

**FIRST AID TO THE DISABLED LOCOMOTIVE  
ENGINE, AIR BRAKE AND AIR SIGNAL  
INCLUDING THE WALCHART VALVE GEAR,  
INSIDE ADMISSION PISTON VALVES,  
DIRECT AND INDIECT VALVE MOTION  
AND THE LATEST AIR BRAKE EQUIPMENT**

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First Aid to the Disabled Locomotive Engine, Air Brake and Air Signal including the Walchart Valve Gear, inside Admission Piston Valves, Direct and Indirect Valve Motion and the Latest Air Brake Equipment by John M. Burley

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**JOHN M. BURLEY**

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VALVES, DIRECT AND INDIRECT  
VALVE MOTION AND THE LATEST  
AIR BRAKE EQUIPMENT.

### A CATECHISM

CONCERNING BREAKS AND FAILURES  
THAT ARE LIABLE TO OCCUR. HOW  
TO PREVENT SOME AND TO LOCATE  
AND REPAIR OTHERS.

— BY —

JOHN M. BURLEY

Compiled from Sixteen Years Actual Experience as  
Locomotive Engineer.

1907

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PREFACE.

The object of this work is to give some information from practical experience concerning the breaks, failures and defects of the air brake and air signal systems and all types of locomotive engines, injectors, metallic packing, lubricators and lubrication, that will assist the locomotive engineer, fireman and trainman to prevent some of them, and in locating and making temporary repairs to others. Shopmen will find this a handy book. There has been considerable new matter incorporated in this enlarged edition. For the car air brakemen the K 2 tripple valve, the defects of the auxiliary reservoir and its connections and adjusting piston travel. For all concerned in a work of this kind, the Walchaert valve gear, inside admission piston valve, direct and indirect valve motion, the cross compound air pump, combined automatic straight air, the E. T. locomotive equipment, the use of hard grease as a lubricant, the parts contained in this book that all railroad men are familiar the breaks, failures and defects are treated only, the new parts there is a short explanation concerning the operation of each part. The writers aim has been to be brief and to the point. In all cases when dealing with a breakdown, failure or defect always use your reason first and your hands afterwards. Bear in mind that good judgment is the first requisite for a successful railroad man in any capacity.

Hoping that by my efforts that I have been able to put before the railroad men a convenient reference book.

J. M. BURLEY.

State Line, Pa., January 1907.

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FIRST AID TO THE  
DISABLED LOCOMOTIVE ENGINE,  
AIR BRAKE AND AIR SIGNAL

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FOUR-CYLINDER ARTICULATED COMPOUND  
LOCOMOTIVE.

*Built by the American Locomotive Co. for the B. & O. R. R.*

This type of engine permits compounding under the most advantageous conditions, as the high-pressure cylinders can be applied to one truck and the low-pressure cylinders to the other, and any desired cylinder ratios can be adopted. This divides the work equally between the two sides of the engine, and the retardation of cut-off peculiar to the compound system gives a more nearly uniform turning moment. In the engine of this type, each pair of cylinders is connected with three pairs of driving wheels, the rear high-pressure group being rigidly attached to the boiler, while the forward or low-pressure group is on a swiveling frame, the motion of which about its center is duly restrained by springs which also tend to bring the forward group of wheels into proper alignment when the engine enters a tangent. The wheel base of each group of 3 pairs of driving wheels is 10 feet, and total wheel base of the engine is 30 feet, 8 inches. The total weight of the engine, in working order, is 334,500 pounds, or slightly over 10,900 pounds per running foot of wheel base. The