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LOCOMOTIVE PRODUCTION ENGINEERING: DEPTH CLASSIFICATION.

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Works out a scheme *for* the Depth Classification of the subjects going with the (BC) "Production Engineering of Locomotive". The schedules given are confined to the First Characteristics for [1P]. Gives a list of 24 selected examples classified according to the scheme. Demonstrates the use of the connecting symbol '=' in constructing isolate numbers based on units of measure. Comments on the Feature Headings.

ABBREVIATIONS USED

(A1) = Array of Order 1	[1P] = [P] of Round 1
(A2) = Array of Order 2	(QI) = Quasi Isolate(s)
(A3) = Array of Order 3	Tel = Telescoping of
(AD) = Alphabetical Device	Tel 1 = Telescoping 1 of
(BC) = Basic Class(es)	Tel 2 = Telescoping 2 of
(IN) = Isolate Number(s)	Tel 3 = Telescoping 3 of
[P] = Personality Facet	

1 INTRODUCTION

The construction of a scheme *for* the Depth Classification of the subjects going with the (BC) "Production of Power-Production-Machinery", such as the Reciprocating Internal Combustion Engine [22] and Boiler [12] has been demonstrated. This paper continues the demonstration of the application of the new methodology of design [17] to the construction of a depth schedule for the classification of the subjects going with the (BC) "Production of Locomotive".

This paper confines itself to the schedule of [1P]. The schedule is provisional.

2 DEFINITION

21 MACHINE

A Machine is a combination of rigid or resistant bodies having definite motions and capable of performing useful

work. The term 'Mechanism' is closely related but applies only to the physical arrangement that provides for the definite motions of the parts of a machine. A machine is an assembly of one or more mechanisms [10].

22 MACHINERY

A Machinery is a group of parts arranged to perform a useful function. Normally some of the parts are capable of motion; others are stationery and provide a frame for the moving parts. The terms 'machine' and 'machinery' are so closely related as to be almost synonymous; however, the term 'machinery' has a plural implication, suggesting more than one machine [11].

23 ENGINE

An Engine is a machine designed for the conversion of energy into useful mechanical motion. The principal characteristic of an engine is its capacity to deliver appreciable mechanical power, as contrasted to a mechanism such as a clock or an analog computer whose significant output is motion. By usage, an engine is usually a machine that burns or otherwise consumes fuel as differentiated from an electric machine that produces mechanical power, without altering the composition of matter [6].

24 LOCOMOTIVE

1 A machine used to move trains on railway tracks [25].

2 A self-propelled engine or vehicle; specifically a steam engine mounted with its boiler and accessories on a truck or trucks designed to run on gauged rails, for hauling cars, wagons, etc, for the conveyance of passengers or freight; hence, any motor running on track, for hauling [24].

3 A vehicle supported on wheels, capable of self-propulsion by converting heat or electrical energy into mechanical power for the purposes of moving railway cars over rails [7].

241 Steam locomotive

A steam-engine and boiler integrally mounted on a frame which is fitted with road wheels driven by the engine. The term is usually restricted to locomotives used to haul passenger or goods traffic on a railway [1].

242 Diesel locomotive

A locomotive powered by a diesel or compression-ignition engine geared to the driving wheels [2].

243 Diesel-electric locomotive

A locomotive in which the motive power from a diesel

engine is used to drive an electric generator which supplies electric motors connected to the driving axles [3].

244 Diesel-hydraulic locomotive

A locomotive powered by a diesel engine, the latter being connected by universal drive shafts to the hydraulic transmission system mounted on the truck between the two driving wheels [8].

245 Turbine locomotive

A locomotive powered by a steam or gas turbine, the power being transmitted to the driving wheels through an electric transmission system [9]. The turbine locomotive is sometimes called Turbine-electric locomotive.

3 BASIC CLASSES IN 'D ENGINEERING'

The first few (BC) in the schedule of Main Class 'D Engineering' occurring in (A1) are as follows:—

D Engineering
D6 Power production
D7 Service production
D7Z Commodity production
D9A Power-production machinery
Tel (A3) *into* (A2) *begins*
D9C Mechanical-power-production machinery
D9J Thermal-power-production machinery
D9M Electrical-power-production machinery
D9N Electronic-power-production machinery
Tel (A3) *into* (A2) *ends*

31 BASIC CLASS FOR 'LOCOMOTIVE'

Locomotive-Production Engineering forms a subclass of the (BC) Production Engineering of Mechanical Power Production Machinery. It is itself a (BC). The following is the chain containing it:

D9C Mechanical-power-production machinery
Tel (A4) *into* (A2) *begins*
D9D Hoisting and conveying machinery
D9E Propulsion machinery
Tel (A5) *into* (A2) *begins*
D9F Land traction machinery
D9F1 Automotive engine
D9F4 Locomotive
Tel (A6) *into* (A3) *begins*
D9F5 Steam locomotive

D9F6 Electric locomotive
D9F7 Reciprocating internal combustion engine
Tel (A7) *into* 1 (A3) *begins*
D9FA Petrol locomotive
D9FB Diesel locomotive
D9FC Diesel-electric locomotive
D9FD Diesel-hydraulic locomotive
Tel 1 (A7) *into* (A3) *ends*
D9FF Turbine engine
Tel 2 (A7) *into* (A3) *begins*
D9FG Steam turbine locomotive
D9FJ Gas turbine locomotive
Tel 2 (A7) *into* (A3) *ends*
D9FN Nuclear locomotive
Tel (A6) *into* (A3) *ends*
D9G Marine engine
D9H Aero-engine
Tel (A4) *into* (A2) *ends*

32 CHARACTERISTIC FOR DIVISION

The (BC) 'D9D4 Locomotive' has been divided into further (BC) on the basis of the Characteristic 'By engine(s) supplying power'.

33 SEQUENCE OF (BC)

The sequence of the (BC) has been derived by applying the Principle of Later-in-Time [18]. The (IN) have been assigned with the help of Scheduled Mnemonics [19].

4 FIRST CHARACTERISTICS

Some of the possible First Characteristics—that is, (QI)—used as the basis for the classification of subjects going with the (BC) 'Production Engineering of Locomotive' and its sub-classes, are given in Table 1 in Sec 41. These (QI) have been selected by blending the *a priori* and pragmatic approaches. The latter consisted of examining about 200 recent articles on the subject. Table 1 also indicates, wherever helpful and necessary, the second and later order (QI). The (QI) other than those of Order 1 are indicated by appropriate indention.

41 TABLE 1. QUASI ISOLATE

SN	Sector	Quasi Isolate	SN	Sector	Quasi Isolate
1	(S-(A))	By Brand	30		By Driving wheel
2	(S-(1))	By Country of make	31		By Pilot wheel
3-5	(S-(a))	By purpose	32-44		By Propulsion unit (For gas turbine)
3		By Distance	32	(S-9ZA)	By Brand
4		By Service line	33	(S-9A)	By Method of power increase
5		By Entity transported			
6-8	(S-ZA)	By Environment	34		By Brake horse power
6		By Resistance			
7		By Altitude	35		By Speed
8		By Latitude	36		By Fuel
9-11		By Cab	37		By Cycle
9	(S-Z91)	By Number	38		By Shaft arrangement
10	(S-Z9a)	By Structure			
11		By Position	39		By Number of turbine stage
12-13		By Bogie of loco			
12		By Articulation	40		By Number of combustion chambers
13		By Number			
14		By Mounting of engine	41		By Kind of combustion chamber
	(S-ZzA)	By Brand			
15	(S-Za)	By Gauge of track			
16		By Weight of locomotive	42		By Compressor type
17		By Weight on drivers	43		By Number of compressor stage
18		By Axle load			
19	(S-A)	By Wheel base	44		By Cooling method
20		By Rail clearance	45-60		(For petrol/diesel engine)
21		By Height over Cab			
22		By Overall width	45	(S-9ZA)	By Brand
23		By Length over buffer	46	(S-9A)	By Number of engines
24		By Overall length	47		By Method of power increase
25		By Maximum radius of negotiable curve	48		By Brake horse power
26		By Mean maximum speed	49		By Compression ratio
27		By Number of the gear	50		By Cycle
			51		By Number of cylinders
28-29		By Tractive effort			
28		By Continuous tractive effort, at Speed	52		By Bore diameter
			53		By Cylinder arrangerment
29		By Starting tractive effort	54		By Crankshaft speed
30-31		By Arrangement of wheel	55		By Fuel tank capacity

SN	Sector	Quasi Isolate	SN	Sector	Quasi Isolate
56		By Displacement	86		By Frequency of supply
57		By Stroke distance			
58		By Fuel injection system	87	(S–99a)	By Position of cylinder
59–60		By Cooling method	88	(S–91)	By Number of cylinders
59		By Device			
60		By Fluid	89	(S–9a)	By Temperature of unit
61–81		By Boiler			
61		By Brand	90	(S–1)	By Number of axles
62		By method of increasing efficiency	91	(S–zZ1)	By Driving wheel diameter
63		By Capacity	92–97	(S–zA)	By Gear drive system
64		By Design efficiency	92		By Kind of drive
65		By Thermal efficiency	93		By Gear box mounting
66		By Temperature	94		By Changing of gear
67		By Fuel			
68		By Rate of combustion	95		By Gear reduction ratio
69		By Fuel consumption	96		By Number of gear
			97		By Stall torque ratio
70		By Steam consumption	98–104		By Transmission system
71–72		By Size			
71		By Width	98	(S–zzA)	By Brand
72		By Height	99	(S–zz1)	By Number of transmission speed
73–75		By Construction			
73		By Support			
74		By Refractory wall	100	(S–za)	By Mode of operation
75		By Tube positioning	101		By Type of transmission
76		By Furnace	102		By Friction clutch
77		By Tube	103		By Stage
78		By Header	104		By Coupling
79		By Firing	105	(S–z01)	By Method of Starting
80		By Draught			
81		By Control of Temperature	106–113	(S–a)	By Control
			106		By Brand
82–86		By Electric/Electronic equipment	107		By Power
			108–113		By Entity controlled
82–86		By Motor			
82	(S–99ZA)	By Brand	108		By Coolant temperature
		By Revolution per minute	109		By Coolant level
83	(S–99A)	By Number of motors	110		By Lubrication
84		By Mounting of motors	111–112		By Braking system
85		By Phase	111		By Braking

SN	Sector	Quasi Isolate	SN	Sector	Quasi Isolate
		mechanism	115		By Lighting
112		By Braking force	116		By Voltage
113		By Speed	117		By Heating and ventilation
114–118		By Facility	118		By Visibility
114		By Track crossing			

42 SEQUENCE OF THE (QI)

There being a large number of (QI), it was helpful to apply the Group Strategy [13]. That is,

1 To group the (QI) into a few groups;

2 Derive a helpful sequence among the groups by applying the Wall-Picture Principle to a pair of groups at a time; and

3 To derive a helpful sequence among the (QI) in each group by applying the Wall-Picture Principle to a pair of (QI) at a time.

43 GROUPING OF (QI)

In making groups of (QI) in each group some affinity is looked for among the (QI). It is sometimes difficult to sense this affinity. In an earlier paper [14] it was mentioned that in subjects going with the (BC) "Commodity Production Engineering" "formation of groups such as the following would be convenient:

Name-associated
Purpose-associated
Whole-machine-design associated
Organ-design associated
Operation-associated

In the present schedule) the (QI) were grouped as follows

Group N	Kind of Group	S Number of (QI) in Table 1
1	Personality-associated	1–8
2	Attribute and Material-Matter Associated	9–103
21	For locomotive as a whole	9–29
22	For organs	30–103
3	Energy-associated	104–118

In the case of the second and later order (QI) associated with each of the Organ-associated first order (QI), it has been found possible to derive a Personality, Matter, Energy sequence for them. A more detailed paper on the grouping of (QI) and deriving a helpful sequence among them according to this methodology, is in preparation. The sequence of the (QI) arrived at is deemed to satisfy the Wall-Picture Principle.

44 Super-Imposition

If a subject warrants the combination of two or more isolates in [IP] derived on the basis of different (QI), the resulting (IN) will be a complex superimposed isolate.

5 NOTATION

51 Allocation of Sectors to (QI)

The provisional allocation of the sectors to the (QI) is given in column 2 of the Table 1 in Sec 41. In assigning the sectors the following factors were taken into consideration:

1 The sequence of the (QI) arrived at in the idea plane should be maintained in the notational plane;

2 The number of digits in (AI) should not normally exceed 3;

3 In order to facilitate the use of mnemonics, some of the (QI) should preferably be allocated sectors in which the first significant digit is an Hindu-Arabic numeral;

4 In order to facilitate the use of (AD) or the addition of figures in Hindu-Arabic numerals for isolates derived should preferably be allocated sectors in which the first significant digit is a Roman capital letter;

5 Gaps should be left among the sectors allocated such that a new (QI), to be interpolated in future, can be given a sector without having to disturb the pattern of allocation of sectors now obtained;

6 Frequently occurring isolates should get, as far as possible, shorter notation than those occurring comparatively less frequently;

7 If the number of isolates derived on the basis of a (QI) is comparatively large (*eg* more than 8), then a sector with a broader base should preferably be allocated to that (QI); and

8 One and the same sector may be allocated to two or more consecutive (QI), in order to make full use of each of the sectors allocated. But, at the same time, care has to be taken not to jeopardise the future interpolation or extrapolation, in the appropriate filiatory sequence of any isolate(s) derived on the basis of any of the (QI) enumerated or any other (QI) that

may have to be accommodated in the future.

91 The isolates in the schedule for organs have been allocated the following sectors [23]:

SN	Organ	Sector	N of Array (IN)
1	General-purpose Machine Element (ME)	(S–a) to (S–za)	44
2	Common Organ Isolates (Other than ME)	(S–zza)	22
3	Organ of remove 5	(S–zz1) to (S–zzA)	31
4	Organ of remove 4	(S–z1) to (S–z9A)	61
5	Organ of remove 3	(S–zA) to (S–zZA)	76
6	Organ of remove 2	(S–1) to (S–9zA)	220
7	Organ of remove 1	(S–A) to (S–ZZA)	235

92 The isolates in the schedule of organs of remove 2 have been grouped according to their general functions [21].

93 The schedules for [P] of levels later than [1P1] have been telescoped into [1P2]. But [1P2] is not telescoped into [1P1]. If in a subject, an isolate in the schedule of [1P1] or [1P3] etc is to be directly attached to the (BC) without the occurrence of an isolate from the schedule of [1P1], then a '0' (Zero) should be added immediately preceding the (IN) from [1P2] etc [15].

52 Extension of the Use of Symbol "="

The use of the connecting symbol "=" for connecting the isolate numbers got by applying the (AD) to multinomials has been demonstrated [4]. It has been found convenient to extend the use of this symbol to connect the members of units of measure, and the integral part and the decimal part in a number. For example, if a measure is expressed in feet and inches, then the part expressed in feet and the part expressed in inches can be connected by "=" symbol:

5=6 can represent 5 feet 6 inches.

Similarly, if a measure is expressed in tons and cwts, then

15=6 can represent 15 tons 6 cwt.

Also, if a measure is expressed in decimal notation, the figures on either side of the decimal point may be connected by the symbol "=". For example,

525=3 can represent 525·3

Such extension of the use of the symbol "=" is demonstrated in several of the Class Numbers in Sec 8.

6 INDEX TO SCHEDULE

Note.—1 The (IN) given against an entry is the (IN) assigned to that isolate in the schedule in Sec 7.

2 (Org) = Organ. (QI) = Quasi Isolate.

7 SCHEDULE

Foci in [P]
(S–*a*) to (S–za) General purpose Machine Element (ME)

Telescoping point
Earlier level
(S–*zza*) Common organ isolates (other than ME)

Telescoping point
Earlier level
Organ of remove 2

1 *By Support and structure*
11 Bed frame
141 Wall
142 Partition
143 Bar. Rod
18 Door. Exit

2 *By Storage and Casing*
22 Cylinder
23 Crankcase
24 Journal box
25 Reservoir. Box
254 Steam chest
254 Fuel store
255 Water tank
258 Air box
27 Machine cabinet
2F Ash pan

3 *By Joining and fastening* (other than ME)

4 *By Separation*
41 Liner
411 Inner
415 Outer
42 Filter
428 Air filter
43 Diaphragm
45 Sleeve

5 *By Motion*
53 Speed changer
55 Crank
56 Sandbox
58 Brake
5C Acceleration resistor

6 *By Reciprocation*
61 Piston

63 Tappet
65 Pushrod
66 Rocker

7 *By Rotation*
71 Camshaft
73 Crankshaft
75 Rotor

8 *By Inertial mechanism*
81 Weight
82 Counter weight
83 Fly wheel
86 Pendulum

91 *By Transfer mechanism*
914 Pump
915 Compresser
92 Lead (Pipe)
921 Inlet
925 Outlet
928 Manifold
92B Stoker
92G Pantograph

93 *By Control*
93A Governor
93K Hand wheel

94 *By Heating*
943 Feed heater
945 Fire box

95 *By Ignition*
955 Fuel
956 Spark advance device

96 *By Cooling and ventilating*
961 Heat exchanger
965 Radiator
967 Coolant
968 Ventilator

97 *By Condensation*
978 Condenser

98 *By Signalling and indication*
982 Bell
983 Whistle
984 Alarm equipment

9A *By Measurement*
9B2 Flow
9B3 Force
9B4 Temperature
9B5 Moisture
9B7 Pressure

9D *By Protection and safety*
9D1 Guard
9D2 Hand rail
9D5 Light
9D6 Spark arrester
9D8 Pilot

9F *By Attenuation*
9F3 Sound absorber
9F4 Shock absorber
9F5 Vibration absorber

9H *By Lubrication*
9H3 Lubricator
9H5 Lubricant

Telescoping point
Earlier level
Organ of remove 1
B Frame
C Cab
C1 Front truck
D Tender
F Wheel
F1 Leading wheel
F3 Driving wheel
F6 Trailing wheel
G Engine
H Air-in-take equipment
J Fuel metering equipment
K Electric equipment
K1 Generator
K2 Alternator
K3 Transformer
K5 Switch gear
K6 Rectifier
K8 Motor

M Fuel injection equipment
Q Exhaust device
Q2 Smokestack
Q4 Steam exhaust
V Starting equipment

Earlier level
a *By Facility*
a2Z *By Visibility*
a31 Forward
a36 Rearward

a3Z *By Heating and Ventilation*
a44 Heating
Tel (A2) *into* (A1) *begins*
a45 With boiler van
a46 Electrical
Tel (A2) *into* (A1) *ends*
a48 Ventilated

a5 *By Lighting*
a55 Compressor assisted

a5B *By Voltage*
Note.—Add the given figure to a5B *and read it as an integer.*
(Illustrative)
a5B24 24 Volts

By Track crossing
aB Cross tracking
aB1 With retractable wheel

aZ *By Control*
b *By Entity regulated*
c *By Speed control*

Tel 1 (A2) *into* (A1) *begins*
d Governor
d1 Direct acting
d14 Variable speed
d15 Limited speed
d16 Constant speed
d2 Relay type
d6 Load limiting
d8 Load distributing
e Mechanical
f Hydraulic
j Pneumatic
Tel 1 (A2) *into* (A1) *ends*

k *By Braking system*

Tel 2 (A2) *into* (A1) *begins*
m *By Braking force* (% loco weight)
Note.—Add the given figure to m, *and read it as an integer.*
(Illustrative)
m73=3 73·3 per cent

n *By Braking mechanism*
n1 Internal shoe (Drum)
n5 Disc
n58 Multi-disc
nB Regenerative
Tel 1 (A2) *into* (A1) *ends*

p *By Lubrication*
p5 Warning system
p6 Automatic shut down

q *By Coolant level*
q5 Warning system
q6 Automatic shut down

r *By Coolant temperature*
r5 Warning system
r6 Automatic shut down

s *By Power*

Tel 3 (A2) *into* (A1) *begins*
t Dynamic
u Pneumatic
u5 Hydraulic
u6 Vacuum
u8 Air
v Electrical
v5 Rheostat
v7 Pressurised
x Automatic
Tel 3 (A2) *into* (A1) *ends*

yA *By Brand*
Note.—To be derived by (AD).
(Illustrative)
yR Rolls Royce

By method of starting
z02 Manual
z06 Electrical
z061 Battery

By Transmission system
zb *By Coupling*
zb5 Fluid
zb6 Torque-convertor
zb8 Torque-convertor coupling

zd *By Stage*
zd1 One
zd2 Two
zd3 Three

zf *By Friction clutch*
zf1 Single disc
zf1Z Multi-disc
zf2 Two
zf3 Three

By Type of transmission
zg Mechanical
zg1 Shaft
zg5 Hydromechanical
zg5S Suri
zj Hydraulic
zk Electrical

By Mode of operation
zm Manual
zp Semi-automatic
zr Automatic

By Number of transmission speed
zz2 Forward
zz6 Reverse
zz8 Forward and reverse
Note.—Add the given number for speed to the appropriate (IN) *for gear, and read it as an integer.*
(*Illustrative*)
zz22 Two forward speeds
zz62 Two reverse speeds

zzA *By Brand of transmission system*
Note.—To be derived by (AD).
(*Illustrative*)
zzR Rolls Royce

By Gear drive system
z9a *By Stall torque ratio*
Note.—Add the first component of the given ratio to z9a, *and read it as an integer.*
(*Illustrative*)
z9a5=2 5·2:1

By Number of the gear
z9j General
z9k First gear
z9m Second gear
z9n Third gear
z9p Fourth gear
z9s Forward and reverse

By Gear reduction ratio
Note.—Add the first component of the given ratio to the (IN) *for the appropriate number of the gear, if given, otherwise to* z9j, *and read it as an integer.*
(*Illustrative*)
z9j60 60:1
z9k130 130:1 on first gear
z9n33 33:1 on third gear

By Changing of gear
zA In stationary position
zB In movement
zC Self-changing

By Gear box mounting
zE Axle-mounted

By Kind of drive
zG Single reduction gear
zG1 Nose suspension
zH Direct drive

Tel 4 (A2) *into* (A1) *begins*
zJ Armature on axle
zK Quill drive
zK1 Geared quill drive
zM Linkage
zN Frame mounting and individual universal rod
zP Side rod
zQ Jack shaft and side rod
zR Geared jack shaft
zS Yoke
Tel 4 (A2) *into* (A1) *ends*
zW Individual
zX Collective

zZ1 *By Driving wheel diameter*
Note.—Add the given figure in feet and inches to zZ, *and read it as an integer.*
(*Illustrative*)
zZ3 3′
zZ4=4 4′4″
zZ4=8=5 4′8·5″

By Number of axle
Note.—Use the given figure as the (IN), *and read it as an integer.*
(*Illustrative*)
5 5 axles
8 8 axles
12 12 axles

By Temperature of unit (in °F)
9b 50 to 59
9c 60 to 69
9d 70 to 79
9e 80 to 89
9f 90 to 99
9g 100 to 109
Note.—Add the digits in the unit place in the figure for the temperature to the appropriate (IN) *in the above schedule, and read it as an integer.*
(*Illustrative*)
9d5 75° F
9g1 101° F
9g9 109° F

By Number of cylinders
91 One cylinder
92 Two cylinders
93 Three cylinders
94 Four cylinders
98A Compound engine

By position of cylinder (for steam loco)
99b Inside-cylinder
99f Outside-cylinder

By Electric/Electronic equipment
99B Transformer
99C Rectifier
99C1 Silicon
99C3 Ignitron

By Motor
99D *By Frequency of supply*
Note.—Add the given figure for the frequency to 99D, *and read it as an integer.*
(*Illustrative*)
99D15 15 Cycles

99E *By Phase*
99E1 Single phase
99E2 Two-phase
99D3 Three-phase

By Voltage
99G *By Motor voltage*
99GA AC
99GD DC
Note.—Correct the given figure to the nearest hundred, divide it by hundred, add the resulting figure to 99GA *or* 99GC *as the case may be, and read it as an integer.*
(*Illustrative*)
99GA6 600 volt
99GD15 1500 volt

99H *By Supply voltage*
99HA AC
99HD DC
Note.—Correct the given figure to the nearest hundred, divide it by hundred, add the resulting figure to 99HA *or* 99HD *as the case may be, and read it as an integer.*
(*Illustrative*)
99HA33 3300 AC volts
99HD35 3500 DC volts

By Mounting or motors
99M1 Axle mounted

By Number of motors
99N1 One
99N2 Two
99N3 Three

99T *By Revolutions per minute*
Note.—Correct the given figure to the nearest hundred, divide it by hundred, add the figure to 99T, *and read it as an integer.*
(*Illustrative*)
99T12 1200 rpm
99T20 2000 rpm

99ZA *By Brand*
Note.—To be got by (AD).
(*Illustrative*)
99ZB Brush

By Boiler
9B *By Control of temperature*
9B1 Damper bypass
9B2 Recirculation
9B3 Differential firing
9B5 Attemperation
9B52 Direct contact
9B53 Drum type
9B54 Submerged
9B6 Firing rate control
9BA Manual
9BB Semiautomatic
9BD Automatic

9C *By Draught*
9C2 Natural
9C3 Induced
9C5 Forced
9C8 Balanced

By Firing
9D Stoker
9D1 Chain grate

9D2	Travelling grate
9D3	Coking grate
9D4	Sprinkler
9D42	Shovel
9D45	Rotary
9D5	Spreader
9D91	Horizontal
9D93	Vertical
9D94	Opposed
9D96	Tangential
9DA	Hand firing
9DD	Automatic
9E	*By Header*
9E3	Box
9E4	Sectional
9F	*By Tube*
9F1	Horizontal
9F2	Horizontal return
9F3	Vertical
9F5	Inclined
9F6	Bent
9H	*By Furnace*
9H1	Internal
9H5	External
9HB	Scotch
9HD	Dutch oven
9HF	Cyclone
9HG	Turbo
9HJ	Combination
9HM	Hopper bottom
9HP	Slagtap
9J	*By Construction*
	By Tube positioning
9J2	Close spaced
9J3	Welded ligament panel
9J4	Flat stud welded to side
9J5	Full stud wall
9J6	Tube and tile
	By Refractory wall
9JC	Solid
9JF	Water-cooled
9JF1	Bare plate
9JF2	Bare tube
9JF3	Extended surface
9JF5	Protected tube
9JJ	Air cooled (Hollow)
	By Support
9K1	Suspended
9K2	Structural support
9K23	On brick setting
9K26	Independent of brick setting

	By Size
9M	*By Height* (in ft) *Note.—Add the given figure to* 9M, *and read it as an integer.* (*Illustrative*)
9M36	36 ft
9M38=6	38 ft 6 in
9N	*By Width* (in ft) *Note.—Add the given figure to* 9N, *and read it as an integer.* (*Illustrative*)
9Q25	2 5 lb/hr
9Q26=5	26·5 lb/hr
9R	*By Rate of combustion* (*in Btu*) *Note.—Correct the given figure to the nearest hundred, divide it by* 100, *add it to* 9R, *and read it as an integer.* (*Illustrative*)
9R28	2800 Btu
	By Fuel
9T	Pulverised coal
9T1	Anthracite
9T2	Semi-anthracite
9T3	Bitumimous coal
9T4	Sub-bituminous coal
9T5	Lignite
9T6	Brown coal
9T7	Hard coal
9T8	Peat
9TE	Coke
	Tel (A3) *into* (A2) *begins*
9TF	High temperature coke
9TG	Low temperature coke
9TJ	Fluid coke
9TK	Coke breeze
	Tel (A3) *into* (A2) *ends*
9TM	Oil
9V	*By Temperature* (in °F) *Note.—Correct the given figure to the tenth place, divide it by* 10, *add it to* 9V, *and read it as an integer.* (*Illustrative*)
9V26	260° F
9V32	320° F

9W *By Thermal efficiency* (in percentage)
Note.—Add the given figure to 9W, *and read it as an integer.*
(*Illustrative*)
9W55 55 per cent
9W62=5 62·5 per cent

9X *By Design pressure* (lb/sq in gauge)
Note.—Correct the given figure to the tenth place, divide it by ten, add it to 9X, *and read it as an integer.*
(*Illustrative*)
9X25 250 lb/sq in g
9X32 320 lb/sq in g

9Y *By Capacity*
Note.—Correct the given figure to the nearest thousand, divide it by 1,000, *add it to* 9Y *and read it as an integer.*
(*Illustrative*)
9Y55 55000 lb/hr
9Y63 63000 lb/hr

By Method of increasing efficiency
9Za Air heater
9Xc Economiser
9Zf Superheater
9Zh Reheater
9Zm Topping
9Zm5 Supercharging

9ZA *By Brand*
Note.—To be derived by (AD),
(*Illustrative*)
9ZC Cochran
9ZM Maxecon
9ZP Powermaster

9Az *By Propulsion Unit* (*For Petrol/Diesel Engine*)
9B *By Cooling method*
By Fluid
9B3 Oil
9B5 Water
9B8 Air

9BA *By Device*
9BF Radiator

9C *By Fuel injection system*
9C1 Direct
9C5 Metered port injection
9C7 Continuous port injection
9C7 Carburetted

9D *By Stroke distance* (in inches)
Note.—Add the given figure in inches to 9D *and read it as an integer.*
(*Illustrative*)
9E17=6 17·6 litres

9F *By Fuel tank capacity* (in gallons)
Note.—Correct the given figure to the tenth place, divide it by 10, *add the resulting figure to* 9F, *and read it as an integer.*
(*Illustrative*)
9F35 350 gal

9G *By Crankshaft speed*
Note.—Correct the given figure to the nearest 100, *divide it by* 100, *add the resulting figure to* 9G, *and read it as an integer.*
(*Illustrative*)
9G18 1800 rpm
9G32 3200 rpm

9Hz *By Cylinder arrangement*
9H In line
9H1 Horizontal
9H3 V-type
9H4 W-type
9HB Double bank

9J *By Bore diameter* (in inches)
Note.—Add the given figure to 9J, *and read it as an integer.*
(Illustrative)
9J8 8 in
9J10=5 10·5 in

9K *By Number of cylinders*
Note.—Add the given figure to 9K, *and read it as an integer.*
(*Illustrative*)
9K8 8 cylinders
9K16 16 cylinders

9L *By Cycle*
9L2 Two stroke
9L21 Single acting
9L22 Double acting
9L4 Four stroke

9M *By Compression ratio*
Note.—Add the given figure to 9M, *and read it as an integer.*
(Illustrative)
9N170 170 ft/lb

By Brake horse power
9P 1 to 99 bhp
Note.—Add the given figure to 9P, *and read it as an integer.*
(Illustrative)
9P34 34 bhp
9Q 100 to 999 bhp
Note.—Correct the given figure to the nearest ten, divide it by 10, *add the resulting figure to* 9Q, *and read it as an integer.*
(Illustrative)
9Q55 550 bhp
9R 1000 bhp and above
Note.—Correct the given figure to the nearest hundred, divide it by 100, *add the resulting figure to* 9R, *and read it as an integer.*
(Illustrative)
9R55 5500 bhp

By Method of power increase
9S Supercharged
9S1 With compressor
9S2 Differential
9S5 Turbo charging
9SA Gas turbine assisted
Note.—Correct the given figure for the bhp *of the gas turbine to the nearest hundred, divide it by* 100, *add the resulting figure to* 9SA, *and read it as an integer.*
(Illustrative)
9SA10 1000 bhp

By Number of engines
Note.—Add the given figure to 9Z, *and read it as an integer.*
(Illustrative)
9Z1 Single
9Z2 Two

9ZA *By Brand of engine*
Note.—To be derived by (AD).
(Illustrative)
9ZP Paxman
9ZR Rolls Royce

9A *By Gas turbine*
9B *By Cooling method*
9B2 Effusion
9B5 Liquid
9B6 Film
9B7 Cycle
9B8 Air

9C *By Number of compressor stage*
9C1 Single
9C1Z Multi-
9C2 Two
9C3 Three

9D *By Compressor type*
9D1 Centrifugal
9D2 Axial flow
9D4 Mixed flow

9E *By Kind of combustion chamber*
9E2 Can-type
9E5 Annular

9F *By Number of combustion chamber*
Note.—Add the given figure to 9F, *and read it as an integer.*
(Illustrative)
9F2 2
9F4 4

9H *By Number of turbine stage*
Note.—Add the given figure to 9H, *and read it as an integer.*
(Illustrative)
9H2 2-Stage
9H3 3-Stage

9J *By Shaft arrangement*

9J1	Single
9J2	Dual
9K	*By Cycle*
9K6	Closed
9K7	Semiclosed
9K8	Open
9M	*By Fuel*
9M1	Solid
9M11	Coal
9M12	Coal slurry
9M5	Liquid mixture
9M52	Gasolene
9M55	Kerosene
9M8	Gaeous fuel
9MB	Single
9MC	Dual
9MJ	Multi
9N	*By Speed* (rpm) *Note.—Correct the given figure to the nearest hundred, divide it by hundred, add the figure to* 9N, *and read it as an integer.* *(Illustrative)*
9N70	7000 rpm
9N85	8500 rpm
9P	*By Fuel capacity* (in lb) *Note.—Correct the given figure to the nearest thousand, divide it by* 1000, *add the figure to* 9P, *and read it as an integer.* *(Illustrative)*
9P75	7500 lb
9P82	8200 lb
9R	*By Brake horse power* *Note.—Correct the given figure to the nearest hundred, divide it by hundred, add the figure to* 9R, *and read it as an integer.* *(Illustrative)*
9R85	8,500 bhp
9R88	8,800 bhp
	By Method of power increase
9S	Supercharging
9S5	Turbo-fan
9ZA	*By Brand* *Note.—To be got by* (AD). *(Illustrative)*
9ZR	Rolls Royce
	By Arrangement of wheels *(For Diesel Engine)*
A	A1A
AA	A1A–A1A
B	B
BA	B–A1A
BB	B–B
C	C
COCO	CO–CO
CC	C–C
	(For Steam Locomotive)
	By Pilot wheel
A	0
B	2
C	4
D	6
E	8
F	10
G	12
	By Driving wheel *Note.—Use the given figure* *(Illustrative)*
2	2
4	4
	Note.—To construct the (IN) for wheel arrangement of a steam locomotive, add the given figure(s) for the driving wheels in between the (IN) for the other pairs of pilot wheels, and read it as an integer. *(Illustrative)*
B6A	2–6–0
B10A	2–10–0
C8=8C	4–8–8–4
K	Total adhesion
	By Tractive effort
M	*By Starting tractive effort* *Note.—Correct the given figure in lb to the nearest thousand, divide it by* 1000, *add the resulting figure to* M, *and read it as an integer* *(Illustrative)*
M62	62000 lb

By Continuous tractive effort, at speed (lb at mph)

P — Less than 1000 lb
Note 1.—Add the given figure to P, *and read it as an integer.*

Q — Above 1000 lb
Note 2.—Correct the given figure to the nearest thousand, divide by 1000, *add the resulting figure to* Q, *and read it as an integer.*
Note 3.—The number for the speed is to be constructed by adding the given figure in mph to the digit B (*eg* B12 for 12 mph). *The figure added is to be read as an integer.*
Note 4.—To construct the (IN) *for the Continuous tractive effort at a given speed, add the* (IN) *for speed constructed according to Note* 3, *to the* (IN) *constructed according to Notes* 1 *and* 2 *above, whichever is appropriate.*
(*Illustrative*)

P625B5=17 — 625 lb at 5·17 mph
Q38B12 — 38,000 lb at 12 mph
Q43B12=8 — 43,000 lb at 12·8 mph

R — *By Number of the gear*
R1 — First gear
R2 — Second gear
R3 — Third gear
R4 — Fourth gear

By Mean maximum speed (in mph)
T — Slow (1 to 20 mph)
U — Medium (21 to 40 mph)
V — High (41 to 100 mph)
W — Very high (above 100 mph)
Note.—Add the given figure to T, U, V *or* W *as the case may be, and read it as an integer.*
(*Illustrative*)

T18 — 18 mph
U35 — 35 mph
W120 — 120 mph
Note.—To construct the (IN) *for maximum speed in each gear, add to* R1, R2, R3 *or* R4, *as the case may be, the* (IN) *for the Mean Maximum speed.*
(*Illustrative*)

R1T15 — 15 mph on first gear
R2T35 — 35 mph on second gear
R4V95 — 95 mph on fourth gear

XB — *By Maximum radius of negotiable curve* (in feet)
Note.—Add the given figure to XB, *and read it as an integer.*
(*Illustrative*)

XB125 — 125 ft.
XB250 — 250 ft.
XD — *By Length*
XE — *By Width*
XF — *By Height*
Note.—(IN) *for a specific dimension is to be constructed by adding the given figures in* ft. *and in to* XD, XE, *or* XF *as the case may be and reading it as an integer.*
(*Illustrative*)

XD56=6 — 56 ft 6 in length
XE6=4 — 6 ft 4 in width
XF15=8 — 15 ft 8 in height

XH — *By Rail clearance*
Note.—Add the given figure in inches to XH, *and read it as an integer.*
(*Illustrative*)

XH8=5 — 8·5 in
XH9=2 — 9·2 in
XH9=8 — 9·8 in

Y — *By Wheel base*
YA — Rigid
YB — Truck
YC — Total
Note.—Add the given figure to YA, YB *or* YC, *as the case may be, and read it as an integer.*
(*Illustrative*)

YA7=6 7 ft 6 in, rigid wheel base
YB8=5 8 ft 5 in, truck wheel base
YC27=5 27 ft 5 in, total wheel base

Za *By Axle load*
Note.—Add the given figure in tonnes and cwt to Za, *and read it as an integer.*
(Illustrative)
Za14=15 14 tonnes 15 cwt
Za24 24 tonnes
Za31=6 31 tonnes 6 cwt

Zc *By Weight on drivers*
Note.—Add the given figure in tonnes and cwt to ZC, *and read it as an integer.*
(Illustrative)
Zc25 25 tonnes
Zc28=5 28 tonnes 5 cwt
Zc35=1 35 tonnes 1 cwt

ZdZ *By Weight of locomotive*
Ze Very light (less than 5 tonnes)
Zf Light (5 to 50 tonnes)
Zg Medium heavy (Over 50 tonnes and less than 200 tonnes)
Zh Heavy (Over 200 tonnes)
Note.—Add the given figure in tonnes and cwt to Ze, Zf, Zg *or* Zh, *as the case may be, and read it as an integer.*
(Illustrative)
Ze1=5 1 tonne 5 cwt
Zg165 165 tonnes
Zh210 210 tonnes

By Gauge of track
Zg Less than 2 ft
Zh 2 ft
Zj 2 ft 6 in
Zk 3 ft
Zm 3 ft 3·37 in
Zp 3 ft 6 in
Zr 4 ft 6 in
Zs 4 ft 8·5 in
Zt 5 ft 6 in
Note 1.—American standard gauge=4'8·5"
2 American narrow gauge=2'6" to 3·6"
3 European narrow gauge=3·281'

ZzA *By Mounting of engine*
Note.—The (IN) for brand of the mount to be derived by (AD).
(Illustrative)
ZzM Metalstik

By Number of bogies of loco
Z1 One
Z2 Two
Z3 Three

By Articulation
Z6 Non-articulated
Z7 Articulated

By Cab
By position
Z9b End
Z9d Centre

By Structure
Z9g Integral with loco frame
Z9j Independent borne

By Number
Z91 One
Z92 Two

ZA *By Environment*
By Latitude
ZC1 Tropical
ZC8 Polar

ZD *By Altitude*
Note.—Correct the figure in ft for the height to the nearest thousand divide it by 1000, *add the resulting figure after* ZD, *and read it as an integer.*
(Illustrative)
ZD10 10,000 ft

ZT *By resistance*
ZTB Gross
ZTD Inherent
ZTG Incidental
ZTJ Curve
ZTM Grade
ZTP Acceleration

By Purpose
By Entity transported

(c)	Freight(Goods)	(1)	*By Country of make*
(d)	Passenger		*Note.—To be* derived *by (GD).*
(d)1	Commuter		*(Illustrative)*
(f)	Shunting (Switching)	(44)	India
(g)	Industrial	(56)	Great Britain
(j)	Mixed duty	(73)	United States of America
	By Service line		
(m)	Main line	(A)	*By Brand*
(n)	Branch line		*Note.—To be derived by (AD).*
(p)	Underground (Subway)		*(Illustrative)*
	By Distance	(S)	Swindon
(t)	Short	(U)	Unilok
(v)	Long		

8 EXAMPLES

D9F4 LOCOMOTIVE PRODUCTION
D9F5 STEAM LOCOMOTIVE

D9F5,(44)-(c)-Zk-B8B;b7213:f STEAM LOCOMOTIVE, INDIAN MAKE, GOODS TRANSPORT, METRE GAUGE, 2-8-2 WHEEL ARRANGEMENT, RIDING STABILITY, INVESTIGATION

1 N55 STABILITY IN riding of 'YD' metre gauge locomotives. (Ind rail tech bul. 12;1955;508-10).

D9F5, (44)-(j)-Zk-Zf38=10=8-YB8-XF11=3-M14-B6B;b7211:f STEAM LOCOMOTIVE, INDIAN MAKE, MIXED DUTY, METRE GAUGE, 38 TONNES 10·8 CWT WEIGHT, 8'4" TRUCK WHEEL BASE, 11'3" HEIGHT, 14000 LB STARTING TRACTIVE EFFORT, 0-6-0 WHEEL ARRANGEMENT, LATERAL STABILITY, INVESTIGATION

2 N55 LATERAL STABILITY of M G Prototype YL (2-6-2) locomotives. (Ind rail tech bul. 12;1955;510-2).

D9F5,(53)-(m)-(d)-Zs-Zg160-YC32=10-V-M60-C8A-99b-98A-94 STEAM LOCOMOTIVE, FRENCH MAKE, MAIN LINE SERVICE, PASSENGER TRANSPORT, 4'8·5" GAUGE, 160 TONNES WEIGHT, 32'10" TOTAL WHEEL BASE, HIGH SPEED, 60000 LB STARTING TRACTIVE EFFORT, 4-8-0 WHEEL ARRANGEMENT, INSIDE CYLINDER, COMPOUND ENGINE, 4-CYLINDERS

3 N64 TUPLIN (W A). Ultimate steam locomotive (Paris-Orleans 4 cylinder compound 4-8-0). (Engineer. 218;1964;330-4).

D9F6 ELECTRIC LOCOMOTIVE

D9F6,(58)-(d)-v5-k;cT1:x3,1 ELECTRIC LOCOMOTIVE, RUSSIAN MAKE, PASSENGER TRANSPORT, RHEOSTAT BRAKE, NET WORK

4 N65 RAKOV (V A). Passenger electric locomotive with rheostat braking. (Elektr i toplovoz tiaga. 3;1965 Mar;22-6. (Power expr. 4;1965;123)

D9F6,(G)-(56)-(m)-(d)-ZD10-Zk-Za14=15-9k20 ELECTRIC LOCOMOTIVE, GENERAL ELECTRIC, BRITISH MAKE, MAIN LINE SERVICE, PASSENGER TRANSPORT, 10000 FT ALTITUDE, 3' GAUGE, 14 TONNES 15 CWT AXLE LOAD, 2020 HP ENGINE

5 N64 3-FT GAUGE LOCOMOTIVES for Colombia: Ten 2020 hp General Electric units with 14½ ton axle load for main line service upto nearly 10000 ft. (Rail gaz. 120;1964;930-1).

D9FB PETROL LOCOMOTIVE

D9FB,) f) -Zs-Ze2-T8-M7-9ZU-9P34-9H3-9G34-9F12-9B8-z9n 33 z9n62-z9m130-u5-k-aB1 PETROL LOCOMOTIVE, SHUNTING, 4'8·5" GAUGE, 2 TONNES WEIGHT, 8 MPH SPEED, 7000 LB STARTING TRACTIVE EFFORT, UNILOK ENGINE, 34 BHP, V-CYLINDER ARRANGEMENT, 34000 RPM, 12 LITRES DISPLACEMENT, AIR COOLED, 33: 1 REDUCTION RATIO ON THIRD GEAR, 32: 1 REDUCTION RATIO ON SECOND GEAR, 130: 1 REDUCTION RATIO ON FIRST GEAR, HUDRAULIC BRAKE, CROSS-TRACKING FACILITY, RETRACTABLE WHEEL

6 N65 CROSS TRACK loco: Unique light shunting loco powered by petrol engine. (Eng des and appl. 1,15;1965;18-9).

D9FC DIESEL-ELECTRIC LOCOMOTIVE

D9FC,9ZK-9S8(10)-9R20-zk-a46 DIESEL—ELECTRIC LOCOMOTIVE, LOCOMOTIVE, KLOCKNER-HUMBOLDT-DEUTZ ENGINE, 1000 BHP GAS TURBINE ASSISTED, 2000 BHP, ELECTRICAL TRANSMISSION, ELECTRICAL HEATING FACILITY

7 N65 TURBINE ASSISTED diesel loco. (Eng des and appl. 1,10;1965 July;20).

D9F6, (53)-(j)-Z2-Zg106-V80=7-AA-9ZS-9R26-9K12-9J8-9H3-9G11-9D11-99N2-99G1-zz8-zr-zk-a44 DIESEL-ELECTRIC LOCOMOTIVE, FRENCH MAKE, MIXED DUTY, 2 BOGIES, 106 TONNES WEIGHT, 80·7 MPH SPEED, A1A-A1A WHEEL ARRANGEMENT, SULZER ENGINE, 2650 BHP, 12 CYLINDERS, 8" BORE DIAMETER, V-CYLINDER ARRANGEMENT, 1050 RPM, 11" STROKE DISTANCE, 2 ELECTRIC MOTORS, AXLE MOUNTED, FORWARD AND REVERSE SPEED, AUTOMATIC ELECTRICAL TRANSMISSION, HEATING FACILITY WITH BOILER VAN

8 N63 FRENCH LOCOMOTIVE activities. (Oil eng and gas turb. 31;1963 July;26).

D9FC,(56)-Zs-Zg114-YC51=6-YB14 = 6-XF12=10-XE8=10-XD63=6-V95-Q3OB27-M55-COCO-9S8-j9R27-9L4-9K12-9J11-9HB-9H-9G8-9E266-9D14=4-9B5-99ZB-99T12-zZ3 = 9-zM51-zk DIESEL-ELECTRIC LOCOMOTIVE, BRITISH MAKE, 4'8·5" GAUGE, 114 TONNES WEIGHT, 51'6" TOTAL WHEEL BASE, 14'6" TRUCK WHEEL BASE, 12'10" HEIGHT, 8'10" WIDTH, 63'6" LENGTH, 95 MPH SPEED, 30,000 LB CONTINUOUS TRACTIVE EFFORT AT 27 MPH, 55,000 LB STARTING TRACTIVE EFFORT, Co-Co WHEEL ARRANGEMENT, GAS TURBINE ASSISTED DIESEL ENGINE, 2750 BHP, 4 STROKE, 12 CYLINDERS, 11" BORE, DOUBLE BANK-IN LINE.ARRANGEMENT, 800 RPM, 266 LITRES DISPLACEMENT, 14'4" STROKE DISTANCE, WATER COOLED, BRUSH ELECTRIC MOTOR, 12000 RPM GENERATOR SPEED, 3'9" DRIVING WHEEL DIAMETER, ELECTRICAL TRANSMISSION

9 N64 BRITISH RAILWAYS standard type 4 locomotive. (Oil eng and gas turb. 31;1964 Feb;28-9).

D9FC,(73)-Z91-Zh272-XF16= 6-XC83 = 6-V70-9ZG-9Z2-9R50-9K16-9H3-zk-v7—DIESEL ELECTRIC LOCOMOTIVE, AMERICAN MAKE, SINGLE CAB, 272 TONNES WEIGHT, 16'6" HEIGHT, 83'6" OVERALL LENGTH, 70 MPH SPEED, G E ENGINE, 2 UNITS, 5000 BHP, 16 CYLINDERS, V-CYLINDER ARRANGEMENT, PRESSURISED ELECTRICAL CONTROL

10 N63 A 5000 HP American diesel-electric lomomotive. (Oil eng and gas turb. 31;1963 July;27).

D9FD DIESEL-HYDRAULIC LOCOMOTIVE

D9FD, BB-9ZN-9R11-9L4-9K12-9G15-u-m73=84-zj DIESEL-HYDRAULIC LOCOMOTIVE, B-B WHEEL ARRANGEMENT, NBI-MAN DIESEL ENGINE, 1100 BHP, 4 STROKE, 12 CYLINDERS, 1500 RPM-PNEUMATIC BRAKE, 73·84% BRAKING FORCE, HYDRAULIC TRANS, MISSION

11 N62 ELL (S O). Recent developments in diesel rail traction. (Dies Eng Users Assoc, 1962 July).

D9FD,(56)-ZzM-YB30-T18-M20-A4A-9ZR-9S-9Q30-9K8-9G18-9G1-z9E-z9A-zzR-zz8-zj-zf2-zd3-zb6-r5-q6-p6-k DIESEL-HYDRAULIC LOCOMOTIVE, BRITISH MAKE, METALASTIK MOUNTING, 30 TONNES WEIGHT, 18 MPH SPEED, 20160 LB STARTING TRACTIVE EFFORT, 0-4-0 WHEEL ARRANGEMENT, ROLLS ROYCE ENGINE, SUPERCHARGED, 307 BHP, 8 CYLINDERS, 18000 RPM, DIRECT FUEL INJECTION, AXLE-MOUNTED GEAR, GEAR CHANGE IN STATIONARY POSITION, ROLLS ROYCE TRANSMISSION SYSTEM, FORWARD AND REVERSE SPEED, HYDRAULIC TRANSMISSION, TWIN-DISC CLUTCH, 3-STAGE, TORQUE CONVERTER, HIGH COOLANT TEMPERATURE WARNING SYSTEM, AUTOMATIC SHUT DOWN FOR LOW LUBRICATING OIL LEVEL, AUTOMATIC CONTROL OF OVER-SPEED

12 N65 ROLLS-ROYCE POWERED locomotives for Ceylon. (Eng des and appl. 1,5;1965;20).

D9FD,(56)-(f)Z-9d-Zf48—T12=5-M33-9ZR-9S-9Q31-9G18-9K8-9C1-9BF25-9ZE-zzR-zz8-zj-zg1H-zf2-zd3-zb6-u-n1-a5B24 DIESEL-HYDRAULIC LOCOMOTIVE, BRITISH MAKE, SHUNTING, CENTRE CAB, 48 TONNES WEIGHT, 12·5 MPH SPEED, 33000 STARTING TRACTIVE EFFORT, ROLLS ROYCE ENGINE, SUPERCHARGED, 311 BHP, 18000 RPM SPEED, 8 CYLINDERS, DIRECT FUEL INJECTION, SERCK RADIATOR COOLER, AXLEMOUNTED GEAR BOX, ROLLS ROYCE TRANSMISSION SYSTEM, FORWARD AND REVERSE SPEED, HYDRAULIC TRANSMISSION, HARDY SPICER CARDAN SHAFT TYPE, TWIN-DISC, 3-STAGE, TORQUE CONVERTER, PNEUMATIC DRUM BRAKE, 24-VOLT LIGHTING

13 N64 DIESEL HYDRAULIC locos for CEGB. (Oil eng and gas turb. 32; 1964 July;53).

D9FD,(56)-(g)-Zt-Zf44-YB9=6-XB165-U23=27-M33-A6A-9ZP-9Q40-9K12-9H3-9B8-9G18—zA3=9-zj DIESEL-HYDRAULIC LOCOMOTIVE, BRITISH MAKE, INDUSTRIAL PURPOSE, 5′ 6″ GAUGE, 44 TONNES WEIGHT, 9′ 6″ TRUCK WHEEL BASE, 165′ RADIUS OF NEGOTIABLE CURVE, 23·27 MPH SPEED, 33210 LB STARTING TRACTIVE EFFORT, 0-6-0 WHEEL ARRANGEMENT, PAXMAN ENGINE, 40 BHP, 12 CYLINDERS, V-CYLINDER ARRANGEMENT, 1800 RPM, AIR-COOLED, 3′ 9″ DRIVING WHEEL DIAMETER, HYDRAULIC TRANSMISSION

14 N63 SERVING THE National Coal Board. (Oil eng and gas turb. 31; 358;1963;33).

D9FD,(56)—(g)-(f)-Zk-Zf2b-YA5=9-XF10=10-XE3-XD14=2-U25-A4A-9ZRU-9Q20-9G18-zZ3 = 5-z9E-z9j16=113-zj-zf2-u8W DIESEL-HYDRAULIC LOCOMOTIVE, BRITISH MAKE, INDUSTRIAL PURPOSE, SHUNTING, 3′ GAUGE, 26 TONNES WEIGHT, 5′ 9″ RIGID WHEEL BASE, 10′10″ HEIGHT, 3′ WIDTH, 14′2″ LENGTH OVER BUFFER, 25 MPH SPEED, 0-4·0 WHEEL ARRANGEMENT, RUSTON ENGINE, 200 BHP, 1800 RPM, 3′5″ DRIVING WHEEL DIAMETER, AXLE-MOUNTED GEAR, 16·113:1 GEAR REDUCTION RATIO, HYDRAULIC TRANSMISSION, TWIN-DISC CLUTCH, WESTINGHOUSE AIR-BRAKE

15 N64 INDUSTRIAL SHUNTING locomotive. (Oil eng and gas turb. 32; 1964 May; 30).

D9FD, (563)-(f)-ZzM-Zt-YB7-XF12 = 4-XE9 = 3-XD40-U20-Q34B3 - BB-9ZR-9Z1-9S-9Q31-9K8-9J5 = 125-9G18-9F20 - 9E12 = 17-9D6-9C1-zZ3 = 7-zzR-zg5-zf2-zd3-zb8 DIESEL HYDRAULIC LOCOMOTIVE, SCOTISH MAKE, SHUNTING, METALASTIK MOUNTING, 5'6" GAUGE, 20 MPH SPEED, 7' TRUCK WHEEL BASE, 12'4" HEIGHT, 9'3" WIDTH, 40' LENGTH 3400 LB CONTINUOUS TRACTIVE EFFORT AT 3 MPH, B-B WHEEL ARRANGEMENT ROLLS ROYCE ENGINE, 2-UNITS, SUPERCHARGED, 311 BHP, 8-CYLINDER, 5·125" BORE, 1800 RPM, 200 GALLONS FUEL TANK CAPACITY, 12·17 LITRES DISPLACEMENT, 6" STROKE, DIRECT FUEL INJECTION, 3'7" DRIVING WHEEL DIAMETER, ROLLS ROYCE TRANSMISSION HYDROMECHANICAL TRANSMISSION, TWIN-DISC CLUTCH, 3-STAGE, SYSTEM, TORQUE CONVERTER COUPLING.

16 N63 SCOTTISH-BUILT SHUNTING locomotives for Colombo. (Oil eng and gas turb. 31,356;1963;36-7).

D9FD, (S)-(f)-Zs-Zf37-YA6-XH8-XF10=10=105-XE8=6-SD21 = 5-XC24 = 6 =75-T17-M23-A4A·9ZR-9Q25-9K8-9J5 =125-9G18-9F35-9E16 = 25-9D6-z9C-z9a5 = 2-zzR-zz8-zj - zf2-zb8 DIESEL-HYDRAULIC LOCOMOTIVE, SENTINEL, SHUNTING, 4'8·5" GAUGE, 37 TONNES WEIGHT, 6' RIGID WHEEL BASE, 8" RAIL CLEARANCE, 10'10·5" HEIGHT, 8'6" WIDTH, 21'5" LENGTH 24'6·75" OVERALL LENGTH, 17 MPH SPEED, 23170 LB STARTING TRACTIVE EFFORT, 0-4-0 WHEEL ARRANGEMENT, ROLLS ROYCE ENGINE, 250 BHP, 8 CYLINDERS, 5·152" BORE DIAMETER, 1800 RPM, 350-GALLONS FUEL TANK CAPACITY, 16·25 LITRES DISPLACEMENT, 6" STROKE DISTANCE, SELF-CHANGING GEAR, 5·21 : 1 STALL TORQUE RATIO, ROLLS ROYCE TRANSMISSION SYSTEM, FORWARD AND REVERSE SPEED, HYDAULIC TRANSMISSION, TWIN-DISC CLUTCH, TORQUE CONVERTER COUPLING.

17 N63 CONVERSION OF ironworks shunter fleet. (Oil eng and gas turb. 31;1963 Sep;33).

D9FD,(Sl)-(g)-Zh-Ze1 =25-XF3 = 11-XE2 = 11-XD5 = 3-P625B5 = 17-9ZL-9P10-9G20-9B8-zz81-zj-z061-n1 DIESEL-HYDRAULIC. LOCOMOTIVE, SIMPLEX, INDUSTRIAL PURPOSE, 2' GAUGE, 1 TONNE 25 CWT WEIGHT, 3'11" HEIGHT, 2'11" WIDTH, 5'3" LENGTH ER, 625 LB STARTING TRACTIVE EFFORT AT 5-17 MPH, LISTER ENGINE, 10 BHP, 2000 RPM, AIR-COOLED, ONE FORWARD AND REVERSE SPEED, HYDRAULIC TRANSMISSION, BATTERY STARTING, INTERNAL SHOE BRAKE.

18 N63 NEW SIMPLEX locomotive. (Oil and gas turb. 31;1963 July;27).

D9FD, (SW)-Z9d-ZzM-Zs-Zg5l-YG15=6-XE8=25-XC34=6-U40-Q27B5=6-M31-A6A-9ZV-9Q65-9K6-9J7 = 5-9H3-9G15-9F34-9D8 = 5-9BF25-zZ4-zj1H-f-a55W DIESEL-HYDRAULIC LOCOMOTIVE, SWINDON, CENTRE CAB, METALASLIK MOUNTING, 4'8·5" GAUGE, 51 TONNES 15 CWT WEIGHT, 15'6" TOTAL WHEEL BASE, 8'2·25" WIDTH, 34'6" OVERALL LENGTH, 40 MPH SPEED, 27000 LB CONTINUOUS TRACTIVE EFFORT AT 5·6 MPH, 31000 STARTING TRACTIVE EFFORT, 0-6-0 WHEEL ARRANGEMENT, VENTURA ENGINE, 650 BHP, 6 CYLINDERS, 7·5" BORE V-CYLINDER ARRANGEMENT, 1500 RPM SPEED, 340 GALLONS FUEL TANK CAPACITY, 8'5" STROKE DISTANCE, SERCK RADIATOR COOLER, 4' DRIVING WHEEL

DIAMETER, HARDY SPICER CARDAN SHAFT HYDRAULIC TRANSMISSION, HYDRAULIC GOVERNOR, WESTINGHOUSE COMPRESSOR ASSISTED LIGHTING

19 N64 SWINDON-BUILD PAXMAN-POWERED type 1 loco. (Oil eng and gas turb. 32;1964 Sep;31-2).

D9FD (T)-(54)-Zf-W120—224-9ZM-9Z2-9S5-9R12-9K12-9G15-9BF3B-z9B—zzM-zz82-zg5-a56 DIESEL-HYDRAULIC LOCOMOTIVE, TALGO, SPANISH MAKE, 120 TO 224 MPH SPEED, MAYBACK ENGINE, 2 UNITS, TURBOCHARGED, 12000 BHP, 12 CYLINDERS, 1500 RPM, BEHR V-FORM RADIATOR COOLER, GEAR CHANGE IN MOTION, MEKHYDRO TRANSMISSION, TWO FORWARD AND TWO REVERSE SPEEDS, HYDROMECHANICAL TRANSMISSION, COLD START PREVENTED BY ELECTRICAL HEATING

20 N65 MORE TALGO trains. (gas and oil pow, 61; 1965; 80).

D9FF STEAM TURBINE LOCOMOTIVE

D9FF,(73)-(d)-Zs-Zh259-YC53-YB19 = 6-YA13=6-M71-9P85-zZA5=8-z9j18=5-zk STEAM TURBINE LOCOMOTIVE, AMERICAN MAKE, PASSENGER TRANSPORT, 488·5" GAUGE, 259 TONNES WEIGHT, 53' TOTAL WHEEL BASE, 19' 6" TRUCK WHEEL BASE, 13' 6" RIGID, WHEEL BASE, 71000 LB STARTING TRACTIVE EFFORT, 85000 LB FUEL CAPACITY, 5" 8" DRIVING WHEEL DIAMETER, 18·5:1 gear reduction RATIO, ELECTRICAL TRANSMISSION

21 N45 AMERICAN GEARED turbine steam locomotive. (Engineer. 180; 1945; 466-9).

D9FF,(73)-(d)-Z2-Zh23n-YA13=4-XF15-XE10=8=75-XC90=10-V95-zZA3=8-zk-v STEAM TURBINE LOCOMOTIVE, AMERICAN MAKE, PASSENGER TRANSPORT, 2 BOGIES, 236 TONNES WEIGHT, 13' 4" RIGID WHEEL BASE, 15' HEIGHT, 10' 8·75" WIDTH, 90' 10" OVERALL LENGTH, 95 MPH SPEED, 3'·8" DRIVING WHEEL DIAMETER. ELECTRICAL TRANSMISSION, AUTOMATIC CONTROL

22 N39 AMERICAN TURBO-ELECTRIC locomotive. (Engineer. 167; 1939; 286-8).

D9FJ GAS TURBINE LOCOMOTIVE

D9FJ, (B)-(d)-Z92-Z2-Zs-Zg115-XF13 = 4-XC63-V90-Q32B21-M12B64-AA-9R25-4-zZ4-zk-x-u8-b1 GAS TURBINE LOCOMOTIVE, BROWN-BOVERI, PASSENGER TRANSPORT, 2 END CABS, TWO BOGIES, 4' 8·5" GAUGE, 115 TONNES WEIGHT, 13' 4" HEIGHT, 63' OVERALL LENGTH, 90 MPH SPEED, 3200 LB STARTING TRACTIVE EFFORT 21 MPH, 12000 LB CONTINUOUS TRACTIVE EFFORT AT 64 MPH, AIA-AIA, 25000 HP GAS TURBINE, 4 DRIVING AXLES, 4' 1½" DIAMETER DRIVING WHEEL, ELECTRICAL TRANSMISSION, AUTOMATIC CONTROL, AIR-BRAKE SYSTEM

23 N50 BRITISH RAILWAYS gas turbine locomotive No 18·000·1 (Engineer. 189;1950;608-10).

D9FJ,(M)-(j)-Z92-Z9b-Z2-Zg120-YC53-XF12=10-XE9-XD66=8-V90-Q29-M60-9R350-9N70-99M1-6-zk GAS TURBINE LOCOMOTIVE, METROPOLITAN-VICKERS, MIXED DUTY, 2 END CABS, TWO BOGIES, 120 TONNES WEIGHT, 53' TOTAL WHEEL BASE, 12' 10" HEIGHT, 9' WIDTH, 66' 8" LENGTH, 90 MPH SPEED, 29,000 LB CONTINUOUS TRACTIVE EFFORT, 60,000 LB STARTING TRACTIVE EFFORT, 35,000 HP GAS TURBINE, 7000 RPM, AXLE-MOUNTED MOTORS, 6 DRIVING AXLES ELECTRICAL TRANSMISSION

24 N49 GAS TURBINE locomotives for British railways: Metropolitan-Vickers gas turbine locomotive. (Engineer. 187; 1949;25-6).

81 Feature Headings

811 In the examples in Sec 8, the Feature Headings are rendered according to the method adopted in the depth schedule for Medical Radiology [20]—that is, all the terms for each of the sought upper links are given in the Feature Heading for the last link. It is felt that the reader will find such a Feature Heading more helpful [5].

812 As each subject is analysed in depth, there will be a link for each of the concepts dealt with. It will be noted that in the example the average number of terms in the last link of the Feature Headings is 20.

813 The reader gets a fairly complete idea about the contents of each document even as he looks through the Feature Headings. This facilitates in pinpointedly choosing the documents which he would like to peruse.

814 This obviously will have an influence on the preparation and presentation of abstracts, and their relation to classification of subjects.

815 These questions are being examined and will be reported upon in due course.

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9 Sec 245 *ibid.* (V 7; P 572).

10 Sec 21 *ibid.* (V 8; P 3).

11 Sec 22 *ibid.* (V 8; P 5).

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