

The Cost

OF

Locomotive Operation

By

GEORGE R. HENDERSON, M.E.

Member American Society Mechanical Engineers;
Member American Railway Master Mechanics' Association.

Published by

THE RAILROAD GAZETTE

New York: 83 Fulton Street

Chicago: Old Colony Building

THE RAILWAY GAZETTE

London: Queen Anne's Chambers, Westminster, S. W.

1906.

INDEX.

	Page.
Acceleration	41, 54
Adjusted tonnage	52
Age of locomotives	120
Air-pump speed	58
Applications	161
Ash pit	151
Barnum, M. K.	86
Berry, J. B.	1, 71
Boell, Camille	139
Bogue, Virgil G.	117
Braking	57
Breckenridge, L. P.	75
Bryan, W. H.	10
Bury, G. J.	170
Calling	158
Card records for repairs.....	106
Clark, F. H.	45
Cleaning fires	150
Coal consumption of air-pumps, 58; of simple locomotives.	33
Coal, evaporative value of.....	34
Combustion, maximum rate of, 28; spontaneous.....	16
Comparative costs	187
Condition	24
Constructive mileage	136
Corrosion	65
Cost unit for repairs.....	115
Curvature, 51; resistance	41
Cut-off pressure	30
Davidson, G. M.	71
Delayed time	134
Depreciation of fuel	17
Design	23
Distillation	73
Dulong's formula	5
Electric lighting	102
Engineers, 125; schedules	125
Evaporation of coals, 34; maximum.....	32
Figures1, 32; 2, 33; 3, 34; 4, 35; 5, 36; 6, 37; 7, 42; 8, 42; 9, 42; 10, 42; 11, 175; 12, 185; 13,	186
Firemen	142
Firing	19
Firing-up	19, 157
Foaming	65
Formulæ; acceleration, 41, 42, 55, 59, 60; available tractive force, 28; cost of repairs, 117; curve resistance, 41;	

	Page.
Dulong's, 5; grade resistance, 41; theoretical tractive force, 28; train resistance.....	40
Fry, C. H.	100, 112
Fuel, 5; depreciation of, 17; handling, 14; hauling, 12; heat units in, 5, 8; loss, 15; price, 9; quality, 5; rate of combustion, 28; records, 20; spontaneous combustion, 16; storage, 17; tests, 11; thermal value, 8; value at St. Louis	10
Fuel, effect of acceleration, 54; adjusted tonnage, 52; braking, 57; condition, 24; curvature, 51; grade, 49; loading, 52; speed, 43; stopping, 59; weight of train, 46; weather	61
Fuel loss by radiation, 19, 25; safety valves, 19; scale....	25
Fuel saving by compounding, 25; superheating	24
Grade resistance	41
Grade, work on	162, 179
Grate surface	11
Grease	84
Handling engines	158
Handling fuel	14
Headlights	101
Heat units in fuel	5, 8
Heating, steam	102
Hostling	146
Inspecting	155
Light engine mileage	138
Lighting, electric	102
Lime	70
Loading, effect on fuel	52
Loss of fuel, 15; by radiation, 19, 25; by safety-valves, 19; by scale	25
Lubricants, 82; effect of hauling, 86; quality, 83; quantity, 86; loss	85
Meetings	110
Mileage, 121; constructive, 136; light engine.....	138
Motors, turntable	148
Oil, fuel, consumed by simple locomotive, 35; compound locomotive, 36; compound locomotive with superheater	37
Oil, lubricating	83
Overtime	131
Parke, F. H.....	57
Peabody, J. A.....	191
Performance records	106
Pooling	139
Pressure, cut-off	30
Price, fuel, 9; water	66
Pump, air, speed of	58
Pumping water	67

	Page.
Radiation loss	19, 25
Rate of combustion (maximum)	28
Renewals	120
Repairs, card records, 106; general, 104; running.....	112
Resistance, train, 40; due acceleration, 41; curvature, 41; grade, 41; affected by number of cars, 41; affected by speed and weight	42
Running	22
Safety-valves, loss by	19
Saving in fuel by compounding, 23; by superheating.....	24
Scale, hard, 65; soft, 64; loss in fuel by.....	25
Schedules, engineers', 126; firemen	142
Soda-ash	70
Speed, air-pump	58
Speed, effect on fuel, 43; on pay of men.....	140
Spontaneous combustion	16
Starting	189
Steam heating	102
Steam, volumes of saturated and superheated.....	38
Stillman, Howard	71
Stopping and starting, 189; effect on fuel.....	59, 189
Storage of fuel	17
Tests of coal	8
Thermal unit	6
Thermal value of coals	8
Time, over, 131; delayed	134
Tools	96
Tractive force	28
Tractive force, ton-mile	116
Train resistance, 40; affected by number of cars, 41; affected by speed and weight.....	42
Treatment of water	69
Turning, engines	146
Turntable motors	148
Undulating profiles	184
Unit of cost (for repairs).....	115
Unit, heat	6
Up and down hill.....	179
Volumes of saturated and superheated steam.....	38
Washing out	76
Waste, 92; quality, 92; quantity	93
Water, 63; bad, 74; corroding, 65; distillation, 73; foam- ing, 65; grading, 71; price, 66; pumping, 67; pure, 64; quality, 63; quantity, 78; scaling, 65; solid matter in, 64; treatment, 69; waste.....	78
Weather effects	42
Weight of train, effect on fuel.....	46
Wiping	152