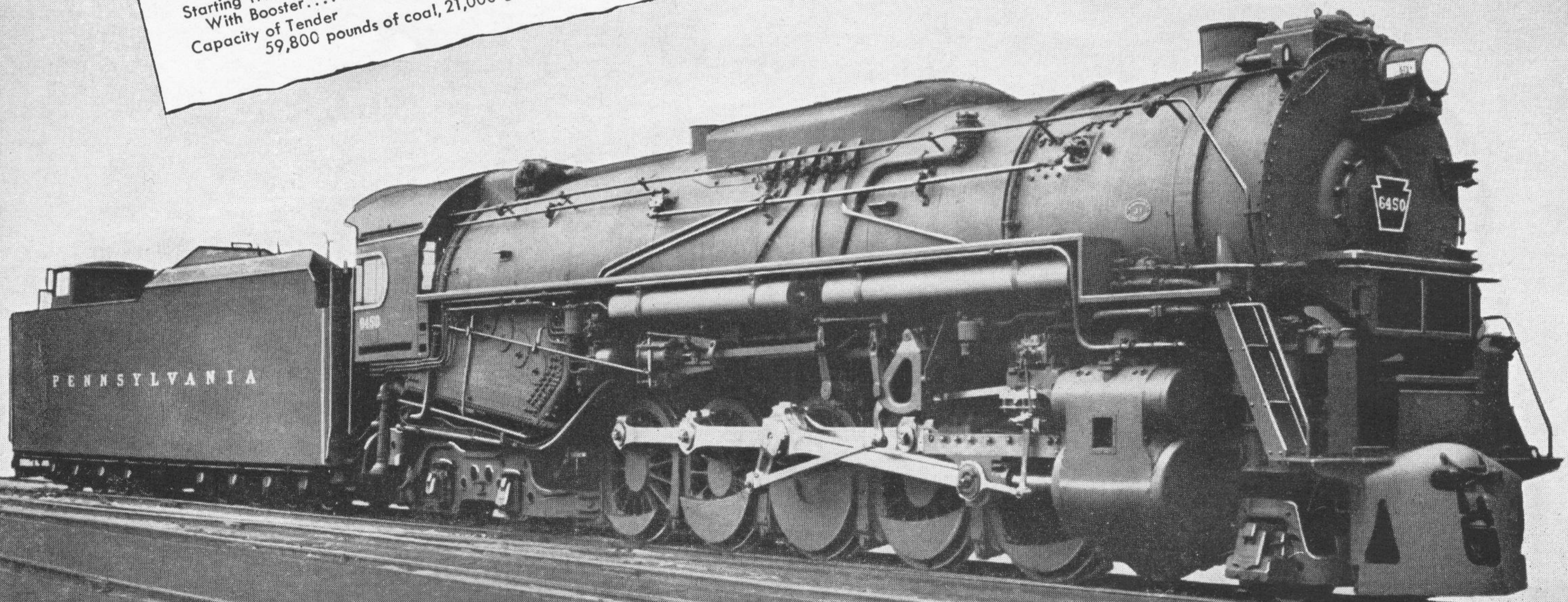
For heavy, through service. Most powerful steam locomotive in the higher speed range ever built. Wheel arrangement 4-4-6-4. Pennsylvania Class Q-2.

- Coupled Length.....124 feet, 7<sup>1</sup>/<sub>8</sub> inches
- Cylinders: front—19<sup>3</sup>/<sub>4</sub>-inch diameter, 28-inch stroke; rear—23<sup>3</sup>/<sub>4</sub>-inch diameter, 29-inch stroke.
- Steam Pressure.....300 pounds per square inch
- Driving Wheel Diameter.....69 inches
- Weight on Driving Wheels.....393,000 pounds
- Total Weight of Locomotive and Tender in Working Order.....1,041,100 pounds
- Starting Tractive Force.....100,800 pounds
- With Booster.....115,800 pounds
- Capacity of Tender.....75,000 pounds of coal. 19,200 gallons of water

**HEAVY DUTY STEAM FREIGHT  
LOCOMOTIVE**

Wheel arrangement: 2-10-4. Pennsylvania  
Class J-1.

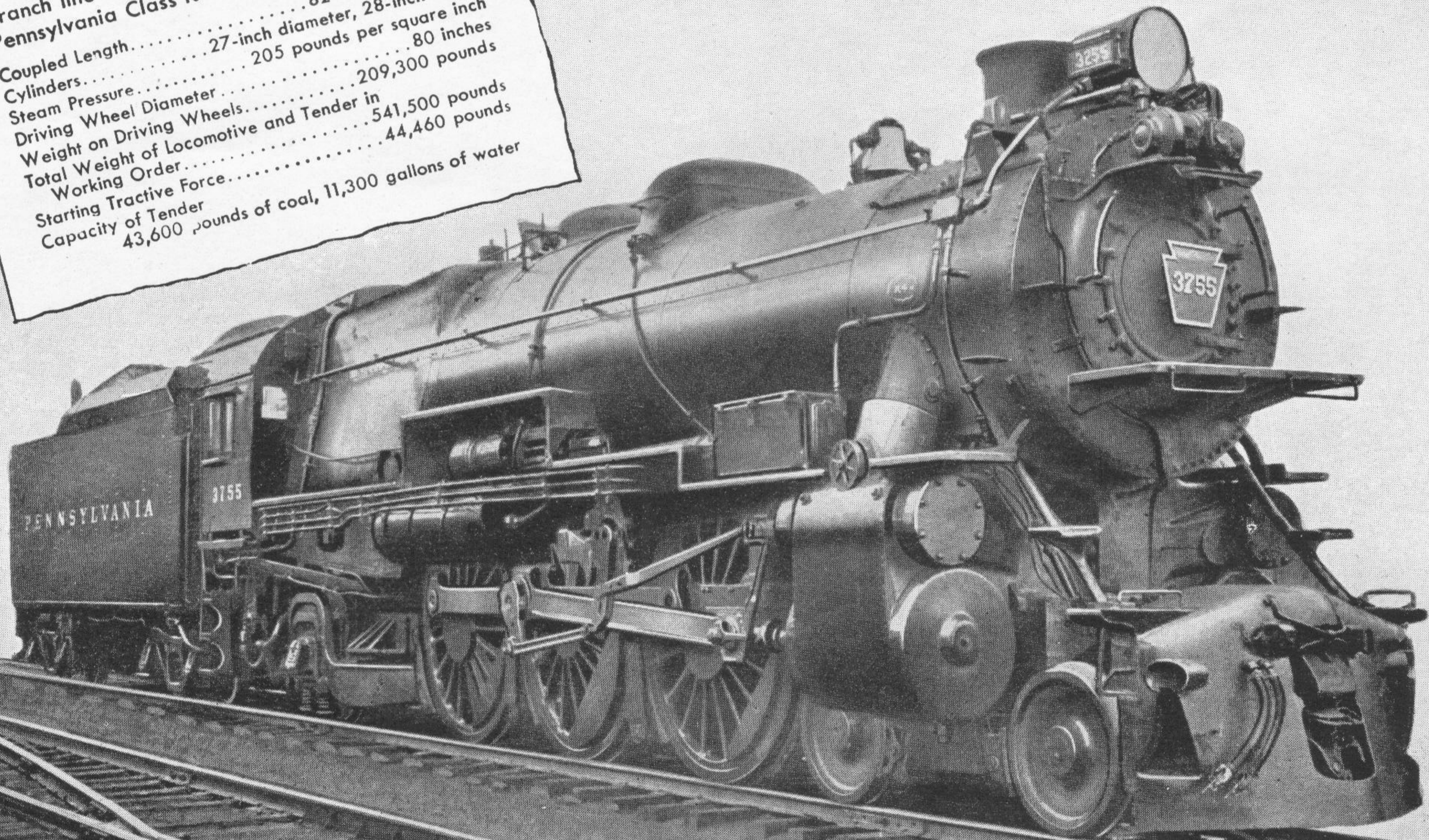
- Coupled Length ..... 117 feet, 8 inches
- Cylinders ..... 29-inch diameter, 34-inch stroke
- Steam Pressure ..... 270 pounds per square inch
- Driving Wheel Diameter ..... 70 inches
- Weight on Driving Wheels ..... 377,800 pounds
- Total Weight of Locomotive and Tender in Working Order ..... 984,140 pounds
- Starting Tractive Force ..... 93,750 pounds
- With Booster ..... 108,750 pounds
- Capacity of Tender ..... 59,800 pounds of coal, 21,000 gallons of water



**ONE OF THE MOST FAMOUS STEAM PASSENGER LOCOMOTIVES**

Now largely replaced in main line service by newer Diesel-electric and steam locomotives, it continues to serve on secondary trains, and in branch line service. Wheel arrangement: 4-6-2. Pennsylvania Class K4s.

Coupled Length.....	82 feet	11 3/4 inches
Cylinders.....	27-inch diameter,	28-inch stroke
Steam Pressure.....	205 pounds per square inch	
Driving Wheel Diameter.....	209,300 pounds	
Weight on Driving Wheels.....	541,500 pounds	
Total Weight of Locomotive and Tender in Working Order.....	44,460 pounds	
Starting Tractive Force.....		
Capacity of Tender	43,600 pounds of coal,	11,300 gallons of water



**HIGH-SPEED ELECTRIC LOCOMOTIVE**

For through passenger and fast freight service.  
Wheel arrangement: 4-6-6-4. Pennsylvania  
Class GG-1.

Coupled Length.....	79 feet, 6 inches
Driving Wheel Diameter.....	57 inches
Weight on Driving Wheels.....	303,000 pounds
Total Weight in Working Order.....	477,000 pounds
Starting Tractive Force.....	70,700 pounds





**ELECTRIC FREIGHT LOCOMOTIVE**

For through service, often operated in multiple.  
Wheel arrangement: 4-6-4. Pennsylvania Class  
P5a. Experiments to develop a still more power-  
ful electric freight locomotive are continuing.

Coupled Length.....	62 feet, 8 inches
Driving Wheel Diameter.....	72 inches
Weight on Driving Wheels.....	229,000 pounds
Total Weight in Working Order.....	394,000 pounds
Starting Tractive Force.....	57,250 pounds

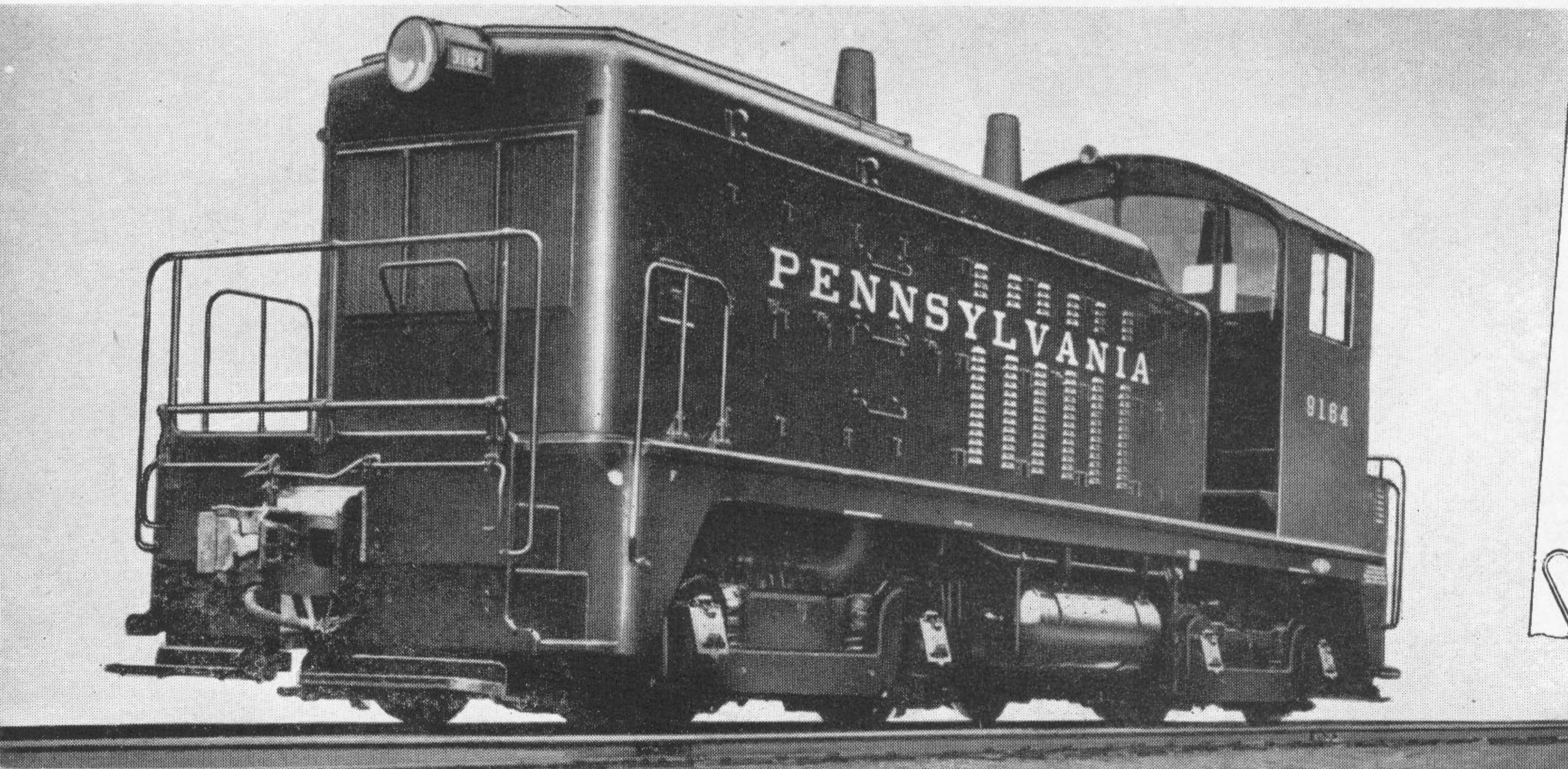




### HEAVY DIESEL-ELECTRIC SWITCHING LOCOMOTIVE

For general service, as well as freight car transfer service between yards. Sometimes used as helper. Wheels arranged in four wheel trucks. Pennsylvania Class FS-20.

- Coupled Length.....51 feet
- Driving Wheel Diameter.....42 inches
- Weight on Driving Wheels, and Total Weight in Working Order.....254,000 pounds
- Starting Tractive Force.....63,500 pounds
- Horsepower.....2,000



### DIESEL-ELECTRIC SWITCHING LOCOMOTIVE

For general service. Wheels arranged in four wheel trucks. Pennsylvania Class ES-10.

- Coupled Length.....44 feet, 5 inches
- Driving Wheel Diameter.....40 inches
- Weight on Driving Wheels, and Total Weight in Working Order.....243,550 pounds
- Starting Tractive Force.....60,890 pounds
- Horsepower.....1,000

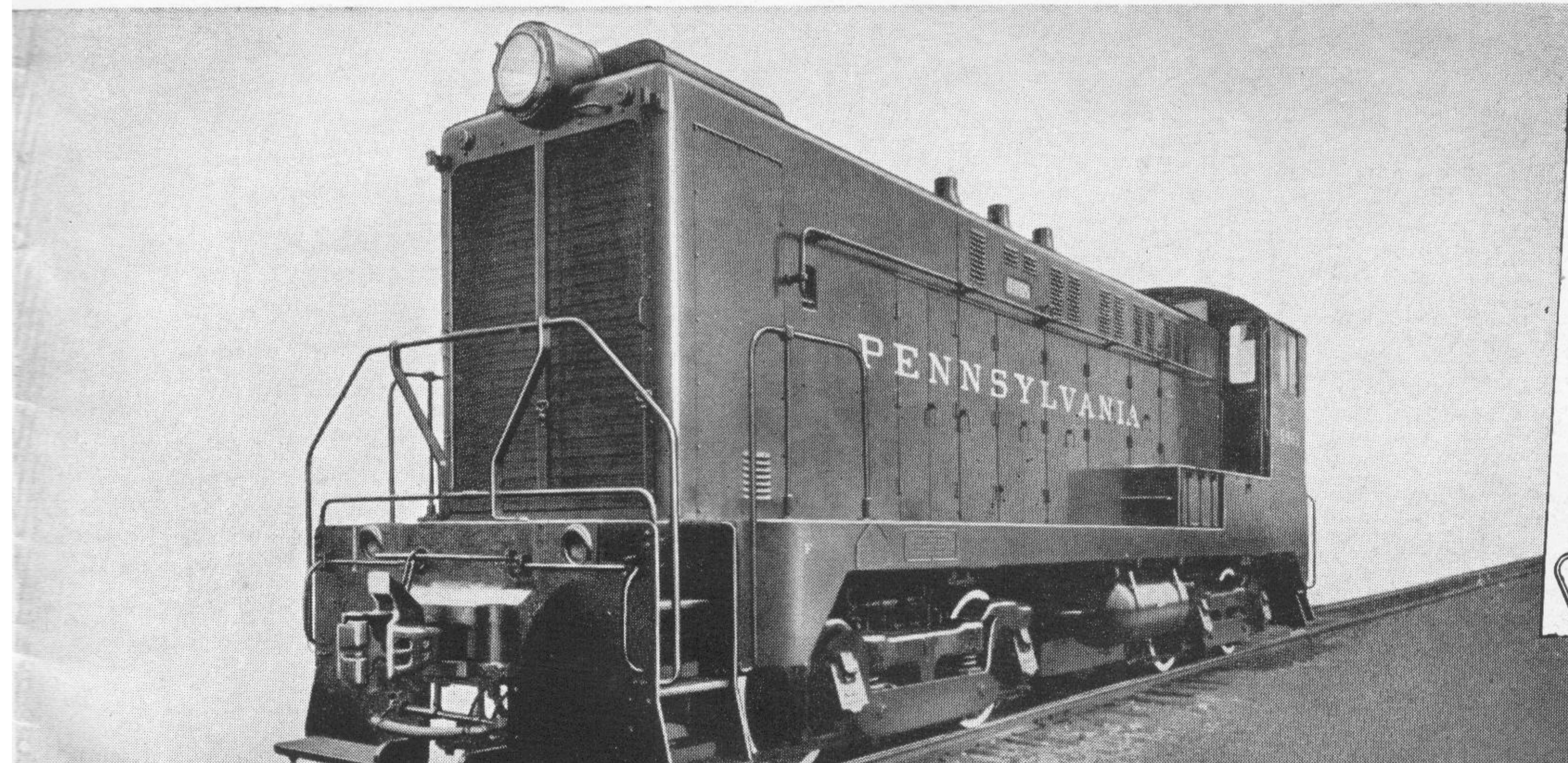




**DIESEL-ELECTRIC SWITCHING  
LOCOMOTIVE**

For general service. Wheels arranged  
in four wheel trucks. Pennsylvania  
Class AS-10.

Coupled Length.....45 feet, 5<sup>3</sup>/<sub>4</sub> inches  
Driving Wheel Diameter.....40 inches  
Weight on Driving Wheels, and Total Weight  
in Working Order.....234,100 pounds  
Starting Tractive Force.....58,525 pounds  
Horsepower.....1,000



**MEDIUM POWER  
DIESEL-ELECTRIC SWITCHING  
LOCOMOTIVE**

For general service. Wheels arranged  
in four wheel trucks. Pennsylvania  
Class BS-6A.

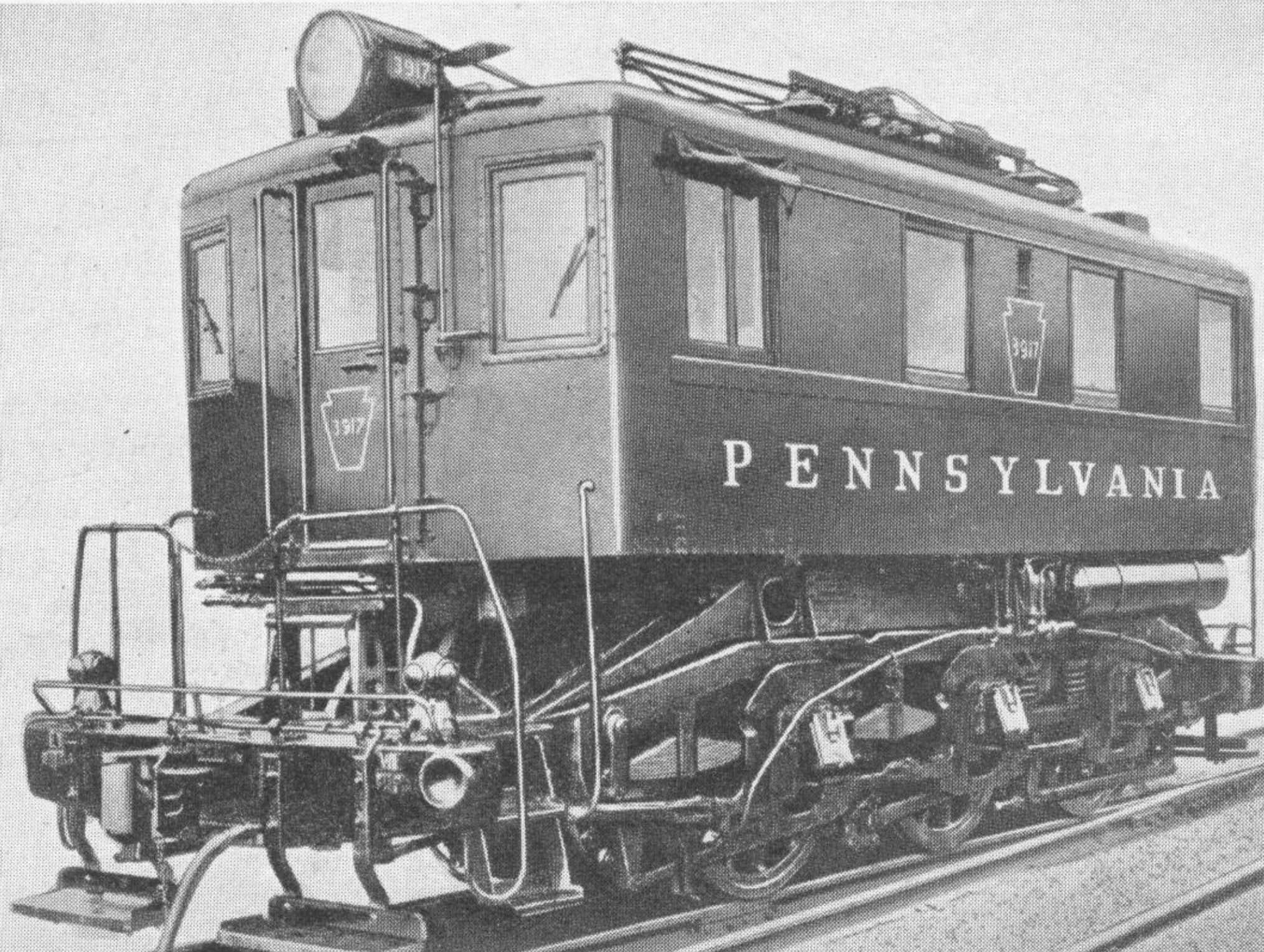
Coupled Length.....46 feet  
Driving Wheel Diameter.....40 inches  
Weight on Driving Wheels, and Total Weight  
in Working Order.....196,000 pounds  
Starting Tractive Force.....49,000 pounds  
Horsepower.....660



### LIGHT DIESEL-ELECTRIC SWITCHING LOCOMOTIVE

For industrial switching, and used in small freight yards. Wheels arranged in four wheel trucks. Pennsylvania Class GS-4.

Coupled Length.....33 feet, 5 inches  
 Driving Wheel Diameter.....33 inches  
 Weight on Driving Wheels, and Total Weight in Working Order.....88,550 pounds  
 Starting Tractive Force.....22,137 pounds  
 Horsepower.....380

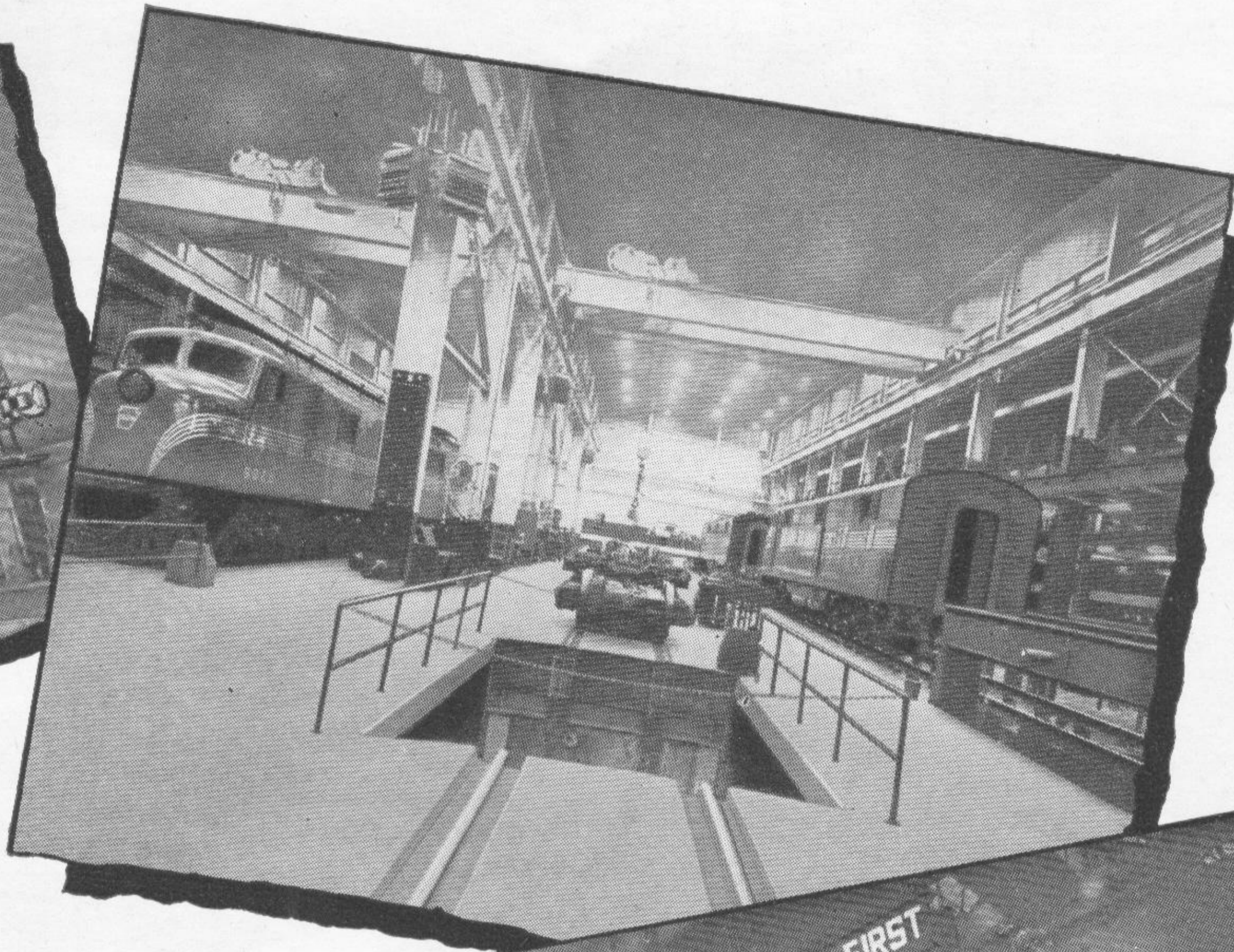
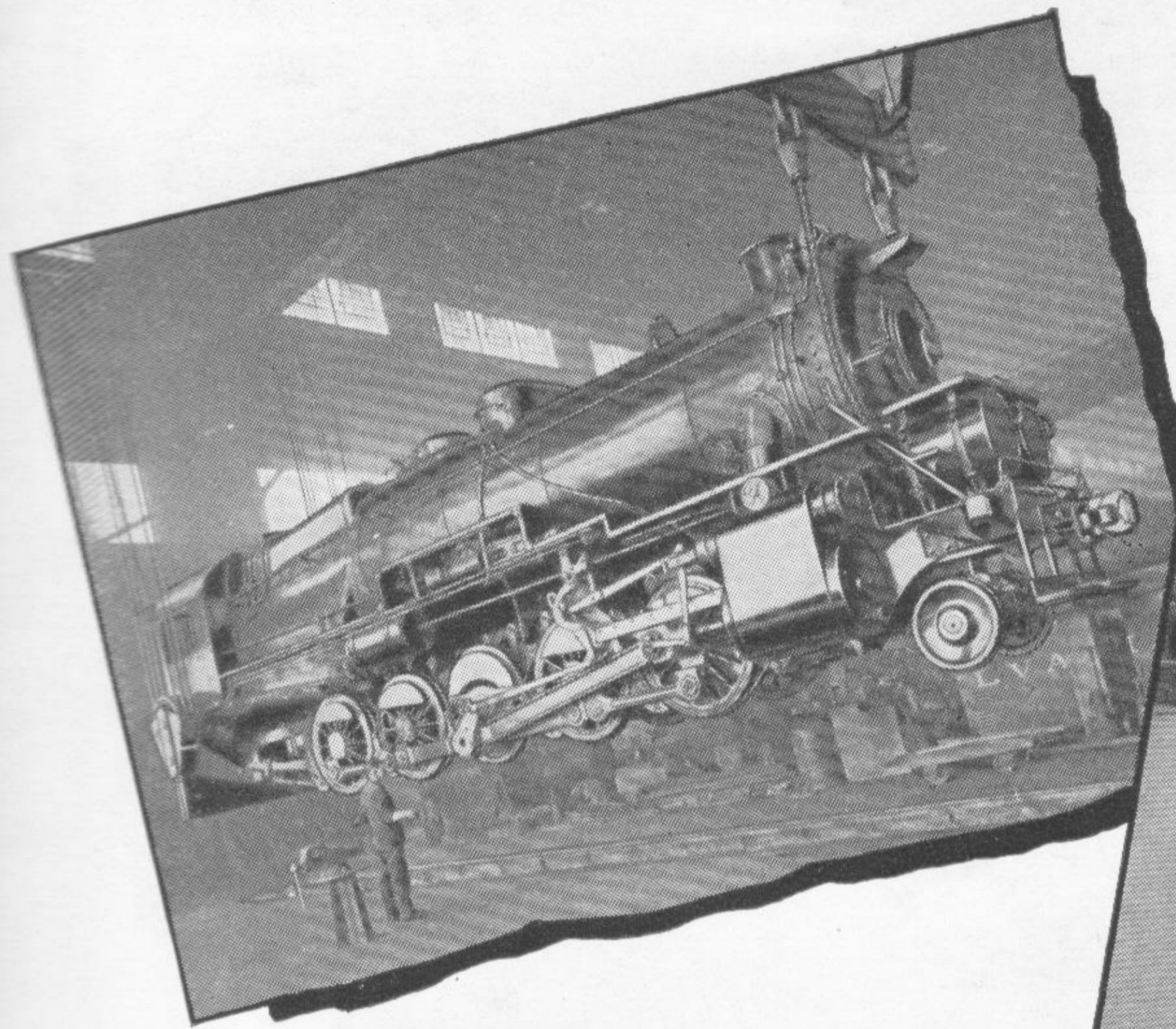


### ELECTRIC SWITCHING LOCOMOTIVE

For general service. Wheel arrangement: 0-6-0. Pennsylvania Class B-1.

Coupled Length.....31 feet, 6 inches  
 Driving Wheel Diameter.....62 inches  
 Weight on Driving Wheels, and Total Weight in Working Order.....157,000 pounds  
 Starting Tractive Force.....39,250 pounds





Pennsylvania Railroad locomotives are maintained and repaired in modern shops, three of which are shown. At left is a scene in the Juniata Shops of the Altoona (Pa.) Works, with a Class I-1 steam freight locomotive being lowered onto the outgoing track after undergoing heavy repairs. The center picture shows part of the new Diesel-electric passenger locomotive maintenance shop at Harrisburg, Pa. At right, the cab of a Class GG-1 locomotive is shown being lifted aside preparatory to repairs on the running gear, at the Wilmington, Del., electric locomotive shops.



The Pennsylvania Railroad's inductive trainphone system provides two-way communication between moving trains and wayside control towers, among moving trains in the same vicinity, and between the ends of the same trains. This illustration depicts a trainphone circuit between a tower operator (above), a freight conductor in his cabin car (above, right), and the train's engineman (right), over which the train crew inform the operator of the progress of their train over the road. Portable carryphones are provided for train crews to expedite communication when away from the trainphone. Communication wires along the railroad, and the track, provide the transmission paths for the system, confining them to the railroad property.

# MAP OF THE PENNSYLVANIA RAILROAD SYSTEM

