

7N1

INDEX

The Engineer.

VOL. LXIII.—FROM JANUARY TO JUNE, 1887.



No 435a

London:

OFFICE FOR PUBLICATION AND ADVERTISEMENTS, 163, STRAND, W.C.

xxx
834/16



J. IV. 1 / 1887 / I

J. IV. 1 J. 126.

INDEX.

Illustrations.

List of Names.

- ADAMSON'S Spring Bollards, 165
 Algoa Bay, Cape Colony, Harbour Works in, 338
 Allen's Portable Pneumatic Rivetting Machine, 35
 American Ammonia Refrigerating Machine, Messrs. Wood and Shipley, 89, 90, 91
 American Anthropological Society of Washington, Archaeological Threshing Implement from Tunis, 436
 American *Engineering News*, Centre-bearing Rail, Fig. A, Side-bearing Rail, Fig. B, 472
 American Feed-water Regulator, 482
 Appleby Bros., Messrs., Twenty Ton Floating Crane, 327
 Applegarth's, Mr. R., Electric Lamp for Divers, Newcastle Exhibition, 453
 Appold Pump, Curved Arms of the, Fig. 5, 286
 Armstrong 110½-Ton Gun, as Mounted in the Turret of the Victoria, Figs. 1 and 2, Newcastle Exhibition, 368
 Armstrong and Co., Messrs. Sir W., 6in. Breech-loading Gun, on Disappearing Carriage, Newcastle Exhibition, 372
 Athus Iron and Steel Works, Belgium, Centrifugal Machine for Reducing Dolomite, Mr. J. L. Marie, 503
 Athus Iron and Steel Works, Locomotive, 503
 Athus Iron and Steel Works, Plan of Lining Repair Department, 503
 Athus Iron and Steel Works, Method for Temporarily Supporting Converter Lining, 504
 Atkinson, Mr. James, Gas Engine, 361, 380
 Atkinson, Mr. James, Gas Engine, Diagram Showing Action of, 361
 Atlantic Steamers, Compound Engines for, 471

 B.B. and C.I. Railway, Drilling Machine, Messrs. G. Booth and Co., 312
 Bailey's "Deadlock" Fastening for Wheels and Axles, Newcastle Exhibition, 454
 Ball, Mr. Joseph, Laddering a Tall Chimney, 435
 Barker's Tramway Rail, 218
 Barr and Langley, Messrs., Railway Points, 164
 Barry Dock and Railways, near Cardiff, The, Mr. J. W. Barry, Mr. T. Forster Brown, Mr. H. M. Brunel, 165
 Baume and Co., Messrs., Stop Watches and Chronographs, Fig. 5, 267
 Belgian State Railways, Locomotives on the, 278, 294, 313
 Bell Bros., Messrs., Coal Wedge, Newcastle Exhibition, 383
 Beloe, Mr. C. H., Steam Tubular Lifeboat, 69
 "Bentnick," s.s., General Arrangement of Engines and Boilers, 288
 "Bentnick," s.s., Indicator Diagrams, 287
 Bentley-Knight Electric Railway System, 68
 Berrier-Fontaine, M. Marc, Hydraulic Drilling Machinery, 360
 Berry and Sons, Messrs., Large Horizontal Plate Bending Machine, 401
 Berthon Pontoon Bridge, The, 259
 Bertram and Sons, Messrs. John, Upright Turret Pulley and Wheel-boring Machine, 502
 Berlin, Metropolitan Railway of, 250, 254
 Berlin, Metropolitan Railway of, Alexander Platz Station, 254
 Biles, Mr. J. H., on Belted and Internally Protected Cruisers, 268
 Birmingham and Derby Junction Railway, Locomotive Engine, Messrs. J. P. Mather, Dixon, and Co., 6
 Birmingham Steam Tramways, General Plan, 218
 Black Rock Colliery, Ynysbwl, Winding Drum, 190
 Black Rock Colliery, Ynysbwl, Lady Windsor Pit, Winding Engines and Steel Drum, Messrs. Daglish and Co., 190
 Bombay, Great Indian Peninsular Railway Workshops, Plan of, 404
 Booth and Co., Messrs., Large Boiler Shell Drilling Machine, 502
 Booth and Co., Messrs. G., Radial Drilling Machine, 176
 Boston, Breakage of the 16in. Steel Shaft of the, 200
 Boston and Providence Railway, Bridge on the, 247
 Bradford Waterworks, Large Sluice Valves, Messrs. Blakeborough and Sons, 95
 Bristol Corporation and the West Indies, Dredgers for, Messrs. W. Simons and Co. (*Supplement, January 7th, 1887*), 23, 24, 55
 Brown, Mr. C., Centrifugal Pump Blade, Fig. 6, 423
 Brown, Marshalls, and Co., Messrs., Hotel Saloon Carriages, 143
 Buckton and Co., Messrs., Double Cutter Planing Machine, 271
 Burma State Railways, Bridge Pier Work, Mandalay Extension, 435
 Burrell and Co., Messrs. C., Traction Engine and Crane Combined, 483
 Burton-on-Trent Sewage Works, Pumping Engines, Messrs. Gimson and Co., 146
 CAIL, Messrs., Water-raising Machines, 227
 Cameron, Mr., Piston-packing, Newcastle Exhibition, 453
 Campbell, Mr. J. Jennings, on Compound Engines for Atlantic Steamers—Combined Diagrams from Compound Engines, 448
 Caré's Boiling-water Pump, 417
 "Celtic" and the "Britannic," The Collision between the, 482
 "Chemcheck," The Steam Yacht, Messrs. Miller, Tupp, and Rowse, 214
 Cochran and Co., Messrs., Water-tight Bunker-doors, 35
 Comet, The, 1885, Newcastle and Carlisle Railway, 154
 Cook and Sons, Messrs. Joseph, Four-deck Steel Cage, Newcastle Exhibition, 454
 Cooper's Turret Lathe for Brass-finishing, Manchester Exhibition, 347
 Cowling, Welch, and Parker-Smith, Messrs., Interchangeable Automatic Continuous Brake, 134
 DE LAVAL'S Cream Separator, The Dairy Supply Company, Agents of the Laval Co., 306
 Dennis Fullway Valve, The, Mr. A. G. Mumford, 238
 "Dolphin," Compound Engines of the Dredger, Messrs. Simons and Co., 23, 24, 55
 "Dolphin" Donkey Pump, The, Messrs. Miller, Tupp, and Rowse, 230
 Douglas, Mr. G. C., Explosion of Heterogeneous Mixtures of Coal, Gas, and Air. Diagrams, 308
 Dutch Screw Pump for Drainage Work, Fig. 3A, 285
 EDDINGTON and Stevenson, Messrs., Traction Engine, 47
 Eddington and Stevenson, Messrs., Water Gauge, 176
 Edge, Mr. C. A., Tramway Point, 218
 Egypt, Cotton Pressing in, Bale Ties, Figs. 3, 4, 5, 6; 511
 Egypt, Cotton Pressing in, Compound Steam and Hydraulic Presses, Messrs. Turner and Lewis, 491, 511
 Egypt, Cotton Pressing in, Horizontal Direct-acting Hydraulic-power Pumps, Mr. B. Stock, 510
 Egypt, Cotton Pressing in, Improved Baling Hoop Punching Machine, Fig. 7; 511
 Egypt, Irrigation in, Works at Afteh, 57
 "El Destructor," Torpedo Cruiser, Messrs. J. and G. Thomson, 26, 27
 Elephant Sectional Gun, Fig. 7, Newcastle Exhibition, 369
 Elswick Guns for H.M.S. "Benbow," The New 110½-ton, 106
 Entwistle and Kenyon, Messrs., Rapid Action Screw Vice, 470
 Ewbank Vice, The, 470
 FARNLEY Flue, The, Newcastle Exhibition, 411
 Fenland, Scoop-wheels in the, 225
 Fielding and Platt, Messrs., Duplex Pumping Engine, Newcastle Exhibition, 454
 Folkestone: New Promenade Pier, Folkestone, Mr. M. N. Ridley, 416, 418, 420
 Fontaine's Hydraulic Drilling Machinery, 360
 Forth Bridge, Elevation of, New Queensferry Pier, 112
 Forth Bridge, The New Queensferry Cantilever Pier in course of Construction, Sir John Fowler and Mr. Benjamin Baker (*Supplement, Feb. 4th, 1887*)
 Forth Bridge, Pier Tube Rivetting Cage, Sir John Fowler and Mr. E. Baker, 194
 Forth Bridge, Pivoted Girder and Cage, 192
 Fothergill's Valve, Newcastle Exhibition, Figs. 1, 2, 410
 Fox, Mr. W., Wave Line Steel Tire Bars, Saltaire Exhibition, Fig. 4, 395
 Fox's Patent Corrugated Tire, Newcastle Exhibition, 453
 GANGES, Railway Ferry over the, 198, 199
 Garrett and Sons, Messrs. Richard, Feed-heater, Newcastle Exhibition, 411
 German Army Magazine Rifle, The, 251
 Golay, Mr. C. H., Chronograph, Fig. 4, 267
 Goodwin and How, Messrs., Clip for Railway Chairs, Newcastle Exhibition, 455
 Gowan's Tramway Rail, 218
 Grange Iron Co., The, Double-acting Horizontal Mine Pump, Newcastle Exhibition, 456
 Grange Iron Co., The, High-speed Horizontal Engine, Figs. 3 and 4, Newcastle Exhibition, 461
 Grange Iron Co., The, Overwinding Gear for Mines, Newcastle Exhibition, 455
 Grange Iron Co., The, Self-contained Underground Hauling Engine, Newcastle Exhibition, Figs. 1 and 2, 461
 Grantham Crank and Iron Co., Combustion Chamber, Vertical Multitubular Boiler, 198
 Grimshaw, Mr. J., Stamped Goods, Saltaire Exhibition, Fig. 7, 395
 Günther, Mr. W., Turbines, Manchester Exhibition, 486
 Gwynne, Messrs. J. and H., Centrifugal Pump, Figs. 3 and 4, 285
 HADFIELD Mills, Electric Light Engines, Messrs. Mather and Platt, 147
 Hamilton, Mr. Tighe, Bevel-wheel Cutting Machine, Messrs. Smith and Coventry, Manchester Exhibition, 345
 Hammersmith Bridge, The New, Sir J. Bazalgette and Mr. Edw. Bazalgette (*Supplement, April 22nd, 1887*), 309
 Hammersmith Bridge, Details of Pier Foundations, Chains, and Anchorage, Sir Joseph Bazalgette and Mr. Edw. Bazalgette, 392
 Hammersmith Bridge, Chain Saddles and Anchorage, 331
 Hammersmith Bridge, Detail Construction of Towers and Roadway Suspension Connectors, 393
 Hammersmith Bridge, Details of Towers, 330
 Hanover Railway, Germany, Compound Engine, Mr. Von Borries, 210, 211
 Haswell's Patent Mechanical Coal Getter, Newcastle Exhibition, 456
 Hawthorn, Leslie, and Co., Messrs. R. and W., Six-coupled Locomotive for 3ft. 6in. Gauge, Newcastle Exhibition, 464
 Hendon Sewerage and Sewage Works, Messrs. Edward Cousins and Son, 353, 354
 Hering, Mr. Rudolph, Adaptation of Field's Annular Syphon, 509
 Hodge and Co., Messrs., Exhausting and Blowing Fans, 279
 Houses of Parliament, Main Drain of the, 86
 Howard's New Sleepers, Saltaire Exhibition, Figs. 2 and 3, 395
 Howard and Bullough Bend, Cotton Machinery at the Manchester Exhibition, 489
 Hunt's Duplex Stone Moulding and Dressing Machine, 340
 Hyde Park Foundry Company, A Large Casting, 279
 INDIAN State Railways, Permanent Way for, 157
 Indian State Railways, Six-horse Engines and Pumps for, 168, 169
 Indian State Railways, Workshop Roofs for, 413
 Italian Cruiser "Dogali," The, 460
 JAMESON Coking Oven, Improved, Newcastle Exhibition, 383, 453
 Jameson's Gauge for Measuring Gases, Newcastle Exhibition, 383, 453
 Java, River Steamer for, Messrs. J. Birch and Co., 177
 "Jubilee," The Steel Tug, Messrs. Steward and Latham, 457, 460
 Johnson, Mr. S. W., Midland Passenger Engine-crank, Fig. 1, Saltaire Exhibition, 395
 KING, Mr. J. H., Compound Engine, 468
 King and Humble, Messrs., Safety Colliery Hook, 55
 Kurrachee Harbour Works, Wharf Extension, 43, 299
 Kurrachee, Screw Pile Wharf at, 43
 LANGDON and Wade, Messrs., Excentric Grip Lever, 290
 Lee, Mr. J., "Clip Draught" Furnace, 55
 Lee and Hunt, Messrs., Sawing Machine, Manchester Exhibition, 345
 Lees, Mr. Wm. T., Repairing Tanks and Reservoirs, 417
 Linnington, Mr. E. A., on High-speed Twin-screws, Diagrams, 292
 Little, Mr. J., Anti-friction Conveyor, 116
 Liverpool Water Supply, Map of Intended Lake Vyrnwy, Mr. Thos. Hawkesley and Mr. G. F. Deacon, 34, 65, 66
 Liverpool Water Supply and the Vyrnwy Lake Masonry Dam, Bridge over the River Eumant, 66
 London and Brighton Railway, Crank Axles, Mr. W. Stroudley, 176
 London Sewerage, New Precipitation Works at Barking, Sir Joseph W. Bazalgette, 84, 85, 108
 Lowmoor Company, The, Wrought Iron Dome, Saltaire Exhibition, Fig. 5, 395
 "MANAUENSE," S.S., Compound Engines, Details, Messrs. Rolls and Sons (*Supplement, May 20th, 1887*), 397
 "Manauense," s.s., Indicator Diagrams, 394
 Manchester Exhibition Buildings, Messrs. Maxwell and Tuke, 351
 Manchester Exhibition Buildings, Details of Dome, Messrs. Maxwell and Tuke, 346
 Marks' Patent Self-sustaining Hoist and Crab, The, Exhibited by Messrs. Tangye, The Manchester Exhibition, 442
 Masnedund, Swing Bridge over, between Falster and Seeland, Denmark, 171, 172
 Mather and Platt, Messrs., Electric Light Engines, Manchester Exhibition, 389, 438
 Mechnernich Mines, Hydraulic Separators at the, 238
 Miller's Patent Strainer, Newcastle Exhibition, 410
 Morison, Mr., on Mr. Wylie's Paper on Triple Expansion Engines, Diagrams, 110, 111, 145
 Mouglin Disappearing Turret, The, 109
 Mumford and Moodie, Messrs., Blast and Exhaust Separator, 310
 Murphy, Mr. T., Check Valve and Plug Cock, 46
 NEW and Co., Messrs. D., Beam-bending and Punching Machine, 231
 Newcastle Exhibition, 30-pounder Rapid-fire Breech-loading Gun, Figs. 5, 6, 369
 Newport Mills, Middlesbrough, Rolling Mill Engine, Mr. J. Head, Manchester Exhibition, 349, 352
 Newcastle Exhibition, New 30-pounder Quick-firing Gun, Fig. 9, 368
 Nicaragua, Light Draught Twin-screw Vessel for, Messrs. Edwards and Symes, 27
 Nicholson, Mr. C. J., Buffer Coupling, 219
 Nicholson, Mr. C. J., Movable Points, 219
 Noble, Captain Andrew, Illustration of the Progress in Gun Construction, 367
 Nordenfelt, The Submarine Boat, 499
 Nordenfelt Submarine Boat for Turkey, 105
 Normandy and Brittany, s.s., Feathering Paddle Wheels, Mr. W. Stroudley, 427
 North-Eastern Railway, Compound Express Engine, Mr. T. W. Worsdell, 57
 North-Eastern Railway, Compound Goods Engine, Mr. T. W. Worsdell (*Supplement, February 18th, 1887*), 155
 North-Eastern Railway, Compound Goods Engine Tender, Mr. T. W. Worsdell, 128
 North-Eastern Railway, Compound Goods Locomotive, Mr. T. W. Worsdell, 30
 North-Eastern Railway, Compound Passenger Engine, Mr. T. W. Worsdell (*Supplement June 3rd, 1887*)
 North Sea and Baltic Canal, The, 479
 OLIVER, Thos. W., Painted and Tarred Ropes Tested for, by Lloyd's Proving House, 319
 "Oroya," s.s., Boilers of the, The Barrow Shipbuilding Company, 290
 "Oroya," s.s., Cross Sections through Boiler and Engine Rooms, The Barrow Shipbuilding Company, 234
 "Oroya," s.s., Pacific Steam Navigation Company's Royal Mail Steamer, The Barrow Shipbuilding Company (*Supplement, March 25th, 1887*), 251, 290
 "Oroya," s.s., Triple Expansion Engines of the, The Barrow Shipbuilding Company (*Supplement, May 6th, 1887*), 357, 358
 Osgood Excavators, The, 3
 Otto Gas Engine, Dynamo mounted on 4-horse, Newcastle Exhibition, 409
 Oury, M., Steel Chains without Welding, 179
 PANAMA and Panama Canal Route, Map of the Isthmus of, 318
 Paris Exhibition, 1889, Roof of the Great Machinery Hall, 375ft. Span, 469, 506
 Paris, Lyons, and Mediterranean Railway Works, Oullins, Travelling Crane, 334
 Partington and Co., Messrs., Step Cone Fire-box, 210
 Pasquier's Safety Stop Valve, 46
 Peckett and Sons, Messrs., Contractors' Locomotive, 191
 Pedrick and Ayer, Messrs., Lathe Boring Bar, 210
 Pothole, Deeping Fen, Scoop Wheels, 225, 478
 "Poplar," Compound Engines of the s.s. (*Supplement, February 4th, 1887*)
 Powis, Bale, and Co., Messrs., Four-cutter Wood Planing, Thicknessing, and Moulding Machine, 259
 Preston and the Ribble Navigation Works, 374
 Proctor's Agricultural Steam Diggers, 28
 Pulsometer Engineering Company, The, Portalis Pulsometer and Boiler, 468
 QUERUEL Engine, Compound, M. Crespin, 72

REINHOLD, Mr. H., Cork Core Packing, 107
 Riachuelo Bridge, The, Diagrams, E. Beyerhaus, 56
 Riachuelo Bridge, The, Diagrams, T. G. Gribble, 9
 Riachuelo Bridge, Girder, Mr. W. C. Kernot on, 228
 Rider Hot-air Engine, Mr. Okes, 55
 Rio Accident, The, Diagram of Position of Contractors' Points, 290
 Robinson and Son, Messrs. Thomas, A New Purifier, 460
 Robson's Gas Hammer, Manchester Exhibition, 439
 Rocket, The, at the Liverpool Exhibition, 150
 Romilly, Mr. F. de, Water-raising Machine, 227
 Rosario de Santa Fé, Port of, Plan, 228
 Rowan, Mr. F. G., Electro-magnetic Tools for Shipbuilding, 446, 447
 Rowan, Mr. W. R., Steam Cars for Steep Gradients, 116
 Ruston, Proctor, and Co., Messrs., Compound Engine, Manchester Exhibition, 348

SALTO, on the River Uruguay, Pier at, Mr. Allan Wilson, 291
 Sanspareil, H.M.S., The Thames Ironworks and Shipbuilding Company, 382
 Scarborough New Sea Wall and Promenade, 28
 Sellar's Automatic Oiling Apparatus, Newcastle Exhibition, 409
 Shand, Mason, and Co., Messrs., Combined Irrigating and Steam Fire Engine, 128
 Sharp, Stewart, and Co., Messrs., Consolidation Narrow Gauge Locomotive, Manchester Exhibition, 396
 Shippon, The Exploded Ploughing Engine Boiler, Messrs. John Fowler and Co., 6
 Simon and Tullige, Messrs., Carpet Beating Machine, Saltaire Exhibition, Fig. 6, 395
 Smith and Co., Messrs., A. and W., Vacuum Sugar Evaporating Plant, 68, 77
 Smith and Coventry, Messrs., Open Spindle Capstan Rest Chasing Lathe, Manchester Exhibition, 347, 348
 Smith, Mr. H. J., Dynamo Electric Igniting Machine, 77
 Société des Ateliers et Chantiers de la Loire, Triple Expansion High-speed Launch Engines, 7
 South-Western Railway, Locomotive Engines of the, from 1851 to 1886 (*Supplement, March 11th*)
 Spiel's Petroleum Engine, Messrs. A. Shirlaw and Co., 50, 54
 Steavenson, Mr. A. R., Hydraulic Drill, Newcastle Exhibition, 383
 Stonely's Sluices, Ballyteigue and Kilmore Reclamation Works, 339
 Stroudley Tin Company, The, Pin-making Machine, Saltaire Exhibition, Figs. 1, 2, 3, 4, p. 434

TANGYE, Messrs., Horizontal Engine with Automatic Cut-off Gear, Manchester Exhibition, 439
 Tangye, Messrs., High Lift Colonial Pump and Circulating Pump Machinery at Manchester Exhibition, 442
 Tangye's, Messrs., High-speed Engine, Manchester Exhibition, 439
 Tangye's, Messrs., Hydraulic Pulley Jack, Manchester Exhibition, 440
 Tay Bridge, The New, Mr. W. H. Barlow, 373, 376
 Taylor, Mr. E. L., Railroad Sleeper, 158
 Teudloff and Corthyn, M.M., Pressure Gauge, 468
 Thornycroft Boiler, The, 424
 Thornycroft Fire-boxes, 485
 Thurston, Professor R. H., Autographic Diagram Testing Machine, 428
 Thurston, Professor R. H., on the Friction of Non-condensing Engines, Diagrams, 96
 Thwaite-Neville Warehouse Crane, Mr. B. H. Thwaite, 97
 Thwaite and Stewart, Messrs., Open-hearth Steel Plant, 470
 Thwaite Twin Gas Producer, The, 77
 Todd, Mr. Herman A., Improved Oil Cup, 146
 "Toussaint L'Ouverture," Canet Protected Guns for the Mediterranean Company, Forges and Chantiers, 270, 274
 Tozer and Sons, Messrs. James H., Steel Chair, Newcastle Exhibition, 453
 Trélat, M. Emile, Stability of Walls at Openings, Diagrams, 312
 Trinity House Spherical and Conical Buoys, 230
 Trinity House, Steel Masts for Floating Lights, 359
 Turner, Mr., Cotton Presses in Egypt, Figs. 1, 8, 9, pp. 491, 511, 512

UNIVERSAL Drill Company, The, Heavy Radial Drill, 258
 Universal Drill Company, The, Universal Drilling Machine, 490
 Unwin, Professor W. C., Measuring Instruments used in Mechanical Testing, 405

"VICTORIA," H.M.S., Messrs. Armstrong, Mitchell, and Co., 381
 Victor Turbine, The 500-H.P., 46
 Vyrnwy Masonry Dam in Course of Construction for the Liverpool Water Supply, Mr. Thomas Hawksley and Mr. G. F. Deacon, 10, 35, 65, 66

WATSON and Sons, Messrs., Automatic Air Valve, Newcastle Exhibition, 411
 Watson and Sons, Messrs., Oriental Steam Pumps, Newcastle Exhibition, 410
 Weeks and Co., Messrs. J., Annular Pipe Heating Apparatus, 76
 Wheeler, Mr. W. H., Drainage of Fens and Low Lands, Messrs. J. and H. Gwynne's Centrifugal Pump, Fig. 7, p. 433
 Whiteley's, Electric Light Plant at, Messrs. J. Richmond and Co., 125, 126, 129
 Wild and Co., Messrs., Power Hammers, 417
 Wilkinson and Lister, Messrs., Drilling Machine, 238
 Williams, Messrs. A. and H., Ferule Extractor, 411
 Williams' Steam Stamp, Ore Crusher, and Amalgamator, the Reading Ironworks Company, 231
 Willis, Mr. J. C., Valve with Removable Seat, Saltaire Exhibition, Figs. 8 and 9, p. 395
 Wilson and Co., Messrs., Pencil-making Machinery, Saltaire Exhibition, Fig. 5, p. 434

Winn and Co., Messrs., Gas Pipe Piercing Machine, 440
 Winnerl, M., Chronographs, Figs. 1 and 6, p. 267
 Worcester, Birmingham and Droitwich Canals, Diagram and Maps, 500
 Wotapek's Exhaust Nozzle, 470

Subject Matter.

ALUMINIUM Bronze Test, Autographic Diagram of, 28
 Ammonia Refrigerating Machine, American, Messrs. Wood and Shipley, 89, 90, 91
 Annular Syphon, Adaptation of Field's, Mr. Rudolph Hering, 509
 Arches, Equipollent, "J. M. D." to the Editor on, with Diagrams, 144

BALE Ties, Cotton Pressing in Egypt, Figs. 3, 4, 5, and 6, p. 511
 Baling Hoop Punching Machine, Improved, Cotton Pressing in Egypt, Fig. 7, p. 511
 Beam Bending and Punching Machine, Messrs. D. New and Co., 231
 Belted and Internally Protected Cruisers, Mr. J. H. Biles on, 268
 Bevel Wheel Cutting Machine, Mr. Tighe Hamilton, Exhibited by Messrs. Smith and Coventry, Manchester Exhibition, 345
 Blast and Exhaust Separator, Messrs. Mumford and Moodie, 310
 Boiler, Combustion Chamber Vertical Multitubular, Grantham Crank and Iron Company, 198
 Boiler and Engine-rooms of the s.s. "Oroya," Cross Sections through, the Barrow Shipbuilding Company, 234
 Boiler Shell Drilling Machine, Messrs. Booth and Co., 502
 Boiler, The Thornycroft, 424
 Boilers of the s.s. "Oroya," the Barrow Shipbuilding Company, 290
 Bollards, Spring, Adamson's, 165
 Brake, Interchangeable Automatic Continuous, Messrs. Cowling Welch and Parker-Smith, 134
 Breakage of the 16in. Steel Shaft of the "Boston," 200
 Bridge, Berthon Pontoon, 259
 Bridge on the Boston and Providence Railway, 247
 Bridge, The Forth—Elevation of North Queensferry Pier, 112
 Bridge, Forth—The North Queensferry Cantilever Pier in Course of Construction, Sir John Fowler and Mr. Benjamin Baker (*Supplement, February 4th, 1887*)
 Bridge, The New Hammersmith, Sir J. Bazalgette and Mr. Edw. Bazalgette (*Supplement, April 22nd, 1887*), 309
 Bridge, Hammersmith—Chain Saddles and Anchorage, 331
 Bridge, Hammersmith—Detail Construction of Towers and Roadway Suspension Connectors, 393
 Bridge, Hammersmith—Details of Pier, Foundations, Chains, and Anchorage, Sir J. and Mr. E. Bazalgette, 392
 Bridge, Hammersmith—Details of Towers, 330
 Bridge Pier Work, Mandalay Extension, Burmah State Railways, 435
 Bridge, Swing, Manedund, between Falster and Seeland, Denmark, 171, 172
 Buffer Coupling, Mr. C. J. Nicholson, 219
 Bunker Doors, 35
 Buoys, Spherical and Conical, Trinity House, 230

CANAL, The North Sea and Baltic, 479
 Canals, Worcester, Birmingham, and Droitwich—Diagrams and Maps, 500
 Carpet-beating Machine, Messrs. Simon and Tullige, Saltaire Exhibition, Fig. 6, 395
 Carriages, Hotel Saloon, 143
 Casting, A Large, the Hyde Park Foundry Company, 279
 Centrifugal Machine for Reducing Dolomite, M. J. L. Marie, Athus Iron and Steel Works, 503
 Check Valve and Plug Cock, Mr. T. Murphy, 46
 Chimney, Laddering a, 435
 Chronograph, Mr. C. H. Golay, Fig. 4, 267
 Chronograph, Ordinary Seconds, Figs. 2 and 3, 267
 Chronographs, Messrs. Baume and Co., Fig. 5, 267
 Chronographs, M. Winnerl, Figs. 1 and 6, 267
 Clip for Railway Chairs, Messrs. Goodwin and How, Newcastle Exhibition, 455
 Coal-getter, Haswell's Patent Mechanical, 456
 Coal Wedge, Messrs. Bell Bros., Newcastle Exhibition, 383
 Coking Oven, Improved Jameson, Newcastle Exhibition, 383, 453
 Colliery Hook, Safety, Messrs. King and Humble, 55
 Collision between the "Celtic" and "Britannic," The, 482
 Compound Engines, Atlantic, 448
 Converter Lining, Method for Temporarily Supporting, Athus Iron and Steel Works, 504
 Conveyor, The Anti-friction, Mr. J. Little, 116
 Cork Core Packing, Mr. H. Reinhold, 107
 Cotton Machinery at the Manchester Exhibition, the Howard and Bullough Bend, 489
 Cotton Presses in Egypt, Mr. W. Turner, Figs. 1, 8, and 9, pp. 491, 511, 512
 Crane, The Thwaite-Neville Traversing Warehouse, Mr. R. B. Thwaite, 97
 Crane, Travelling, Paris, Lyons, and Mediterranean Works, Oullins, 334
 Crane, Twenty-ton Floating, Messrs. Appleby Bros., 327
 Crank Axles, London and Brighton Railway, Mr. W. Stroudley, 176
 Crane and Traction Engine, Combined, 483
 Cream Separators, Steam and Hand Power, the Laval Company, 306
 Cruiser, "Dogali," The Italian, 460

DAM, Vyrnwy—see Vyrnwy
 Dams of the World, Typical Masonry and Earthwork, 187, 207
 "Deadlock" Fastening for Wheels and Axles, Bailey's, Newcastle Exhibition, 454
 Diagram of Position of Contractors' Points at the Rio Accident, 290

Diagram Testing Machine, Autographic, Professor Thurston, 428
 Direct-acting Hydraulic Power Pumps, Cotton-pressing in Egypt, Mr. B. Stork, 510
 Dock and Railway, The Barry, near Cardiff, Mr. J. W. Barry, Mr. T. Forster Brown, and Mr. H. M. Brunel, 165
 Dome, Wrought Iron, the Lowmoor Company, Saltaire Exhibition, Fig. 5, p. 395
 Donkey Pump, The Dolphin, Messrs. Miller, Tupp, and Rouse, 230
 Drainage of the Houses of Parliament, 86
 Dredger, The Dolphin, 23, 24, 25
 Dredgers for the Bristol Corporation and the West Indies, Messrs. W. Simons and Co. (*Supplement, January 7th, 1887*), 23, 24, 55
 Drill, Heavy Radial, the Universal Drill Company, 258
 Drilling Machine, B. B. and C. I. Railway, Messrs. G. Booth and Co., 312
 Drilling Machine, Universal Radial Drilling Company, 490
 Drilling Machine, Messrs. Wilkinson and Lister, 238
 Drilling Machinery, Hydraulic, 360
 Dynamo Electric Igniting Machine, M. H. J. Smith, 77
 Dynamo Mounted on Four-Horse Otto Gas Engine, Newcastle Exhibition, 409

ELECTRIC Lamp for Divers, Mr. R. Applegarth, 453
 Electric Light Engines, Hadfield Mills, Messrs. Mather and Platt, 147
 Electric Light Engines, Messrs. Mather and Platt, Manchester Exhibition, 389, 438
 Electric Light Engines at Whiteley's, Details of Richmond's Valve Gear, 126
 Electric Light Plant at Whiteley's, Messrs. J. Richmond and Co., 125, 126, 129
 Electric Railway System, The Bentley-Knight, 68
 Electro-magnetic Tools for Shipbuilding, Mr. F. G. Rowan, 446, 447
 Engine Boiler, The Exploded Ploughing, at Shippon, 6
 Engine, Compound, Hanover Railway, Germany, Mr. Von Borries, 210, 211
 Engine, Compound, Mr. J. H. King, 468
 Engine, Compound, Messrs. Ruston, Proctor, and Co., Manchester Exhibition, 348
 Engine, Compound Express, North Eastern Railway, Mr. T. W. Worsdell, 87
 Engine, Compound Goods, North-Eastern Railway, Mr. T. W. Worsdell, (*Supplement, February 18th*)
 Engine, Compound Passenger, North-Eastern Railway (*Supplement, June 3rd, 1887*)
 Engine, Compound Queruel, M. Crespin, 72
 Engine, Compound, of the s.s. "Poplar" (*Supplement, February 4th, 1887*)
 Engine, Compound, Who Invented the Diagrams, Robt. Gill, 70
 Engine, Crank, Midland Passenger, Mr. S. W. Johnson, Saltaire Exhibition, Fig. 1, 395
 Engine, Duplex Pumping, Messrs. Fielding and Platt, Newcastle Exhibition, 454
 Engine, Gas, Diagram Showing Action of, Mr. James Atkinson, 361
 Engine, New Gas, Mr. Jas. Atkinson, 361, 380
 Engine, High-speed, Messrs. Tangye, Manchester Exhibition, 439
 Engine, High-speed Horizontal, The Grange Iron Company, Newcastle Exhibition, Figs. 3, 4, 461
 Engine, Horizontal, with Automatic Cut-off Gear, Messrs. Tangye, Manchester Exhibition, 439
 Engine, Rolling Mill, Newport Mills, Middlesbrough, Mr. J. Head, Manchester Exhibition, 349
 Engine, Self-contained Underground Hauling, The Grange Iron Company, Newcastle Exhibition, Figs. 1 and 2, 461
 Engine, Spiel's Petroleum, Messrs. A. Shirlaw and Co., 50, 54
 Engine, Traction, Messrs. Eddington and Stevenson, 47
 Engines and Boilers of the s.s. "Bentinck," 288
 Engines, Compound, for Atlantic Steamers, 471
 Engines, Compound, for Atlantic Steamers, Combined Diagrams from Compound Engines, Mr. J. Jennings Campbell, 448
 Engines, Compound, of the Dredger "Dolphin," Messrs. Simons and Co., 23, 24, 55
 Engines and Pumps, Six-horse, Indian State Railways, 168, 169
 Engines, Rider Hot-air, Mr. Okes, 55
 Engines, Triple Expansion, Mr. Morison on, Mr. Wylie's Paper on Diagrams, 110, 111, 145
 Engines, Triple Expansion High Speed Launch, Société des Ateliers et Chantiers de la Loire, 7
 Engines, Triple Expansion, s.s. "Oroya," the Barrow Shipbuilding Company (*Supplement, May 6th, 1887*), 357, 358
 Excavator, The Osgood, 3
 Excentric Grip Lever, Messrs. Langdon and Wade, 290
 Exhaust Nozzle, Wotapek's, 470
 Exhibition Buildings, Manchester, Messrs. Maxwell and Tuke, 351
 Exhibition Buildings, Manchester, Details of Dome, Messrs. Maxwell and Tuke, 346
 Explosion of Heterogeneous Mixtures of Coal Gas and Air Diagrams, Mr. Geo. C. Douglas.

FANS, Exhausting and Blowing, 279
 Feathering Paddle Wheels, s.s. "Normandy" and "Brittany," Mr. W. Stroudley, 427
 Feed Heater, Messrs. Richard Garrett and Sons, Newcastle Exhibition, 411
 Feed-water Regulator, An American, 482
 Ferry, Ganges, 198
 Ferule Extractor, Messrs. A. and H. Williams, 411
 Fire-boxes, Thornycroft, 485
 Flue, The Farnley, Newcastle Exhibition, 411
 Four-cutter Wood-planing, Thicknessing, and Moulding Machine, Messrs. Powis, Bale, and Co., 259
 Four-deck Steel Cage, Messrs. Joseph Cook and Son, Newcastle Exhibition, 454
 Fullway Valve, The Dennis, Mr. A. G. Mumford, 238
 Furnace, "Clip Draught," Mr. J. Lee, 55
 Furnace Flue, Farnley, 411

GAS Engine, Atkinson's, 361, 380
 Gas Hammer, Robson's, Manchester Exhibition, 439

Gas-pipe Piercing Machine, Messrs. Winn and Co., 440
 Gas Producer, The Thwaite Twin, 77
 Gaseous Mixtures, Explosion of, 208
 Gauge for Measuring Gases, Jameson's, Newcastle Exhibition, 383, 453
 Girder of the Riachuelo Bridge, Mr. W. C. Kernot, 228
 Gun, Armstrong 110½-ton, as Mounted in the Turret of the "Victoria," Figs. 1 and 2, Newcastle Exhibition, 368
 Gun Construction, Illustration of the Progress in, Capt. Andrew Noble, 367
 Gun, Elephant Sectional, Fig. 7, Newcastle Exhibition, 389
 Gun, New 30-Pounder Quick Firing, Fig. 9, Newcastle Exhibition, 368
 Gun, 6in. Breech-loading, on Disappearing Carriage, Messrs. Sir W. Armstrong and Co., Newcastle Exhibition, Figs. 3 and 4, 372
 Gun, 30-Pounder Rapid-fire Breech-loading, Figs. 5 and 6, Newcastle Exhibition, 369
 Guns, Canet Protected, for the Toussaint l'Ouverture Mediterranean Co., Forges and Chantiers, 270, 274
 Guns, The New 110½-ton Elswick, for H.M.S. "Benbow," 106

HAMMERS, Power, Messrs. Wild and Co., 417
 Harbour Works in Algoa Bay, Cape Colony, 338
 Harbour Works, Kurrachee, 43, 299
 H.M.S. "Sanspareil," The Thames Ironworks and Shipbuilding Co., 382
 H.M.S. "Victoria," Messrs. Armstrong, Mitchell, and Co., 381
 Hoist and Crab, The Marks Patent Self-sustaining, Manchester Exhibition, 442
 Hotel Saloon Carriages, Messrs. Brown, Marshalls and Co., 143
 Hydraulic Drill, Mr. A. R. Steavenson, Newcastle Exhibition, 383
 Hydraulic Drilling Machinery, Mr. Marc Berrier-Fontaine, 360
 Hydraulic Pulley Jack, Messrs. Tangye, Manchester Exhibition, 440
 Hydraulic Separators at the Mechnich Mines, 238

INDICATOR Diagrams, s.s. "Bentinck," 287
 Irrigation in Egypt, Works at Atfeh, 57

LADDERING a Tall Chimney, Mr. Joseph Ball, 435
 Lathe Boring Bar, Messrs. Patrick and Ayer, 210
 Lifeboat, Cross Section of Steam Tubular, 69
 Lifeboat, Steam Tubular, 69
 Lifeboat, Curve of Stability, Ludwig Benjamin, 9
 Light Draught Twin Screw River Steamer, Messrs. Edwards and Symes, 27
 Lining Repair Department, Plan of, Iron and Steel Works, Athus, Belgium, 503
 Locomotive, Athus Iron and Steel Works, 503
 Locomotive, The Comet, 1835, Newcastle and Carlisle Railway, 154
 Locomotive, Compound Goods, North-Eastern Railway, 30
 Locomotive, Consolidation Narrow Gauge, Manchester Exhibition, Messrs. Sharp, Stewart and Co., 396
 Locomotive, Contractor's, Messrs. Peckett and Sons, 191
 Locomotive Engine, Birmingham and Derby Junction Railway, Messrs. J. P. Mather Dixon and Co., 6
 Locomotive Engines of the South-Western Railway from 1851 to 1886 (*Supplement, March 11th*)
 Locomotive for 3ft. 6in. Gauge, Messrs. R. and W. Hawthorn, Leslie, and Co., Newcastle Exhibition, 464
 Locomotive, The Rocket, at the Liverpool Exhibition, 150
 Locomotives on the Belgian State Railway, 278, 294, 313

MEASURING Instruments used in Mechanical Testing, Professor W. C. Unwin, 405
 Magazine Rifle, German, 251
 Map of Intended Lake Vyrnwy—Liverpool Water Supply, Mr. Thos. Hawksley and Mr. G. F. Deacon, 34
 Map of the Isthmus of Panama and Panama Canal Route, 318
 Masonry Dam, The Vyrnwy, 10, 34, 35, 65, 66

NAVIGATION Works, Preston and the Ribble, 374

OIL Cup, Improved, Mr. Herman A. Todd, 146
 Oiling Apparatus, Sellar's Automatic, Newcastle Exhibition, 409
 Open Hearth Steel Plant, Messrs. Thwaite and Stewart, 470
 Ore Crusher and Amalgamator, Williams' Steam Stamp, The Reading Ironworks, 231
 Overwinding Gear for Mines, The Grange Iron Co.'s, Newcastle Exhibition, 455

PENCIL Making Machinery, Messrs. Wilson and Co., Fig. 5, 434
 Permanent Way for Indian State Railways, 157
 Pier, Folkestone New Promenade, Mr. M. N. Ridley, 416, 418, 420
 Pier at Salto on the Uruguay River, Mr. Allan Wilson, 291
 Pier Tube Rivetting Cage—Forth Bridge, Sir John Fowler and Mr. E. Baker, 194
 Pin-making Machine, The Broad Water Pin Co., Saltaire Exhibition, Figs. 1, 2, 3, 4, 434
 Pipe Heating Apparatus, Annular, Messrs. J. Weeks and Co., 76
 Piston Packing, Mr. Cameron, Newcastle Exhibition, 453
 Pivoted Girder and Cage, Forth Bridge, 192
 Planing Machine, Double Cutter, Messrs. Buckton and Co., 271
 Plate Bending Machine, Large Horizontal, Messrs. Berry and Sons, 401
 Ploughing Engine Boiler, The Exploded, at Shippon, Messrs. John Fowler and Co., 6
 Pneumatic Rivetting Machine, Allen's Portable, 35
 Point, Tramway, Edge's, 218
 Points, Movable, 219

- Points, Railway, 164
 Pontoon Bridge, The Berthon, 259
 Port of Rosario de Santa Fé, Plan of, 228
 Presses, Compound, Steam and Hydraulic, Cotton Pressing in Egypt, Mr. W. Turner, 491, 511
 Pressure Gauge, M.M. Teudloff and Corthyn, 468
 Pulsometer and Boiler, Portable, The Pulsometer Engineering Co., 468
 Pulverising Machine, 503
 Pump Blade, Centrifugal, Mr. C. Brown, Fig. 6, 286, 433
 Pump, Carré's Boiling Water, 417
 Pump, Centrifugal, Messrs. J. and H. Gwynne, 433
 Pump, Curved Arms of the Appold, Fig. 5, 286
 Pump, for Drainage Work, Centrifugal, Messrs. J. and H. Gwynne, Figs. 3, 4, 285
 Pump for Drainage Work, Dutch Screw, Fig. 3A, 285
 Pump, The Grange Iron Co.'s Double-acting Horizontal Mine, Newcastle Exhibition, 456
 Pumping Engines, 146
 Pumps, Indian State Railways, 168
 Pumps, Oriental Steam, Messrs. Watson and Sons, Newcastle Exhibition, 410
 Pumps, Messrs. Tangye's High Lift Colonial and Circulating, Manchester Exhibition, 442
 Purifier, a New, Messrs. Thos. Robinson and Son, 460
- RADIAL Drilling Machine, Messrs. G. Booth and Co., 176
 Railroad Sleeper, Mr. E. L. Taylor, 158
 Rail, Tramway, 218
 Rails, "Centre-bearing" and "Side-bearing" 472
 Railway, Berlin Metropolitan, 250, 254
 Railway, Electric, 68
 Railway Ferry over the Ganges, 198, 199
 Railway Points, Messrs. Barr and Langley, 164
 Repairing Tanks and Reservoirs, Mr. W. T. Lees, 417
 Reservoirs, Repairing, 417
 Resistance of Slide Valves, 78
 Rifle, The German Army Magazine, 251
- Rivetting Machine, Pneumatic, 35
 Roof of the Great Machinery Hall, Paris Exhibition, 1889, 375ft. Span, 469, 506
 Rolling Mill Engine, 349
 Ropes, Painted and Tarred, as Tested by Lloyd's Proving House, for Thos. W. Oliver, 319
 Rudder of "El Destructor," 27
- SAFETY Stop Valve, Pasquier's, 46
 Sawing Machine, Messrs. Lee and Hunt, Manchester Exhibition, 345
 Scoop Wheels in the Fenland, 225, 478
 Screw Pile Wharf at Kurrachee, 43
 Screw Vice, Rapid Action, Messrs. Entwistle and Co., 470
 Screws, Twin, High-speed, 292
 Sea Wall and Promenade, Scarborough, 28
 Sewerage, London, New Precipitation Works at Barking, 84, 85, 108
 Sewerage and Sewage Works, Hendon, Messrs. E. Cousins, 353, 354
 Shaft Steel, Breakage of, 200
 Sleepers, Howard's New, Saltaire Exhibition, Figs. 2 and 3, 395
 Sluices, Stoney's, Ballyteigue and Kilmore Reclamation Works, 339
 Sluice Valves, Large, 95
 Spindle Capstan Rest Chasing Lathe, Messrs. Smith and Coventry, Manchester Exhibition, 347, 348
 Stability of Walls at Openings, M. Emile Trélat, Diagrams, 312
 Stamped Goods, Mr. J. Grimshaw, Saltaire Exhibition, Fig. 7, 395
 Steam Cars for Steep Gradients, Mr. W. R. Rowan, 116
 S.S. "Manauense," Compound Engines, Details, Messrs. Rollo and Sons (*Supplement, May 20th, 1887*), 397
 S.S. "Manauense," Indicator Diagrams, 394
 Steam Tramways, Birmingham, General Plan, 218
 Steam Yacht "Chemcheck," The, Messrs. Miller, Tupp, and Rouse, 214
- Steamer "Oroya," the Pacific Steam Navigation Co.'s Royal Mail, The Barrow Shipbuilding Co. (*Supplement, March 25th, 1887*), 251
 Steamer, River, for Java, Messrs. J. Birch and Co., 177
 Steel Chains without Welding, M. Oury, 179
 Steel Chair, Messrs. James H. Tozer and Sons, Newcastle Exhibition, 453
 Steel Masts for Floating Lights, Trinity House, 359
 Steel Fire Bars, Wave Line, Mr. W. Fox, Saltaire Exhibition, Fig. 4, 395
 Steel Tug, "Jubilee," The, Messrs. Steward and Latham, 457, 460
 Step Cone Fire-box, Messrs. Partington and Co., 210
 Stone Moulding and Dressing Machine, Hunt's Duplex, 340
 Stop Watches and Chronographs, 267
 Strainer, Miller's Patent, Newcastle Exhibition, 410
 Submarine Boat "Nordenfelt," The, 499
 Submarine Boat for Turkey, the Nordenfelt, 105
 Sugar Evaporating Plant, Vacuum, Messrs. A. and W. Smith and Co., 68, 77
 Syphon, Annular, 509
- TENDER, Compound Goods Engine, N.E. Railway, Mr. T. W. Worsdell, 128
 Threshing Implement from Tunis, Archaeological, 436
 Tire, Corrugated, Mr. Fox, Newcastle Exhibition, 453
 Torpedo Cruiser, "El Destructor," Messrs. J. and G. Thomson, 26, 27
 Traction Engine and Crane Combined, Messrs. C. Burrell and Co., 483
 Tramway Points, Movable, Mr. C. I. Nicholson, 219
 Tramway Point, Mr. C. A. Edge, 218
 Tramway Rail, Barker's, 218
 Tramway Rail, Gowan's, 218
 Tramways, Birmingham Steam, 218
 Tug "Jubilee," 457
- Turbine, the 500-H.P. Victor, 46
 Turbines at the Manchester Exhibition, Mr. W. Günther, 486
 Turret Lathe for Brass Finishing, Cooper's, Manchester Exhibition, 347
 Turret, the Mougin Disappearing, 109
 Twin Screws, High Speed, Mr. E. A. Linnington, 292
- UPRIGHT Turret Pulley and Wheel-boring Machinery, Messrs. John Bertram and Sons, 502
- VALVE, Automatic Air, Messrs. Watson and Sons, Newcastle Exhibition, 411
 Valve, Dennis's Full-way, 238
 Valve, Fothergill's, Figs. 1 and 2, Newcastle Exhibition, 410
 Valve with Removable Seat, Mr. J. C. Willis, Figs. 8 and 9, Saltaire Exhibition, 395
 Vice, the Ewbank, 470
- WATCHES, Stop, 267
 Water Gauge, Messrs. Eddington and Stevenson, 176
 Water-raising Machines, Messrs. Cail, 227
 Water-raising Machine, Mr. F. de Romilly, 227
 Water-tight Bunker Doors, Messrs. Cochran and Co., 35
 Waterworks, Bradford, Large Sluice Valves, Messrs. Blakeborough and Sons, 95
 Wheel and Axle Fastening, 454
 Wheel Boring Machine, 502
 Winding Drum, Black Rock Colliery, 190
 Winding Engines and Steel Drum, Lady Windsor Pit, Black Rock Colliery, Ynysbwl, Messrs. Darglish and Co., 190
 Workshop Roofs for Indian State Railways, 413
 Workshops, Plan of Great Indian Peninsular Railway, Bombay, 404
- YACHT, Steam, 214

Miscellaneous.

- 1887, 11
 Abstracts of Consular and Diplomatic Reports 391, 434, 478
 Accidents in Mines, Sir Fred. Abel, 440
 Accuracy of Artillery Fire, 354
 Adit, An Old and Long, 68
 Admiralty Contracts, 215
 Aeronauts, Military, 171
 Afteh, Irrigation Works at, 57
 "All Rights Reserved," 115
 Aluminium Alloys, 28, 57
 Ambleside Railway Bill, The, 152
 Amendment of Specifications, 29
 American Ammonia Refrigerating Machine, 89
 American Armour-plates, 509
 American Drills, 480
 American Engineering News, 97, 111, 136, 158, 180, 201, 240, 269, 320, 384, 431, 472, 512
 American Notes, 19, 37, 60, 81, 101, 120, 139, 161, 183, 203, 223, 243, 263, 283, 303, 323, 365, 407, 451, 495
 American Railway Accidents, 9
 American Railway Guides, 276
 American Trade, 64
 Ammonia Refrigerating Machine, American, 89, 90, 91
 Andrew, Sir W. P., 218
 Annular Pipe-heating Apparatus, Weeks', 77
 Annular Syphon, Novel Method of Utilising the, 509
 Anti-friction Metal for Heavy Machinery, 31
 Aquarium of the Fisheries Exhibition, Sale of, 86
 Aqueduct in Holiday-street, Birmingham, Description of, 209
 Arch Problem, The, 180
 Armed Cruisers for the Mercantile Fleet, 235
 Armour-plates, 374
 Armour-plates, Schneider v. Sheffield, 332
 ASSOCIATION OF BIRMINGHAM, STUDENTS OF THE INSTITUTION OF CIVIL ENGINEERS:
 Sewerage of Towns, Mr. Joseph Pickering on the, 154
 Association, Engineer Students', 175
 ASSOCIATION, FINSBURY TECHNICAL COLLEGE OLD STUDENT:
 Rain as a Geologic Agent, Mr. G. T. Moody, 202
 Association of Foremen Engineers, 136
 Association, Agricultural Engineers' 364
 ASSOCIATION OF FOREMEN ENGINEERS AND DRAUGHTSMEN, THE LONDON, 96, 136, 277, 364
 Notes on Gas Manufacture, Mr. F. Darlington, 402
 Association, The Geologists'—Excursion, 350
 Association of Municipal Engineers, 375
 ASSOCIATION OF STUDENTS OF THE INSTITUTION OF CIVIL ENGINEERS, MANCHESTER:
 Road-making, Mr. Bracegirdle, 49
 Athus Iron and Steel Works, Belgium—Basic Lining Department, 503
 Atkinson's New Gas Engine, 361, 379
 Atlantic Telegraph Working, 114
 Automatic Calls to Distant Signals, 374
- BALE Ties, 511
 Baling Hoop Punching Machine, Improved, 511
 Ballyteigue and Kilmore Reclamation Drainage Works, County Wexford, Ireland, 339
 Barking Sewage Outfall, Precipitation Works at the, 83, 84, 85, 108, 109
 Barr and Langley's Railway Points, 164
 Barry Dock and Railways near Cardiff, The, 165
 Basic Slag as a Manure, Dr. Grube's Lectures on, and Reference to Sidney Gilchrist Thomas, 238
 Bath and West of England's Society's Show, 404
 Bazalgette, Sir J., and Mr. Bailey-Denton, 316
- B. B. and C. I. Railway, Booth's Drilling Machine, 312
 Beam-bending and Punching Machine, New's, 231, 237
 Beams with Fixed Ends, 509
 Belgian Competition, 75
 Belgian State Railway Locomotives, 278, 279, 290, 294, 313, 314
 Bengal and North-Western Railway, Railway Ferry over the Ganges, 198, 199
 Bentley-Knight Electric Railway System, The, 68
 Berlin, The Metropolitan Railway of, 250, 251, 254
 Berthon Boats, The Late Gen. Gordon and, 359
 Berthon Pontoon Bridge, The, 259
 Bevel Wheel Cutting Machine, Mr. Tighe Hamilton, 345
 Binns, Mr. Charles, 67
 Birmingham and Bristol Canal, The, 499
 Birmingham Steam Tramways, 218
 Black Process, The, 36
 Black Rock Colliery, Winding Engines and Winding Drum, 190, 191
 Blast Furnaces in the Cleveland District, Sir B. Samuelson, 445
 Blast Furnaces in the Cleveland District in 1887, Cost of, Sir B. Samuelson, 428
 Board of Trade and Boiler Insurance, The, 51
 Boiler, Combustion Chamber Vertical Multi-tubular, 198
 Boiler Construction, 288
 Boiler Shell Drilling Machine, Large, Messrs. George Booth and Co., 502
 Boiler, The Thornycroft, 424
 Boilers, Donkey, 145
 Boilers and Engines, New, 139
 Boilers, High-pressure Marine, 488
 Boilers of the s.s. "Oroya," 290
 Boilers, Torpedo Boats', 437
 Bollards, Adamson's Spring, 165
 Bolton, Sir Francis, 36
 Bombay, Plan of Great Indian Peninsular Railway Workshops, 404
 Books Received, 53, 75, 115, 197, 277, 356, 400, 467
 Borehole in Leicestershire, On a, Mr. Stooke, 403
 Boring Bar Lathe, 210
 Borings in the Chalk at Bushey, Herts, Mr. W. Fox, 403
 Bradford Waterworks, Large Sluice Valves, 95
 Brake, The Interchangeable Automatic Continuous, 134
 Brake, The Westinghouse, 220
 Brakes, Mr. Moon on Continuous, 127
 Brakes, Railway, 220
 Brasses, Old, 195, 280
 Bridge on the Boston and Providence Railway, 247
 Bridge, Hammersmith, 52
 Bridge, The New Hammersmith (*Supplement, April 22nd, 1887*), 52, 309, 331, 392, 393
 Bridge Pier Work, Mandalay Extension, 435
 Bridge Railway, Swing, over the Masnedund, Denmark, 171, 172
 Bridge over the River Eunant, Liverpool Water Supply, 65
 Brighton Electric Railway, The, 94
 Bristol Docks, 107
 British Association, The, 220
 British Iron Trade, 154
 Buenos Ayres Port and Harbour, 117
 Buffalo Electric Light Company, The, 411
 Buoys, Spherical and Conical, 230
 Burnah State Railways, Bridge Pier Work, 435
 Burton-on-Trent Sewage Engines, 180, 200, 220, 229
 Burton-on-Trent Sewage Works, Pumping Engines, 146
- CALAIS, Modern, 356
 Calorimetric Thermometers, Professor Pickering on, 407
 Canadian Iron Trade, The, 39
 Canal between India and Ceylon, Proposed, 131
 Canal, The Birmingham and Bristol, 499
 Canal, The Panama, 499
 Canal, The Resecop, 61
 Canals, The North Sea, Baltic, and Westphalian, 479
 Canet Protected Guns for the Toussaint l'Ouverture, 270, 274
 Capell's Fan, 370
 Carpet-beating Machine, Messrs. Simon and Tullige, Fig. 6, 395
 Carron Co., The, A Heavy Roll, 370
 Casting, A Large, 279
 Caution against Philip Barry, 277
 Cement, Sugar in, 28, 56, 117, 220
 Centrifugal Machine for Reducing Dolomite, Athus Iron and Steel Works, 503
 Chalk Springs in the London Basin, Mr. J. W. Grover, 403
 Changes of Level in the Surface of Water Surrounding a Vessel, &c., Professor J. H. Cotterill on, 252
 Check Valve and Plug Cock, Combined, 46
 "Chemcheck," The Steam Yacht, 210, 214
 Chemistry to Engineering, Relation of, Professor H. E. Armstrong, 110
 Chenille Cutting, 399
 Chilled Cast Iron, Mr. Morgans on, 156
 Chilled Iron and Steel Projectiles, 74
 Chinese Railways, Inauguration of, 465
 Chinese Trade, 56
 Chronographs, Stop Watches and, 267
 Cillies, Drainage of the River, 418
 "Clip Draught" Furnace, Mr. J. Lee, 54
 Clip for Railway Chairs, Messrs. Goodwin and How, 455
 Clyde Shipbuilding Trade, 192, 462
 Coal Export, Our, 236
 Coal Gas and Air, Explosion of Heterogeneous Mixtures of, 308
 Coal Getter, Haswell's Patent Mechanical, 456
 Coal Trade Strike and London Coal, 378
 Coal Wedge, Messrs. Bell Bros., 383
 Coking Oven, Improved Jameson, 383, 453
 Collapsible Berths for Emigrant Ships, 400
 College for the Colonies, 113
 Colliery Hook, Safety Detaching, Messrs. King and Humble, 55
 Collision between the "Celtic" and the "Britannic," 482
 Colonial Conference, The, 256
 Colonies, College for the, 113
 Colour-blindness and Engine-drivers' Eyesight, 359
 Comet, 1885, The Newcastle and Carlisle Railway, 154
 Complaint, A New, 414
 Compound Locomotives, 57, 70, 136, 215
 Compound v. Triple Expansion Marine Engines, 286
 Concrete Dock Works: Alarming Discovery at Aberdeen, 515
 Condensation in Steam Cylinders, 98, 107, 136, 179, 200, 220
 Consular and Diplomatic Reports, Abstracts of, 3, 22, 67, 89, 104, 123, 142, 170, 186, 212, 227, 248, 272, 309, 340
 Continuous Brakes on Goods Trains, 465
 Contractors' Locomotive, 191
- CONTRACTS OPEN:
 Indian State Railways, N.W. Railway, 5ft. 6in. Gauge, 157
 Kurrachee Harbour Board, Ship Wharf Extension, Girders and Joists, 298, 299
 Screw Pile Wharf at Kurrachee, 43, 49
 Steel Masts for Floating Lights, 359
- CONTRACTS OPEN (*continued*):—
 Spherical and Conical Buoys, Trinity House, 230
 Workshop Roofs for Indian State Railways, 413
 415
 Control of the London Water Supply, 422
 Conversion of Compound Engines to Tri-compound, 35
 Conversion of Timber in the Pine-growing Districts of the U.S.A., by Circular and Band Saws, Mr. Ransome, 428
 Converter Lining, Method for Temporarily Supporting, 504
 Conveyor, The Anti-friction, 116
 Cotton Machinery at the Manchester Exhibition, 390, 489
 Cotton Presses for Egypt, Mr. W. Turner, 511
 Cotton Pressing in Egypt, 491, 510
 Crane, The Thwaite-Neville Warehouse, 97
 Crane, Travelling, Paris, Lyons, and Mediterranean Railway Works, 334, 337
 Crane, Twenty-Ton Floating, 327
 Crank Axles, London and Brighton Railway, 176
 Cream Separator, Mechanical, 305, 306
 Cruiser "Dogali," The Italian, 460
 Cruisers, Types of some New, 185
 Current Half-year on Railways, The, 152
 Cycles, The Stanley Exhibition of, 134
 Cylinder Condensation, 93, 98, 107, 136, 179, 200, 220
- DAMS of the World, Typical Masonry and Earthwork, 187, 189, 207, 208
 Dangerous Paints and Compositions, 116
 "Deadlock" Fastening for Wheels and Axles, Bailey's, 454
 Defective Weapons, 384, 421
 Defence of our Coaling Stations, 75
 Delta Metal Valves, 217
 Dennis Fullway Valve, The, 238
 Denny, Mr. William, 237
 Diagram Testing Machine, Autographic, Professor Thurston, 428
 Disappearing Turret, The Mougin, 109
 "Dogali," The Italian Cruiser, 460, 485
 "Dolphin" Donkey Pump, The, 230
 "Dolphin," The Dredger (*Supplement, January 7th, 1887*), 4, 23, 24, 55
 Dome, Wrought Iron, The Lowmoor Company, Fig. 5, 395
 Domestic Drainage, 296, 319, 414, 437, 501
 Donkey Boilers, 99, 145
 Double-cutter Planing Machine, 271
 Drainage of Fens and Low Lands by Steam Power Mr. W. H. Wheeler, 83, 103, 123, 163, 225, 265, 285, 433
 Drainage of Fens and Low Lands by Steam Power, Pumping Stations, 477
 Drainage of the Houses of Parliament 86
 Drains, Engine, 164
 Dredgers for Bristol and for the West Indies (*Supplement, January 7th, 1887*), 4, 23, 24, 55
 Drill, Hydraulic, Mr. A. R. Stevenson, 383
 Drilling Machine, Automatic, Messrs. Wilkinson and Lister, 238
 Drilling Machine, Booth's, 312
 Drilling Machine, Universal, 480, 490
 Drilling Machinery, Hydraulic, M. Marc Berrier-Fontaine, 360
 Drills, American, 480
 Duplex Stone Dressing Machine, Hunt's, 340
 Dutch Screw Pump for Drainage Work, 285
 Dynamos, Characteristics of, Mr. G. L. Hodgson on, 99
 Dynamo Electric Igniting Machine, 77
 Dynamo Mounted on Four-horse Otto Gas Engine, 409

- EADS, Captain James Buchanan, 220
 Eddington and Steevenson, Messrs., Traction Engine, 46, 47
 Eddington and Steevenson's Water Gauge, 176
 Education of Engineers, The, 336, 374, 501
 Education, Too Much, 394
 Education and Patents, 295
 Egypt, Irrigation in, 57, 133
 Egypt, Twenty Years' Cotton Pressing in, 491, 510
 Eiffel and Jubilee Towers, 196
 "El Destructor," Torpedo Cruiser, 26
 Electric Lamp for Divers, Mr. R. Applegarth, 453
 Electric Light Engines at the Hadfield Mills, 147
 Electric Light Engines, Messrs. Mather and Platt, 438
 Electric Light Illuminations, 501
 Electric Light Installation, Large Cotton Mill, 78
 Electric Light at Whiteley's, 124, 129, 145, 180, 220
 Electric Lighting, 139
 Electric Lighting at the Indian and Colonial Exhibition, 73
 Electric Lighting Plant of the Colonial Exhibition, Sale of, 55
 Electric Railway System, The Bentley-Knight, 68
 Electric Safety Lamp, with Schanschiff's Primary Liquid Single Battery, Mr. S. B. Coxon upon, 333
 Electric Search Lights, 63
 Electrical Progress in 1886, 44
 Electro-magnetic Tools for Shipbuilding, Mr. F. G. Rowan, 446, 447
 Elswick Exhibits at the Newcastle Exhibition, 367
 Elswick Guns, The New 110½-ton, 106, 127
 Employers' Liability, 300
 Engine Boiler, An Exploded Ploughing, 6, 9
 Engine, Combined Irrigating and Steam Fire, 128
 Engine, Compound, Mr. J. H. King, 468
 Engine, Compound, Messrs. Ruston, Proctor and Co., 348
 Engine, Compound Express, N.E. Railway, 87, 97
 Engine, Compound Goods, N.E. Railway, (*Supplement, February 18th, 1887*), 24, 30, 128, 155
 Engine, Compound Passenger, N.E. Railway, (*Supplement, June 3rd, 1887*), 436
 Engine, Compound Queruel, 72
 Engine Crank, Midland Passenger Engine, Mr. S. W. Johnson, Fig. 1, 395
 Engine Drains, 164
 Engine-drivers' Eyesight, 229, 280, 300
 Engine-drivers' Eyesight and Colour-blindness, 319, 332
 Engine, Duplex Pumping, Messrs. Fielding and Platt, 454
 Engine, French Triple Expansion, 9
 Engine, Gas, Diagram showing Action of, Mr. James Atkinson, 361
 Engine, High-speed, Messrs. Tangye, 439
 Engine, High-speed, Horizontal, The Grange Iron Co., Figs. 3, 4, 461
 Engine, Horizontal, with Automatic Cut-off Gear, Messrs. Tangye, 439
 Engine, The Life History of an, by Prof. Ryan, 126
 Engine, Locomotive, Birmingham and Derby Junction Railway, 1838, 6, 9
 Engine, New Gas, Mr. James Atkinson, 361, 380
 Engine, Rolling Mill, Newport Mills, Middlesbrough, Mr. J. Head, 349, 360
 Engine, Self-contained, Underground Hauling, Figs. 1, 2, The Grange Iron Co., 461
 Engine, Spiel's Vertical Petroleum, 54
 Engine Tender, Compound Goods, 128
 Engine, Traction, Messrs. Eddington and Steevenson, 46, 47
 Engine Trial, Extraordinary, 200, 228
 Engine Trials, The Royal Agricultural Society's, 492
 ENGINEER, THE, on the Dimensions of Physical Quantities, 243
 Engineering and Allied Trades, Section in Connection with the London Chamber of Commerce, 229, 240
 Engineering in Canton, 279
 Engineering Literature, A Professor on, 173
 Engineering Trades in 1886, 58
 Engineering Trades and the London Chamber of Commerce, 229, 240
 Engineers and the London Chamber of Commerce, 236
 Engines and Boilers, General Arrangement of, s.s. "Bentnick," 288
 Engines, Compound, 67
 Engines, Compound, for Atlantic Steamers, 448
 Engines, Compound, for Atlantic Steamers, Mr. J. Campbell, 447, 471
 Engines, Compound, of the Dredger "Dolphin," 23, 24
 Engines, Compound, s.s. "Manauense," Messrs. Rolls and Sons (*Supplement, May 20th*), 397
 Engines, Compound, of the s.s. "Poplar" (*Supplement, February 4th, 1887*), 95
 Engines, Electric Light, Messrs. Mather and Platt, 389
 Engines, On the Friction of Non-Condensing, 96, 148
 Engines, Gas, 374, 402
 Engines, High-speed, in Cargo Boats, 236
 Engines, Management of Drainage, 123
 Engines, Marine Compound, v. Triple Expansion, 286
 Engines, Oke's Improved Rider Hot-air, 55
 Engines and Pumps, 6-Horse, for the Indian State Railways, 168, 169, 170, 215
 Engines, Traction, Inspecting, 320
 Engines, Triple Expansion, s.s. "Oroya" (*Supplement, May 6th, 1887*), 357, 358
 Engines, Triple Expansion Marine, The late Mr. Wyllie's Papers on, 110, 135, 145
 Engines Used for Driving Wheels and Pumps, 123
 English Girder Manufacture, 276
 Equipollent Arches, 144
 Excavator, New, Osgood Dredge Co., 3, 4
 Exhaust Nozzle, Bertha Wotapek's, 470
 Exhibition, The Adelaide, 70
 Exhibition, The American, 120, 303, 358
 Exhibition, Brussels, 1888, 88
 Exhibition Buildings, 402
 Exhibition of Cadiz, National Maritime, August to October, 1887, 484
 Exhibition, The Colonial, Sale of Electric Lighting Plant, 55
 Exhibition of Cycles, The Stanley, 134
 Exhibition, The Glasgow International, 277, 354, 460
 Exhibition at Havre, International Maritime, 164, 385
 Exhibition, Indian and Colonial, Electric Lighting at, 73
 Exhibition, The Indian and Colonial Reports, 298
 Exhibition, Limited, The American, 217, 259
 Exhibition, The Liverpool, The "Rocket" at, 150, 153
 Exhibition of Machinery at Milan, International, 128
 Exhibition, The Manchester—see Manchester Exhibition
 Exhibition, 1888, The Melbourne Centennial, 488
 Exhibition, The Newcastle—see Newcastle Exhibition
 Exhibition of 1889, The Paris, 468, 469, 502
 Exhibition, The Paris Railway, 36, 51
 Exhibition, The Saltaire—see Saltaire Exhibition
 Exhibition, the Sportsman's, 364
 Exhibitors' Club, An, 170
 Explosions of Heterogeneous Mixtures of Coal Gas and Air, 308
 Explosives Act, The Working of the, 336
 External and Internal Armour, 275
 FALLACIES of Perpetual Motion, On the, 192
 Fans for Forced Blast, 402
 Fans, Hodge's Exhausting and Blowing, 279, 293
 Fastest Boat in the World, The, 237
 Fastest Vessel Afloat, The, 415, 437
 Feed-heater, Messrs. Richard Garrett and Sons, 411
 Feed-water Regulator, 482
 Ferule Extractor, Messrs. A. and H. Williams, 411
 Fibres, The Finest, Mr. C. V. Boys on the, 283
 Filter Presses for the Treatment of Sewage Sludge, 158
 Finsbury Technical College, 88, 260
 Fire-arms, Magazine and Repeating, 188
 Fire Engines, Mr. V. J. Bonton, 440
 Fire-escapes, 152
 Fires in London, 113
 Firewood-cutting Machines, 131
 Fitter? What is a, 319
 Flight of the Pelican, The, 414, 437
 Floating Steam Cranes, 327
 Flood Works, Corporation of Leicester, 253
 Flour Mill Machinery, Modern, 317
 Flow of Metals, The, 131
 Flue, The Farley, 411
 Fly-wheel in a Rolling Mill at Marchiennes, Breakage of, 176
 Folkestone New Promenade Pier, 416, 418, 420
 Fontaine's Hydraulic Drilling Machinery, 360
 Force of Water, The, 61
 Forth Bridge, The, 310, 312
 Forth Bridge, Elevation of North Queensferry Pier, 112, 115
 Forth Bridge, Erection of the (*Supplement, February 4th, 1887*), 95
 Forth Bridge, The, Pivoted Girder and Cage, 192, 194
 Foundations in America, Failure of, 387
 Four-cutter Wood-planing, Thicknessing, and Moulding Machine, 259
 Fox, Mr. Sam, 171
 Free Trade, Fair-Trade, and no Trade, 484
 French Telegraph Cables, 174
 Friction of Engines, 136
 Friction of Non-condensing Engines, Professor R. H. Thurston on the, 96, 148
 Fuel, Mr. A. Forbes on, 445
 Fuel, New Patent, 378
 Fuel Supply in Ships of War, Sir N. Barnaby, 266
 Furnace, "Clip Draught," 54
 GANGES Ferry, Bengal and North-Western Railway, 198, 199
 Gas Engine Progress, 117
 Gas Engines, 374, 402
 Gas Explosion on Board the "J. H. Nieman," 418
 Gas Explosion, Natural, Youngstown, Ohio, 470
 Gas Hammer, Robson's, 439
 Gas Manufacture, Mr. F. Darlington's Notes on, 402
 Gas-pipe Piercing Machine, Messrs. Winn and Co., 440
 Gas Producer, Twin, 77
 Gas Production and Distribution, 175
 Gauge for Measuring Gases, Jameson's, 383, 453
 Geographical Instruction, 220
 German Army Magazine Rifle, The, 251
 German Shipbuilding, 320
 Gold Mining Machinery for the Transvaal, by Henry Louis, 477
 Gordon, The Late General, and Berthon Boats, 359
 Government Contracts, Waste of Bolts and Rivets, 415
 Grain Dryers, 220
 Great Eastern Steamship, The, 153, 275
 Green, Mr. Sam, 415
 Grinding Wood, 51
 Gruel Mortar, 200
 Gruson Turrets, 421
 Gun, Armstrong, 110½-Ton, Figs. 1 and 2, 368
 Gun Construction, Illustration of the Progress in, Captain Andrew Noble, 367
 Gun, Elephant Sectional, Newcastle Exhibition, Fig. 7, 369
 Gun, Firing Trial of the 110½-ton B.L. Elswick, 106, 127
 Gun, The 110-ton Iron, 196
 Gun, New 30-pounder Quick Firing, Fig. 9, 368
 Gun, 6in. Breech-loading, on Disappearing Carriage, Figs. 3 and 4, 472
 Gun Steel, Treatment of, 255
 Gun Steel, Treatment of, Col. Eardley Maitland on, 209
 Gun, 30-pounder, Rapid-fire Breech-loading, Figs. 5, 6, Newcastle Exhibition, 369
 Guns, The Greatest, in the World, 17
 HADFIELD Mills, Electric Light Engines at the, 147
 Hammer, Gas, 439
 Hammers, Power, 417
 Hammersmith Bridge, The New (*Supplement, April 22nd, 1887*), 52, 309, 331, 392, 393
 Hammersmith Bridge, Opening of the New, 504
 Hannover Railroad, Germany, Compound Locomotive, Von Borrie's System, 210, 211
 Harbour Works in Algoa Bay, Cape Colony, Mr. Wm. Shield on, 333, 338
 Harbours of Refuge, 315
 Hawkesbury Bridge, The New, 160
 Hayti, Despatch Boat for, 270, 274
 Heberlein Brake, The, 437
 Hematite Iron Production in the North, 466
 Hendon Sewage Works, 353, 354
 H.M.S. "Benbow," Elswick Guns for, 106, 127
 H.M.S. "Sanspareil," 382
 H.M.S. "Victoria," 381
 High-speed Engines in Cargo Boats, 236
 High-pressure at Sea, 443
 Hodges' Exhausting and Blowing Fans, 279, 293
 Hoist and Crab, The Marks Patent Self-sustaining, 442
 Hook, Colliery, Messrs. King and Humble's, 55
 Horse-power of Steam, The, 300
 Hotel Saloon Carriages, Messrs. Brown, Marshall and Co., 142, 143
 Howard and Bullough Bend, The, 489
 Humber Guardship, Accident on board the, 449
 Husband, Mr. Wm., 361
 Hydraulic Cement from Blast-furnace Slag, On the Manufacture of, Mr. R. J. Friswell, 459
 Hydraulic Mining and the Californian River Beds, 317
 Hydraulic Separators at the Mechnich Mines, 238
 IMPORTATION of British Marked Goods, 237
 Indian State Railways, N.W. Railway, 5ft. 6in. Gauge, 157
 Indian State Railways, 6-horse Engines and Pumps for, 168, 169, 170
 Inspecting Traction Engines, 320
 INSTITUTE, THE IRON AND STEEL, 317
 Inaugural Address of the President, Mr. Adamson, 428
 Cost of Blast-furnaces in the Cleveland District in 1887, Sir B. Samuelson, 428, 445
 Notes on the Terni Steel Works, Sir Bernhard Samuelson, 428
 Patent Composite Steel and Iron, Mr. G. Allan, 428
 Some Investigations as to the Effects of Different Methods of Treatment of Mild Steel in the Manufacture of Plates, Mr. James Riley, 445
 South Chicago Works of the North Chicago Rolling Mill Co., Mr. E. C. Potter, 445
 INSTITUTE OF MINING AND MECHANICAL ENGINEERS, THE NORTH OF ENGLAND :
 Improved Electric Safety Lamp, with Schanschiff's Liquid Single Battery, Mr. S. B. Coxon, 333
 INSTITUTE, WEGHLEY NEW TECHNICAL, 402
 Italian Government and the Simplon Tunnel, The, 417
 Jamaica, Temperature and Pressure in, 384
 Jacob, Mr. Wm., 437
 Jubilee Banquet at Colchester, 484
 Jubilee, 507
 Irish Metal Mines, Mr. G. H. Kinahan, 456
 INSTITUTION OF CIVIL ENGINEERS, THE, 64, 262, 328, 375, 415, 491
 Accidents in Mines, Sir Fred. Abel, 440
 Borehole in Leicestershire, Mr. Stooke on a, 403
 Borings in Chalk at Bushey, Herts, Mr. W. Fox, 403
 Chalk Springs in the London Easin, Mr. J. W. Grover, 403
 Conversion of Timber in the Pine-growing Districts of the United States of America, by Circular-saws and Band-saws, Mr. L. H. Ransome, 428
 Electric Illumination at, 508
 Filter Presses for the Treatment of Sewage Sludge, Mr. Wm. Santo Crimp, 158
 List of Premiums Awarded, 470
 Manufacture of Salt near Middlesbrough, On the, Sir Lowthian Bell, 428
 Past and Present Telegraphy, Mr. E. Dodd, 277
 Printing Machinery, Mr. E. A. Clowes on, 300
 The Queen and the, 412
 Sewage Sludge and its Disposal, Mr. Wm. Joseph Dibdin, 157
 Treatment of Gun Steel, Col. Eardley Maitland, 209
 Water Supply from Wells, 403
 Wells and Borings of the Southampton Waterworks, Mr. W. Matthews, 403
 INSTITUTION OF CIVIL ENGINEERS' STUDENTS :
 Description of the Aqueduct in Holiday-street, Birmingham, Mr. F. D. Sharp, 209
 INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND :
 Education of Engineers, Mr. H. Dyer, 336
 INSTITUTION OF MECHANICAL ENGINEERS, THE, 76, 229, 403
 Inaugural Address by the President, Mr. E. H. Carbutt, 403
 Triple Expansion Marine Engines, The late Mr. Wyllie's Paper on, 110, 135, 145
 Institution of Mechanical Engineers and the Patent Office, 229
 INSTITUTION OF NAVAL ARCHITECTS, THE :
 Inaugural Address of the President, the Earl of Ravensworth, 257
 Changes of Level in the Surface of Water Surrounding a Vessel, produced by the Action of a Propeller and by Skin Friction, by Professor J. H. Cotterill, 252, 267
 Comparative Effects of Belted and Internal Protection upon the other Elements of a Design of a Cruiser, Mr. J. H. Biles, 268
 Fifty Years of Yacht-building, Mr. Dixon Kemp, 265
 Forces Acting on the Blade of a Screw Propeller, The, Mr. G. A. Calvert, 267
 Fuel Supply in Ships of War, Sir N. Barnaby, 266
 The Merchant Service and the Royal Navy, Sir N. Barnaby, 257, 260
 Practical Application of Stability Calculations, Mr. A. Denny on, 286
 Results of a Series of Progressive Speed Trials Carried out at Cherbourg on a Torpedo Boat, Mons. L. de Bussy, 257
 Shifting Cargoes, Professor Jenkins on, 286
 Some Recent High-speed Twin-screws, Mr. E. A. Linnington, 292
 Twin-screw Torpedo Boats, "Wiborg" and "Destructor," Mr. Biles on the, 257
 INSTITUTION, THE UNITED SERVICE :
 Magazine and Repeating Arms, Capt. W. H. James, 188
 Iron, Chilled, Mr. Morgans on, 156
 Iron, Coal, and General Trades of Birmingham, Wolverhampton and other Districts, 17, 37, 58, 79, 99, 119, 137, 159, 181, 201, 221, 241, 261, 280, 301, 321, 341, 363, 385, 405, 429, 449, 472, 492, 513
 Iron and Steel, Notes on the Working Stress of, 48
 Iron and Steel Shipbuilding of 1886, 175
 Iron Trade, Economy in the, 32
 Iron Trade, Frauds in the, 196
 Iron Trades in 1886, The, 147
 Irrigation in Egypt, Works at Afteh, 57
 JACK, Hydraulic Pulley, Messrs. Tangye, 440
 Japan, Industrial Exhibition in, 443
 Java, Light Draught River Steamer for, 177
 KAPUNDA and Ada Melmore, The, 300
 King and Humble, Messrs., Safety Detaching, 55
 King's College, Annual Dinner of the Old Students of, 115
 King's Cross Terminus, Renewal of Roof over Departure Platform, Mr. R. M. Bancroft, 474
 Knowle's Air Pumps? 255
 Kurrachee Harbour Board, Ship Wharf Extension, 298, 299
 Kurrachee, Screw Pile Wharf at, 43, 49
 LABOUR Statistics, Collection and Publication of, by the Government, 132
 Laddering a Tall Chimney, Mr. Joseph Ball, 435
 Langdon and Wade's Eccentric Grip Lever, 290
 Larssen's Slag Cement, 299
 Lathe Boring Bar, 210
 Lathe for Brass Finishing, Cooper's Turret, 347
 Lathe, Spindle Capstan Rest Chasing, Messrs. Smith and Coventry, 347, 348
 Launch Engines, Triple Expansion High-speed 7, 9
 Launch at Pola, 491
 Launch of a Steamship at Goole, 322
 Launches and Trial Trips, 78, 110, 158, 220, 240, 260, 300, 343, 385, 429, 472, 494, 514
 Lay Torpedo, The, 191
 Lazy-tongs in Structural Work, 339
 LEADERS :
 1887, 11
 Admiralty Contracts, 215
 "All Rights Reserved," 115
 Ambleside Railway Bill, The, 152
 American Railway Guides, 276
 Armed Cruisers for the Mercantile Fleet, 235
 Atlantic Telegraph Working, 114
 Australian Mails, The, 74
 Belgian Competition, 75
 Board of Trade and Boiler Insurance, The, 51
 Bridge Failures in the United States, 355
 Brighton Electric Railway, The, 94
 Chilled Iron and Steel Projectiles, 74
 Coal Trade Strike and London Coal, 378
 Collection and Publication of Labour Statistics by the Government, 132
 College for Colonists, A, 113
 Colonial Conference, The, 256
 Continuous Brakes on Goods Trains, 465
 Control of the London Water Supply, 422
 Cost of Treating London Sewage, The, 32
 Critical Points in Mechanical Engineering 31
 Current Half-year on Railways, The, 152
 Cylinder Condensation, 93
 Defective Weapons, 421
 Defence of our Coaling Stations, The, 75
 Depression in the Milling Trade, 508
 Drainage of Richmond, The, 52
 Economy in the Iron Trade, 32
 Education of Engineers, The, 336
 Education and Patents, 295
 Effects of Mining Rents and Royalties upon the Iron Trade, 423
 Eiffel and Jubilee Towers, The, 196
 Electric Lighting at the Indian and Colonial Exhibition, 73
 Engineers and the London Chamber of Commerce, 236
 English Girder Manufacture, 276
 Explosives Act, The Working of the, 336
 External and Internal Armour, 275
 Fiftieth Anniversary of the Railways of France The, 75
 Fire-escapes, 152
 Fires in London, 113
 Flow of Metals, The, 131
 Frauds in the Iron Trade, 196
 French Telegraph Cables, 174
 Gas Production and Distribution 175
 Great Eastern Steamship, The, 153, 275
 Hammersmith Bridge, 52
 Harbours of Refuge, 315
 Hematite Iron Production in the North 466
 High-pressure Marine Boilers, 488
 High-pressure at Sea, 443
 High-speed Engines in Cargo Boats, 236
 Hundred-and-Ten Ton Gun, The, 196
 Hydraulic Mining and the Californian River Beds, 317
 Importation of British Marked Goods, 237
 Inauguration of Chinese Railways, 465
 Industrial Exhibition in Japan, 443
 Jubilee, 507
 Locomotive Boiler Explosions in the United States, 276
 Locomotives for Australia, 337
 London Coal Duty, The, 377
 London Plumbers and the Plumbers' Company, 52
 Maligakanda Reservoir, The, 115
 Mechanism in the Battle-field, 152
 Melbourne Centennial Exhibition, The, 488
 Metalliferous Mines and Life, 356
 Methods of Paying Workers in Machine Shops, 217
 Metropolitan Sewage Disposal, 295
 Mining Machinery and Loss of Life, 444
 Naval Dock at Bombay, The, 377
 Naval Reform in France, 399
 New Northumbrian Railway, The, 296
 New Patent Fuel, A, 378
 New Russian Iron and Steel Import Tariff of the 7th of May, 1887, 378
 New South Wales Railway, The, 33
 New South Wales Railways, Proposal to Sell, 52
 New Submarine Boat, "Nordenfolt," 400
 North Eastern Railway Works, 94
 Ocean Penny Postage, 355
 Open-hearth Steel in the North-east, 217
 Our Export of Coal, 236
 Our Steamships, 423
 Overwinding at Collieries, 31
 Paris Railway Exhibition, The, 51
 Petroleum Trade of the Black Sea, 487
 Professor on Engineering Literature, A, 173
 Professors and Text Books, 256
 Proposed Canal between India and Ceylon, The, 131

LEADERS (continued):—

- Railway Bill as Amended, The, 276
 Railway Charges on Rails, 132
 Railway Half-year, The, 508
 Railway Legislation in America, 151
 Rating of Machinery, The, 173
 Rating of Machinery, The, 217
 Recent Advances in Domestic Drainage, 296
 Remarkable Patent, A, 33
 Report on the Patent Office, The, 195
 Royal Agricultural Society, The, 196
 Royal Agricultural Society's Trials, 467
 Sanitary Registration of Buildings, The, 316
 Sanitation of Indian Cities, The, 74
 Second Thames Bridge below the Tower, A, 487
 Severn Tunnel, The, 488
 Sewage Plans of the Metropolitan Board, 508
 Shipbuilding on the East Coast, 52
 Shipowners and the Port of London, 93
 Shipowners and the Triple-expansion Marine Engine, 174
 Sir J. Bazalgette and Mr. Bailey Denton, 316
 Sizes of Steamers, The, 276
 Slag as Manure, 378
 Smoke Prevention, 151
 Solingen as a Competitor, 400
 Spanish Iron Exports, 196
 Speed Experiments with Ships' Models, 316
 Steady Trains, 466
 Steamer Subsidies of the German Government, 399
 Steamships and their Loss, 508
 Steamships Lost and Sold, 74
 Steamships, Our, 337
 Strike in the Steel Trade, 94
 String Railway Brakes, 296
 Tap Cinder, 75
 Traffic of the Suez Canal, The, 422
 Treatment of Gun Steel, The, 255
 United States Railway Catastrophes, 216
 Valetta Dispute, The, 114
 Victoria University, 52
 Water Supply in the City, 337
 Webb, Mr. F. W., on Railway Brakes, 335
 Whitworth's Work, 73
 Leamington Waterworks, Mr. W. B. Purser, 375
 Leather, Mr. John Wignall, 107
- LEGAL INTELLIGENCE:
 Deacon's Patents, 88
 The Edison and Swan Electric Lighting Company v. Woodhouse and Rawson, 127
 Harris v. Rothwell, 293
 In re the Trade Mark "Normal," 180
 Shaw, Savill, and Albion Co. v. Bell-Coleman Refrigerating Co., 375
 Leinster Coalfield, Development of, by Railway Communication, 370, 437
- LETTERS TO THE EDITOR:
 A New Complaint, U., 414
 Aluminium Alloys, Eugene H. Cowles, 57
 Amendment of Specifications, Wm. Spence, 29
 Anti-friction Metal for Heavy Machinery, W. D., 31
 Arch Problem, The, H. M. Martin, 180
 Armour-plates, W. B. G., 374
 Armour Plates, Schneider v. Sheffield, Sheffieldiensis, 332
 Association of Foremen Engineers, Wm. Powrie, 136
 Automatic Calls to Distant Signals, Harold D. Smith, 374
 Behaviour of Steam in the Cylinder, D. K. Clark, 29
 Buenos Ayres Port and Harbour, Jas. Haddock, 117
 Burton-on-Trent Sewage Engines, Gimson and Co., 200
 Burton-on-Trent Sewage Engines, Gimson and Co., 229
 Burton-on-Trent Sewage Engines, W. Walker, 180, 220
 Castor Oil Presses? H. Orchard, 173
 Cement not Setting? Petros, 421
 Chenille-cutting Machines, Old Subscriber, 399
 Chilled Castings? F. F., 507
 Chinese Trade, W. Mesing, 56
 Coir Fibre Machinery? H. S. V., 215
 Colour-blindness and Engine-drivers' Eyesight, John Place, 359
 Colour-blindness and Engine-drivers' Eyesight, Clement E. Stretton, 359
 Compound Engine, Who Invented the, Robt. Gill, 70
 Compound Engines? A Southern Engineer, 215
 Compound Locomotives, H. C., 57
 Compound Locomotives, A. Mallet, 136
 Compound Locomotives, A Roundhouse Foreman in Denmark, 136
 Condensation in Steam Cylinders, Robt. Gill, 107
 Condensation in Steam Cylinders, X., 200
 Cost of Steam, Clyde, 421
 Cylinder Condensation, G. R. Bodmer, 98, 179, 220
 Cylinder Condensation, George Harrison, 136
 Development of the Leinster Coalfield by Railway Communication, Lucius J. Boyd, 437
 Differential Self-feeding Ratchet Braces? Ratchet, 399
 Dogali, The, B. Waymouth, 485
 Domestic Drainage, J. Botting, 319
 Domestic Drainage, F. Botting, 437
 Domestic Drainage, Wm. Dodds, 501
 Domestic Drainage, W. Silver Hall, 414
 Donkey Boilers, Jas. W. Beck, 99
 Donkey Boilers, Andrew Young, 145
 Drug Mills? Colonial, 215
 Early Standard Gas Threads? J. W., 295
 Education of Engineers, J. W. Davis, 501
 Education of Engineers, The, Edw. Gobert, 374
 Electric Light Illuminations, Anglo-American Brush Electric Light Corporation, 501
 Electric Light at Whiteley's, The, "Palmam qui meruit ferat," 145
 Electric Light at Whiteley's, Joseph Richmond and Co., 220
 Electric Light at Whiteley's, Woolstenhulmes, Rye, and Co., 180
 Electro-magnets? Electro-motor, 507
 Employers' Liability, Harland and Wolff, 300
 Engine-drivers' Eyesight, Clement E. Stretton, 229, 300
 Engine-drivers' Eyesight, Clement E. Stretton, 332
 Engine-drivers' Eyesight, M. Inst. M.E., 280
 Engine-drivers' Eyesight and Colour-blindness, H. C., 319
 Engine-drivers' Eyesight and Colour-blindness, John Place, 319

LETTERS TO THE EDITOR (continued):—

- Engineering in Canton, W. Mesny, 279
 Engines of the Schull and Skibbereen Tramway? W. P. S., 487
 Equipollent Arches, I. M. D., 144
 Exhibition Buildings, H. Conradi, 402
 Extraordinary Engine Trial, An, W. C. Kernot, 200
 Extraordinary Engine Trial, An, Jas. B. Lewis, 228
 Fans for Forced Blast, Fan, 402
 Fastest Vessel Afloat, The, Fair Play, 415
 Fastest Vessel Afloat, The, Fair Play, 437
 Fire-wood Cutting Machines? Firewood, 131
 Flight of the Pelican, The, I. Lancaster, 414
 Flight of the Pelican, The, Vital Spark, 437
 Free Trade, Fair Trade, and No Trade, A Trader, 484
 Friction of Engines, W. S., 136
 Gas Engine Progress, Tynesider, 117
 Gas Engines, James Atkinson, 402
 Gas Engines, W. C. Unwin, 402
 Galvanising Iron? Ferum, 151
 Government Contracts—Waste of Bolts and Rivets, Wybrow, 415
 Grain Dryers, John Whitmore, 220
 Grinding Wood? W. B., 51
 Gruel Mortar, W. Mesing, 200
 Gruson Turrets, G. C. Warden and Co., 421
 Gunstock Machinery? B. F., 151
 Heating Cocks? Constant Reader, 443
 Hoffmann Kilns? Calcium, 421
 Horse-power of Steam, The, R. Sheward, 300
 Inspecting Traction Engines, George Croll, 320
 Institution of Mechanical Engineers and the Patent Office, M. Inst. M.E., 229
 Iron Band Stands? W. S. C., 421
 "Kapunda" and "Ada Melmore," The, Stephen H. Terry, 300
 Knitting Machines? J. C., 151
 Knowles' Air Pumps? L. B. R., 255
 Larssen's Slag Cement, John Thomas, 299
 Law of Storms? Is there a, Arthur Wilson, 136
 Letter Presses? T. A., 151
 Lifeboats, Ludwig Benjamin, 8
 Lifeboats, J. H. Greenhill, 8
 Lifeboats, J. W., 8, 56
 Lighting of Lisbon, R. Giffen, 402
 Lighting of Lisbon, The, Teneriffe, 414
 Lining Cisterns? J. D., 11
 Liquid Fuel, Geo. N. Arnison, 8
 Liquid Fuel, John Duckitt, 8
 Local Government Board, The, C., 70, 107
 Local Government Board, The, J. A., 98
 Local Government Board, Saline, 28
 Local Government Board, A Voice from the Black Rod, 28
 McDonald's Hydraulic Pressure Regulator? H. H. and Co., 31
 Machinery for Galvanising Sheets? X., 195
 Machine for Drilling Bicycle Hubs and Trueing Wheels? A. S., 315
 Magnesia Bricks? C. H., 421
 Manchester Exhibition, The, John Lysaght, Limited, 377
 Manganese and Manganese Ores, Manganese, 335
 Manufacture of Pill-boxes? Pill-box, 399
 Metropolitan Sewage Disposal, Alfred S. Jones, 319
 Modern Flour Mill Machinery, Barlow and Sons, 335
 Modern Milling Machinery, J. H. Carter, 484
 Moduli of Extension and Compression, 314
 National Maritime Exhibition of Cadiz—August to October, 1887, 484
 Neutral Surface in Solid Beams, Wm. Donaldson, 29
 Newton's Third Law, Stephen Eddy, 374
 Newton's Third Law, I. Lancaster, 332
 Normal School of Science and Royal School of Mines, J. F. D. Donnelly, 56
 Northern Engineering Company, The, Schischkar and Harrison, 107
 Oatmeal Milling? Engineer, 195
 Ocean Penny Postage, J. Henniker Heaton, 437
 Old Brasses, W. A., 195
 Old Brasses, Foundryman, 280
 Otto and Atkinson Gas Engines, The, Crossley Bros., Limited, 374
 Overwinding in Collieries, A Colliery Man, 56
 Overwinding Gear, The Grange Iron Co., 485
 Painted and Tarred Ropes, Thos. W. Oliver, 319
 Paraffine Stoves, I. H. K., 235
 Patent, A Curious, N. N. N., 70
 Patent Fuel Machinery? J. R. B., 151
 Patent Office Amenities, Volvox, 8
 Patents, The Dates of, P. J. L., 280
 Petroleum Boilers? R. P., 421
 Port of Rosario de Santa Fé, Jas. Haddock, 228
 Preston and the River Ribble Navigation, Viator, 98
 Preston and the Ribble Navigation Scheme, J. B., 57, 117
 Preston and the Ribble Navigation Scheme, G. Henry Roberts, 29
 Preston and the Ribble Navigation Works, G. Henry Roberts, 98, 145, 374
 Problem of Flight, The, A. J. Crichton, 484
 Problem of Flight, I. Lancaster, 29
 Problem in Practical Mechanics, James D. MacKinnon, 145
 Proctor's Agricultural Steam Diggers, Frank Proctor, 28
 Professors and Engineers, J., 319, 402
 Professors and Engineers, W. Shairp, 402
 Professors and Students, J., 280, 358
 Professors and Students, J. T. N., 300, 332, 375
 Professors and Students, W. Shairp, 359
 Progress in Machinery, J. V. H., 280
 Pumps for Indian State Railways, Glenfield Co., (Limited), 195
 Quartz-crushing Machines? V. E. F., 215
 Rail Tops or Spear Heads, M. I. S. C., 315
 Railway Brakes, Clement E. Stretton, 220
 Railway Bridge over the Riachuelo, E. Beyershaus, 56
 Railway Bridge over the Riachuelo, Maurice F. Fitz-Gerald, 8
 Railway Bridge over the Riachuelo, T. G. Gribble, 8, 98
 Railway Rolling Stock, Fabian, 229, 320
 Railway Rolling Stock, General Expenses and Profit, 200, 299
 Refrigerating Machinery, R. Banfield, 107
 Riachuelo Bridge, The, W. C. Kernot, 228
 Riachuelo Bridge, The, W. Hugh Woodcock, 280

LETTERS TO THE EDITOR (continued):—

- Ribble Navigation, The, David Alan Stevenson, 70
 Rolling Mill Engine, Jeremiah Head, 377
 Rowing Clubs, Evan Colville Nepean, 215
 R.A.S.E. "Competitive Trials," The, Edwin Foden, 358
 R.A.S.E. "Competitive Trials," The, Richard Garrett and Sons, 358
 Royal Agricultural Society's Engine Trials, Compound Engines, 332
 Royal Agricultural Society's Engine Trials, Old Portable, 332
 Royal Agricultural Society's Engine Trials, Henry D. Marshall, 214
 Six-horse Power Engines and Pumps for the Indian State Railways, Glenfield Co., Kilmarnock, 215
 Slag Cement, J. E. Stead, 485
 Slide Valve Friction, Stephen H. Terry, 179
 Slide Valve Friction, W. Walker, 200
 Smoke Conduits, James Price, 144
 Steady Trains, Wm. James Martin, 501
 S.S. "Bentinck," John F. Elsworth, 314
 S.S. "Bentinck," H. C. P., 314
 S.S. "Bentinck," Geo. Rodger, 314
 Steel Cylinder Liners, H. S. Carington, 484
 Steel Rust? Anti-corrosion, 295
 Steel Rust, R. Hartland, 315
 Stowing Anchors? MacNicol and Co., 355
 Street-paving, H. S., 375
 Struts, Joseph Bernays, 56, 107
 Struts, The Strength of, W. E. Ayrton and John Perry, 98
 Struts, The Strength of, J. Walker, 99
 Struts, Testing, Robt. H. Smith, 70
 Sugar in Mortar, D. Marr Henderson, 220
 Sugar in Mortar, S. M., 332
 Sugar in Cement, A. Nelson Barnes, 28, 117
 Sugar in Cement, Reginald E. Middleton, 56
 Sulphur Refining Plant? C. and B., 443
 Testing Columns and Struts, Joseph Bernays, 107
 Theoretic Diagrams, J. Jennings Campbell, 501
 Theoretic Diagrams, Thos. Mudd, 485
 Theory and Practice, J. H. Williams, 180
 Tilbury Docks, C. E., 29
 Toothed v. Rope Gearing, Mancuniensis, 375
 Torpedo Boat Casualties, John Donaldson, 484
 Torpedo Boat Casualties, P. W. D., 501
 Torpedo Boat Casualties, Ernest Smythe, 501
 Torpedo Boat Casualties, One of a Torpedo Crew, 501
 Torpedo Boats' Boilers, P. H. Sadler, 437
 Torpedo Boats' Boilers, Yarrow and Co., 437
 Trent Canal, The, W. M. C., 136
 Twin Screws, Sydney W. Barnaby, 314
 Use of the Westinghouse Automatic Brake on Inclines, The Westinghouse Brake Company, 414
 Value of Science to the Engineer, Stephen Eddy, 229
 Ventilation of Sewers, The, N. E. S., 484
 Vyrnwy Liverpool Waterworks, The, Civil Engineer, 70, 117, 144
 Vyrnwy Waterworks, The, T. Hawksley, 56, 98, 136
 Vyrnwy Waterworks, J. H. L., 136
 Vyrnwy Waterworks, The, A Member, 117
 Wages in the Royal Dockyards, C., 501
 Wages at Swindon, Swindonians, 98
 Water Supply in Canton, W. Mesny, 228
 Westinghouse Brake, The, John Place, 229
 What is a Fitter? S. H. T., 319
 Whitworth's Inventions, Suum Cuique, 98
 Lever, Excentric Grip, Messrs. Langdon and Wade, 290
 Liège, Technical Bureau of the Semaine Industrielle, 504
 Lifeboat, Steam Tubular, Mr. C. Beloe, 69
 Lifeboats, 8
 "Lightfoot" Dry Air Refrigerator and Otto Gas Engine, Combined, 154
 Lining Cisterns, 11
 Liquid Fuel, 8
 Lisbon, Lighting of, 402, 414
- LITERATURE:
 Abridgment of the Specifications relating to Velocipedes, by R. E. Phillips, 33
 A Glance at our Naval Future, 1887, A. Albini, 444
 Algebra for the Use of Schools and Colleges, by Wm. Thomson, 277
 Almanach für die K. K. Kriegs Marine, 1887, 175
 Causes Scientifiques, Decouvertes and Inventions, by Henri de Parville, 132
 Construction and Equipment of Grain Magazines, by G. Luther, 489
 Conversion of Heat into Work: Practical Handbook on Heat Engines, by Wm. Anderson, 175
 Cours de Construction Navale professé à l'École d'Application du Genie Maritime, par A. Hauser, 226
 Die Galvanostegie, by Jos. Schaschi, 356
 Dynamics for Beginners, Rev. J. B. Lock, 423
 Elements of Geology, by T. Howard Gore, 337
 Engineer Studies, by Major E. M. Lloyd, 197
 Explosions in Coal Mines, by W. N. and J. B. Atkinson, 356
 Exterior Ballistics, by James M. Ingalls, 226
 Fortunes Made in Business: A Series of Original Sketches, Biographical and Anecdotic, from the Recent History of Industry and Commerce, by Various Writers, 488
 Gas Engine, The, by Dugald Clerk, 52
 Handbook of Brewing Calculations, by O. W. Villiers, 489
 History of the Theory of Elasticity and of the Strength of Materials, from Galileo to the Present Time, by the late Isaac Todhunter, 276
 Hydraulic Power and Hydraulic Machinery, by Professor Robinson, 115
 Hydraulics: The Flow of Water through Orifices, over Weirs, and through open Conduits and Pipes, by Hamilton Smith, jun., 75
 Illustrated Nautical Polyglot, by J. C. Coxe, 115
 Laxton's Builder's Price Book for 1887, originally compiled by Wm. Laxton, 337
 Les Machines Marines: Cours Professe à l'École d'Application du Genie Maritime, par A. Bienayme, 509
 Manual of Lithology, by E. H. Williams, 297
 Mechanics of the Girder, by J. D. Crehore, 297
 Mechanics of Machinery, The, by Alex. B. W. Kennedy, 378
 Minutes of Proceedings of the Institution of Civil Engineers, with other Selected and Abstracted Papers, 153

LITERATURE (continued):—

- Modern Practice of Shipbuilding in Iron and Steel, by Sam. J. P. Thearle, 467
 Origin of Mountain Ranges, Considered Experimentally, Structurally, Dynamically, and in Relation to their Geological History, by T. Mellard Reade, 400
 Practical Electric Lighting, by A. Bromley Holmes, 509
 Recent Locomotives, Enlarged Edition, Including a Chapter on Compound Locomotives, 256
 Storage of Electrical Energy, and Researches in the Effects Created by Currents Combining Quantity with High Tension, by Gaston Planté, 489
 Street's Indian and Colonial Mercantile Directory for 1886-7, 75
 Text-book of Gunnery, 1887, by Major G. MacKinlay, 489
 The A. B. C. of Modern Photography, 277
 The Portable Engine: Its Construction and Management, by Wm. Dyson Wansborough, 317
 The Steam Engine, by George C. V. Holmes, 196
 Topographical Drawing and Sketching, by Lieut. Henry A. Reed, 317
 The Watch and the Clockmaker's Handbook, Dictionary, and Guide, by F. J. Britten, 33
 Treatise on Belts and Pulleys, J. Howard Cromwell, 467
 Triangulation and Measurements of the Forth Bridge, by Reginald E. Middleton, 277
 Liverpool Water Supply, 9, 10, 34, 35, 65
 Local Government Board, 28, 70, 98, 107
 Locomotive Boiler Explosions in the United States, 276
 Locomotive by the Cockerill Co., Athus Iron and Steel Works, 503
 Locomotive, Compound Goods, the N.E. Railway (Supplement, February 18th, 1887), 24, 30, 128, 155
 Locomotive, Consolidation Narrow Gauge, Messrs. Sharp, Stewart, and Co., 396
 Locomotive, Contractor's, 191
 Locomotive Engine, Birmingham and Derby Junction Railway, 1838, 6, 9
 Locomotive Engine, Compound Passenger, Von Borrie's System, Hanover Railway, 210, 211
 Locomotive History on the S.W. Railway (Supplement, March 11th, 1887), 198, 218
 Locomotive, Six-Coupled, for 3ft. 6in. Gauge, 464
 Locomotives, Mr. R. S. Mytton, 440
 Locomotives for Australia, 337
 Locomotives on the Belgian State Railway, 278, 279, 290, 294, 313, 314
 Locomotives, Compound, 57, 70, 136, 215
 London and Brighton Railway, Crank Axles, 176
 London Coal Duty, The, 377
 London, Fires in, 113
 London, Health of, 8
 London Plumbers and the Plumbers' Company, 52
 London Sewage, The Cost of Treating, 32, 295
 London Sewage, New Precipitation Works at Barking, 83, 84, 85, 108, 109
 Lubricants and Lubricating Apparatus, Mr. P. T. Gask on, 189
 Luton, New Sewage Pumping Engines, 467
- MCDONALD'S Hydraulic Pressure Regulator, 31
 Machine Shops, Methods of Paying Workers in, 217
 Magazine and Repeating Arms, 188
 Magnesia in Portland Cement, 219
 Maligakanda Reservoir, The, 115, 205
 MANCHESTER EXHIBITION, 325, 345, 377, 438
 Bevel Wheel Cutting Machine, Messrs. Smith and Coventry, 345
 Compound Engine, Messrs. Ruston, Proctor, and Co., 348
 Cotton Machinery at, 390, 489
 Details of Dome, Messrs. Maxwell and Tuke, 346
 Electric Light Engines, Messrs. Mather and Platt, 389, 438
 Engine, Horizontal, with Automatic Cut-off Gear, Messrs. Tangye, 439
 Exhibition Buildings, The, Messrs. Maxwell and Tuke, 346, 351
 Gas Hammer, Robson's, 439
 High-speed Engine, Messrs. Tangye, 439
 Hoist and Crab, Mark's Patent Self-sustaining, Messrs. Tangye, 442
 Hydraulic Pulley Jack, Messrs. Tangye, 440
 Pumps, High Lift Colonial and Circulating, Messrs. Tangye, 442
 Rolling Mill Engine, Newport Mills, Middlesbrough, Mr. J. Head, 349
 Sawing Machine, Messrs. Lee and Hunt, 345
 Spindle Capstan Rest Chasing Lathe, Messrs. Smith and Coventry, 347, 348
 Turbines at the, 484
 Turret Lathe for Brass Finishing, Cooper's, 347
 Manchester Ship Canal, The, 403
 Manganese Steel, Pfeil's "Retort," 230
 Measuring Instruments for Mechanical Testing, 405
 Mechanical Cream Separation, 305, 306
 Mechanical Engineering, Critical Points in, 31
 Mechanical Engineers, Early Training of, 462
 Mechanism in the Battle-field, 152
 Mechernich Mines, Hydraulic Separators at the, 238
 Melbourne Centennial Exhibition, The, 1888, 488
 Merchant Service and the Royal Navy, Sir N. Barnaby on the, 257, 260
 Metal Trades Displays at Birmingham, The, 239
 Metalliferous Mines and Life, 356
 Metropolitan Railway of Berlin, The, 250, 251, 254
 Metropolitan Sewage Disposal, 32, 295, 319
 Metropolitan Sewage Disposal, Sir J. Bazalgette and, 316
 Mild Steel in the Manufacture of Pates, Treatment of, 445
 Military Aeronauts, 171
 Milling Machinery, Modern, 484
 Milling Trade, Depression in the, 492, 508
 Mining Machinery and Loss of Life, 444
 Mining Rents and Royalties upon the Iron Trade Effect of, 423
 Mint, The, 451
 Miscellanea, 5, 25, 45, 71, 92, 118, 130, 149, 167, 193, 213, 233, 249, 273, 289, 311, 329, 362, 371, 398, 419, 441, 463, 481, 505
 Mississippi Levees, 229
 Moduli of Extension and Compression, 314
 Moon, Mr., on Continuous Brakes 127

Morbid Anatomy of Ships, 163
 Mortar, Gruel, 200
 Mougin Disappearing Turret, The, 109
 Mumford and Moodie's Blast and Exhaust Separator, 310

NAVAL Dock at Bombay, The, 377
 Naval Engineer Appointments, 18, 54, 78, 96, 111, 153, 197, 212, 243, 290, 354, 403, 445, 476, 509
 Naval Reform in France, 399
 Navigation in Central Asia, 19
 Navigation Works, Preston and the Ribble, 374
 Neutral Surface in Solid Beams, 29
 New Companies, 19, 39, 61, 81, 101, 120, 139, 161, 183, 203, 223, 243, 263, 283, 303, 323, 343, 365, 387, 407, 431, 451, 475, 495, 515
 Newcastle Boiler Insurance Company, The, 189
 NEWCASTLE EXHIBITION, 245, 453
 Armstrong's 110½-ton Gun, Figs. 1 and 2, 368
 Automatic Air Valve, Messrs. Watson and Sons, 411
 Breech-loading (6in.) Gun on Disappearing Carriage, Messrs. Sir W. Armstrong and Co., Figs. 3 and 4, 372
 Clip for Railway Chairs, Messrs. Goodwin and How, 455
 Coal Getter, Haswell's Mechanical, 456
 Coal Wedge, Messrs. Bell Brothers, 383
 Coking Oven, Improved, Jameson's, 383, 453
 Corrugated Tire, Fox's Patent, 453
 "Deadlock" Fastening for Wheels and Axles, Bailey's, 454
 Double-acting Horizontal Mine Pump, The Grange Iron Co., 456
 Dynamo Mounted on Four-horse Otto Gas Engine, 409
 Electric Lamp for Divers, Mr. R. Applegarth, 453
 Elephant Sectional Gun, Fig. 7, 369
 Elswick, Exhibits at, 367
 Feed Heater, Messrs. Richard Garrett and Sons, 411
 Flue, The Farnley, 411
 Four-deck Steel Cage, Messrs. Joseph Cook and Son, 454
 Gauge for Measuring Gases, Jameson's, 383, 453
 Hauling Engine, Self-contained Underground, The Grange Iron Co., Figs. 1 and 2, 461
 High-speed Horizontal Engine, The Grange Iron Co., Figs. 3 and 4, 461
 Hydraulic Drill, Mr. A. R. Steavenson, 383
 Locomotive, Six-coupled, for 3ft. 6in. Gauge, Messrs. R. and W. Hawthorn, Leslie and Co., 464
 Machinery at, The Grange Iron Company, 461
 New 30-pounder Quick Firing Gun, Fig. 9, 368
 Oiling Apparatus, Sellar's Automatic, 409
 Oriental Steam Pumps, Messrs. Watson and Sons, 410
 Overwinding Gear for Mines, The Grange Iron Company, 455
 Piston Packing, Mr. Cameron, 453
 30-pounder Rapid Fire Breech-loading, Figs. 5 and 6, 369
 Pumping Engine, Duplex, Messrs. Fielding and Platt, 454
 Steel Chair, Messrs. Jas. H. Tozer and Sons, 453
 Strainer, Miller's Patent, 410
 Valve, Fothergill's, Figs. 1 and 2, 410
 Newhaven Sewerage, 46
 New South Wales Railway, The, 33
 New South Wales Railway, Proposal to Sell, 52
 New's Beam Bending and Punching Machine, 231, 237
 Newton's Third Law, 332, 374
 Nicaragua Canal, Ratification of the Menscal Contract for the, 359
 Nordenfelt New Submarine Boat, 400
 Nordenfelt Submarine Boat at Constantinople, The, 499
 Nordenfelt, The Submarine Torpedo Boat, 444
 Nordenfelt Submarine Boats for Turkey, 103, 105
 Normal School of Science and Royal School of Mines, 56
 North-Eastern Railway Compound Express Engine, 87, 97
 North-Eastern Railway Compound Goods Engine, (*Supplement, February 18th, 1887*) 24, 30, 128
 North-Eastern Railway Works, 94
 North of England, The, 18, 38, 59, 80, 100, 120, 138, 160, 182, 202, 222, 242, 262, 282, 302, 322, 342, 362, 386, 406, 430, 450, 473, 494, 513
 North Sea and Baltic Canal, The, 479
 Northern Engineering Company, The, 107
 Northumbrian Railway, The New, 296
 Notes from Scotland, 18, 38, 60, 80, 100, 120, 138, 160, 182, 202, 222, 242, 262, 282, 302, 322, 342, 364, 386, 406, 430, 450, 474, 494, 514
 Notes from Germany, 17, 38, 60, 80, 100, 138, 160, 182, 202, 222, 242, 262, 282, 301, 322, 342, 364, 386, 406, 430, 450, 474, 494, 514
 Notes from Lancashire, 18, 37, 59, 79, 99, 119, 137, 159, 181, 201, 221, 241, 261, 281, 301, 321, 341, 363, 385, 405, 429, 449, 473, 493, 513
 Notes and Memoranda, 5, 25, 45, 71, 92, 118, 130, 149, 167, 193, 213, 233, 249, 273, 289, 311, 329, 362, 371, 398, 419, 441, 463, 481, 505
 Notices to Correspondents, 11, 31, 51, 73, 93, 113, 131, 151, 173, 195, 215, 235, 255, 275, 295, 315, 335, 355, 377, 399, 421, 443, 465, 487, 507

OBITUARY:

Andrew, Sir W. P., 218
 Binns, Mr. Charles, 67
 Bolton, Sir Fred., 36
 Denny, Mr. William, 237
 Eads, Capt. James Buchanan, 210
 Fox, Mr. Sam., 171
 Green, Mr. Sam., 415
 Husband, Mr. Wm., 361
 Jacob, Mr. Wm., 437
 Leather, Mr. John Wingall, 107
 Ordish, Mr. R. M., 220
 Rich, Mr. W. E., 9
 Roach, Mr. John, 49
 Stevenson, Mr. Thos., 385
 Tarbotton, Mr. Marriott Ogle, 218
 Whitworth, Mr. Joseph, 75
 Ocean Penny Postage, 355, 437
 Oil Cup, Improved, 146
 Oiling Apparatus, Sellar's Automatic, 439
 Omnibuses with Gas, Lighting, 322
 Open-hearth Steel in the North-east, 217
 Open-hearth Steel Plant, Messrs. Thwaite and Stewart, 470

Ordish, Mr. R. M., 220
 Ore Crusher and Amalgamator, Williams', 231
 Osgood Excavator, The, 3, 4
 Ottawa Ship Canal Scheme, The, 300
 Otto and Atkinson Gas Engines, The, 374
 Overwinding in Collieries, 31, 56
 Overwinding Gear, 485
 Overwinding Gear for Mines, The Grange Iron Company's, 445, 455

PACIFIC Steam Navigation Company's Royal Mail Steamer "Oroya" (*Supplement, March 25th, 1887*), 234, 237, 251, 290
 Packing, Reinhold's Cork Core, 107
 Paddle Wheels, Feathering, s.s. "Normandy" and "Brittany," Mr. W. Stroudley, 427
 Paints and Compositions, Dangerous, 116
 Panama Canal, The, 121, 498
 Panama Canal, Notes on the, Mr. R. Nelson Boyd, 293, 318
 Paraffine Stoves, 235
 Paris Exhibition, 1889, Roof of Machinery Hall, 502, 506
 Paris Railway Exhibition, The, 51
 Pasquier's Safety Stop Valve, 46
 Patent, A Curious, 70
 Patent, A Remarkable, 33
 Patent Office Amenities, 8
 Patent Office, Report on the, 195
 Patents, Education and, 295
 Patents, The Dates of, 280
 Paying Workers in Machine Shops, Methods of, 217
 Pencil-making Machinery, Messrs. Wilson and Co., Saltaire Exhibition, Fig. 4, 434
 Permanent Way—"Centre-bearing" and "Side-bearing" Rails, 472
 Permanent Way, Howard's New Sleepers, Figs. 2 and 3, 395
 Permanent Way for Indian State Railways, 157
 Permanent Way Steel Chair, Messrs. James H. Tozer and Sons, 453
 Petroleum Engine, Spiel's, 50, 54
 Petroleum Trade of the Black Sea, The, 487
 Pfeil's "Retort" Manganese Steel, 230
 Pier at Salto, on the River Uruguay, 291
 Pier Tube Rivetting Cage, Forth Bridge, 192, 194
 Pin-making Machine, The Stroudwater Pin Company, Figs. 1, 2, 3, 4, 434
 Piston Packing, Mr. Cameron, 453
 Planing Machine, Double-acting, 271
 Plate-bending Machine, Large Horizontal, Messrs. Berry and Sons, 401, 403
 Ploughing Engine Boiler, An Exploded, 6, 9
 Plumbers' Company, London Plumbers and the, 52
 Pontoon Bridge, The Berthon, 259
 Port of Rosario de Santa Fé, 228
 Portland Cement, Magnesia in, 219
 Portland Cement, Tests at Long Dates, R. E. Middleton on, 395
 Power Hammers, Messrs. Wild and Co., 417
 Practical Mechanics, Problem in, 145
 Precipitation Works at the Barking Sewage Outfall, 83, 84, 85, 108, 109
 Presses, Compound Steam and Hydraulic Cotton, Mr. W. Turner, 491, 510
 Pressure Gauge, M.M. Teudloff and Corthym, 468
 Preston and the Ribble Navigation Scheme, 29, 57, 70, 98, 117, 145, 374
 Printing Machinery, Mr. E. A. Clowes on, 300, 320
 Private Bill Legislation, 156, 232, 462
 Private Bills in Parliament, 307
 Private Bills, Prospective, 33
 Problem of Flight, The, 29, 484
 Problem in Practical Mechanics, 145
 Proctor's Agricultural Steam Diggers, 28
 Professors and Engineers, 319, 402
 Professors and Students, 280, 300, 332, 358, 359, 375
 Professors and Text-books, 256
 Progress in Machinery, 280
 Propositions on the Direct Motion of Steam Vessels, 497
 Puddling Furnaces, 39
 Pulsometer and Boiler, Portable, The Pulsometer Engineering Company, 468
 Pump Blade, Centrifugal, Mr. C. Brown, Fig. 6, 433
 Pump, Carré's Boiling Water, 417
 Pump, Centrifugal, Messrs. J. and H. Gwynne, 433
 Pump, Double-acting Horizontal Mine, The Grange Iron Company, 456
 Pumping Engines, Burton-on-Trent Sewage Works, 146
 Pumping Stations, Cost of, 163
 Pumps, Horizontal Direct-acting Hydraulic Power, 510
 Pumps for Indian State Railways, 195
 Pumps for Italy, Another Set of Large, 53
 Pumps, Oriental Steam, Messrs. Watson and Sons, 410
 Pumps, Messrs. Tangye's High-lift Colonial and Circulating, 442
 Purifier, A New, Messrs. Thos. Robinson and Son, 460

QUEEN and the Civil Engineers, The, 412
 Queensland, Floods in, 240
 Queruel Engine, Compound, 72

RADIAL Drill, Large Heavy, 258
 Radial Drilling Machine, 175
 Railway Accidents in America, 290
 Railway Bill, The, 185
 Railway Bill as Amended, The, 276
 Railway Brakes, 220
 Railway Brakes, String, 296
 Railway Bridge over the Riachuelo, 8, 56, 98, 228, 280
 Railway Charges on Rails, 132
 Railway Disasters in the United States, 246
 Railway, An Early, 19
 Railway Exhibition at Paris, 36
 Railway Ferry over the Ganges, 198, 199
 Railway Half-year, The, 508
 Railway Legislation, 178
 Railway Legislation in America, 151
 Railway Matters, 5, 25, 45, 71, 92, 118, 130, 149, 167, 193, 213, 233, 249, 273, 289, 311, 329, 362, 371, 398, 419, 441, 463, 481, 505
 Railway, The New Northumbrian, 296
 Railway, Opening of a Section of the Assam-Bihar State, 283
 Railway Points, Barr and Langley's, 164

Railway, The Proposed Lake District, 94
 Railway Rolling Stock, 200, 229, 299
 Railway Swing Bridge over the Masnedund, Denmark, 171, 172
 Railway, The Current Half-year on, 152
 Railways of France, Fiftieth Anniversary of the, 75
 Rain as a Geologic Agent, 202
 Raising Water, Machines for, 83
 Ransome's Improvements in the Manufacture of Portland Cement, Mr. R. J. Friswell, 177
 Rating of Machinery, The, 173, 217
 Refrigerating Machinery, 107
 Refrigerating Machinery on Board Ship, 364
 Refrigerator, "Lightfoot" Dry Air, and Otto Gas Engine Combined, 154
 Reinhold's Cork Core Packing, 107
 Report on the Patent-office, 195
 Reschitza Iron and Steel Works, Electric Lighting at the, 298
 Resecop Canal, The, 61
 Reservoir Dams, Mr. David Gravel on, 187, 189, 207, 208
 Resistance of Materials, A New View of the, by W. C. Unwin, 2
 Resistance of Slide Valves, 78
 Reversible Lead Batteries and their use for Electric Lighting, by Desmond G. Fitz-Gerald, 239, 269
 Rewards to Inventors, 36
 Riachuelo Bridge, The, 8, 56, 98, 228, 280
 Ribble Navigation, The, 29, 57, 70, 98, 117, 145
 Rich, Mr. W. E., 9
 Richmond, The Drainage of, 52
 Richmond's Valve Gear, Electric Light Engines, Details of, 126
 Rivet Pitch Calculator, A, 55
 Rivetting Machine, Allen's Portable Pneumatic, 35
 Roach, Mr. John, 49
 Road-making, Economical, Mr. Bracegirdle on, 49
 "Rocket" at the Liverpool Exhibition, The, 150, 153
 Rolling Contact of Bodies, The, 415
 Rolling Mill Engine, 377
 Rolling Mill Engine with Variable Expansion, Newport Mills, Middlesbrough, 349, 360
 Rolling Stock, Railway, 320
 Roof of the Great Machinery Hall, Paris Exhibition, 1889, 468, 469
 Ropes, Painted and Tarred, 319
 Ross's System of Lighting with Oil, 482
 Rowan's Steep-grade Tramway Cars, 116
 Rowing Clubs, 215
 Royal Agricultural Society, The, 196
 R.A.S.E. "Competitive Trials," 358
 Royal Agricultural Society's Engine Trials, 314, 332, 492
 Royal Agricultural Society's Trials, 467

ROYAL DUBLIN SOCIETY:
 Irish Metal Mines, Mr. G. H. Kinehan, 456
 Royal National Lifeboat Institution, 361
 Rudder of "El Destructor," 27
 Russian Iron and Steel Import Tariff of the 7th of May, 1887, 378
 Safety Detaching Hook, Messrs. King and Humble's, 55
 Salt, Manufacture of, near Middlesbrough, Sir L. Bell, 428
 Salt for the Removal of Snow, Employment of, 4
 SALTAIRE EXHIBITION, 434
 Carpet Beating Machine, Messrs. Simon and Tullige, Fig. 6, 395
 Engine Crank, Midland Passenger Engine, Mr. S. W. Johnson, Fig. 1, 395
 Match-making Machinery, Messrs. Seanor and Sons, 433
 Pencil-making Machinery, Messrs. Wilson and Co., 434
 Pin-making Machinery, The Stroudwater Pin Company, 434
 Sleepers, Howard's New, Figs. 2, 3, 395
 Stamped Goods, Mr. J. Grimshaw, Fig. 7, 395
 Valve with Removable Seat, Mr. J. C. Willis, Figs. 8, 9, 395
 Wave Line Steel Tire Bars, Mr. W. Fox, Fig. 4, 395
 Wrought Iron Dome, The Lowmoor Company, Fig. 5, 395

Salto, on the River Uruguay, Pier at, 291
 Sandberg's Goliath Rails, 243
 Sanitary Registration of Buildings, 316
 Sanitary Registration of Buildings Bill, 24
 Sanitation of Indian Cities, The, 74
 Sawing Machine, Messrs. Lee and Hunt, 345
 Scarborough New Sea Wall and Promenade, 28
 Science and the Jubilee, 361
 "Scoop" Wheel, The, for Lifting Water, 225
 "Scoop" Wheels, Pothole, Deeping Fen, 478
 Screw Propeller Efficiency, 141, 205
 Screw Vice, Rapid Action, Messrs. Entwistle and Kenyon, 470
 Selected American Patents, 20, 40, 62, 82, 102, 121, 140, 162, 184, 204, 224, 244, 264, 284, 304, 324, 344, 366, 388, 408, 432, 452, 476, 516
 Separator, Cream, 305, 306
 Separator, Mumford and Moodie's Blast and Exhaust, 310
 Severn Tunnel, The, 488
 Sewage, London, 32, 295
 Sewage Plans of the Metropolitan Board, 508
 Sewage Sludge and its Disposal, 157
 Sewage Sludge at Lincoln, 459
 Sewerage and Sewage Works, Hendon, 353, 354
 Sewerage of Towns, Mr. Joseph Pickering on the, 154
 Sheffield District, The, 18, 38, 59, 80, 100, 119, 137, 159, 181, 202, 222, 241, 261, 281, 302, 321, 341, 363, 386, 406, 429, 450, 474, 493, 513
 Sheffield Waterworks Contest, The, 258
 Shifting of Cargoes, Professor Jenkins on the, 286
 Shipping Economy, 305
 Shipbuilding on the Clyde, 46
 Shipbuilding on the East Coast, 52
 Shipowners and the Port of London, 93
 Shipowners and the Triple Expansion Marine Engines, 174
 Shipping Project at Cardiff, A New, 80
 Ships, Morbid Anatomy of, 163
 Slag Cement, 485
 Slag Cement, Larssen's, 299
 Slag as Manure, 378
 Slide Valve Friction, 179, 200
 Slide Valves, Resistance of, 78
 Smith's Sugar Evaporating Pan, 68
 Smoke Conduits, 144
 Smoke Prevention, 151
 Society of Arts, 24
 Society, The Bath and West of England Agricultural, 76

SOCIETY, BRISTOL NATURALISTS', ENGINEERING SECTION:
 Stationary Engines, Mr. G. W. Sutcliffe, 248
 Society, The City of London College Science, 36
 Society, The Dundee Mechanical, 468, 472
 SOCIETY OF ENGINEERS, THE:
 Presentation of the Premiums for Papers read during the Past Year, 128
 Refrigerating Machinery on Board Ship, Mr. T. B. Lightfoot, 364
 Renewal of Roof over Departure Platform at King's Cross Terminus, Mr. R. M. Bancroft, 475
 Visit of the Members to Messrs. Aveling and Porter's Works at Rochester, 492
 Society of Engineers, The Amalgamated, 394
 SOCIETY OF ENGINEERS, THE DERBY:
 The Westinghouse Brake and its Working, Mr. Sam Waddington, 197
 SOCIETY, GREAT WESTERN RAILWAY, WOLVERHAMPTON, STAFFORD-ROAD JUNIOR ENGINEERING:
 Dynamo-electric Machinery, Mr. E. Yates, 272
 SOCIETY, THE JUNIOR ENGINEERING:
 Early Training of Mechanical Engineers, Mr. S. H. Wells, 462
 Fallacies of Perpetual Motion, On the, Mr. W. J. Tennant, 192
 Relation of Chemistry to Engineering, Prof. H. E. Armstrong, 110
 Steam Jacketting, Mr. R. G. Bleasby, 328
 Torpedo Boats and Machinery, Mr. Chas. Smith on, 277
 SOCIETY, KING'S COLLEGE ENGINEERING, 67
 Inaugural Address of Mr. C. S. Vesey Brown, 67
 Characteristics of Dynamos, Mr. G. L. Hodgson, 99
 Fire Engines, Mr. V. J. Bonton, 440
 Locomotives, Mr. R. S. Mytton, 440
 Lubricants and Lubricating Apparatus, Mr. P. T. Gask, 189
 Secondary Batteries, Mr. A. H. Preece, 115
 Telephones, Mr. J. R. Brydges, 161
 Visit of the Society to the Engineering Laboratory, University College, 142
 SOCIETY OF CIVIL AND MECHANICAL ENGINEERS, 145
 Notes on the Panama Canal, Mr. R. Nelson Boyd, 293
 Reservoir Dams, Mr. David Gravel, 189
 Society, Leeds Engineering, 68
 SOCIETY, THE LIVERPOOL ENGINEERING, 178, 415
 Compound Engines for Atlantic Steamers, Mr. J. Jennings Campbell, 447
 Force of Water, The, Mr. A. W. Brightmore, 61
 Paper by Professor Hele Shaw upon the Steam Engine, 178
 Submarine Vessels, Mr. J. F. Waddington, 451
 SOCIETY, THE MASON COLLEGE ENGINEERING:
 Inaugural Address of the President, Professor R. H. Smith, 209
 SOCIETY OF MECHANICAL ENGINEERS, THE AMERICAN, 385
 Friction of Non-condensing Engines, On the, Professor R. H. Thurston, 96
 Notes on the Working Stress on Iron and Steel, Mr. Benjamin Baker, 48
 SOCIETY, THE PHYSICAL:
 Delicate Calorimetric Thermometers, and on Expansion of Thermometer Bulbs under Pressure, Professor Pickering, 407
 Measuring Instruments used in Mechanical Testing, Professor W. C. Unwin, 405
 New Measuring Instruments used in Testing Materials, by Professor W. C. Unwin, 78
 Note on Beams Fixed at the Ends, Professors Ayrton and Perry, 509
 Permanent and Temporary Effects on Some of the Physical Properties of Iron Produced by Raising the Temperature to 100 deg. Cent., by Mr. Herbert Tomlinson, 78
 Production, Preparation, and Properties of the Finest Fibres, On the, Mr. C. V. Boys, 283
 Transformers for Electric Distribution, Note on, Dr. S. P. Thompson, 475
 Society, The Steam Engine Makers', 133
 SOCIETY OF TELEGRAPH ENGINEERS AND ELECTRICIANS:
 Reversible Lead Batteries and their Use for Electric Lighting, by Desmond G. Fitz-Gerald, 239, 269
 SOCIETY, UNIVERSITY COLLEGE ENGINEERING:
 Fuel, Mr. A. Forbes, 445
 Sodium, New Method of Producing, 509
 Solingen as a Competitor, 400
 Southampton Deep Water Dock, 460
 Southampton Waterworks, 253
 South Chicago Works of the North Chicago Rolling Mill Company, Mr. E. C. Potter, 445
 South Kensington, Sale of the Engines, Machinery and Electrical Plant at, 107
 South Kensington Museum, 18, 77, 88, 117, 132, 186, 220, 333, 387, 460
 South-Western Railway, Locomotive Engines on the, from 1851 to 1886 (*Supplement, March 11th, 1887*), 198, 218
 Spanish Iron Exports, 196
 Spanish Iron Ore, 492
 Spanish Ordnance, 170
 Speed Experiments with Ship's Models, 316
 Spiel's Petroleum Engine, 50, 54
 Stability Calculations, Mr. A. Denny on the Practical Application of, 286
 Stability of Walls at Openings, 312
 Stamped Goods, Mr. J. Grimshaw, Fig. 7, 395
 Stanley Exhibition of Cycles, The, 134
 Staveley Iron Company, Chesterfield, London Agents of the, 354
 Steady Trains, 466, 501
 Steam Cars for Steep Gradients, Rowan's, 116
 Steam, Cost of, 421
 Steam in the Cylinder, Behaviour of, 29
 Steam Engine Tests at Newcastle-on-Tyne, 504
 Steam Jacketting, 328
 Steam Thrashed and Agricultural Engines, 479
 Steam Thrashed Wheat in India, 512
 Steam Yacht "Chemcheck," The, 210, 214
 Steamer for Java, Light Draught River, 177
 Steamer Subsidies of the German Government, 399
 Steamer, Twin-screw Light Draught River, for Nicaragua, 27
 Steamers, The Sizes of, 276
 S.S. "Bentinck," 314
 S.S. "Bentinck" Indicator Diagrams, 286, 287
 Steamship Economy, 148
 Steamship Efficiency, 435
 S.S. "Manauense," The (*Supplement, May 20th 1887*), 394, 397

- S.S. "Oroya," The (*Supplement, May 6th, 1887*), 357, 358
- S.S. "Oroya," Cross Section through Boiler and Engine Rooms, 234, 237, 290
- Steamships and their Loss, 508
- Steamships Lost and Sold, 74
- Steamships, Our, 337, 423
- Steamships, Size of Ocean, 60
- Steel Armour-plates and Gun-forgings in the U.S. The Bids for, 387
- Steel Cage, Four Deck, Messrs. Joseph Cook and Son, 454
- Steel Chains without Welding, The Manufacture of, 179
- Steel Cylinder Liners, 484
- Steel and Iron, Patent Composite, Mr. G. Allan, 428
- Steel Masts for Floating Lights, 359
- Steel, Open-hearth, in the North of England, 217
- Steel Shafting, Tests of, 200
- Steel and Steel-faced Armour, 288
- Steel Tire Bars, Wave Line, Mr. W. Fox, Fig. 4, 395
- Steel Tug "Jubilee," The, Messrs. Steward and Latham, 457, 460
- Steel Works at Middlesbrough, New, 189
- Step Cone Fire-box, Partington's, 210
- Stone Moulding and Dressing Machine, 340
- Stop Watches and Chronographs, 267
- Strainer, Miller's Patent, 410
- Street Paving, 375
- Strike in the Steel Trade, 94
- String Railway Brakes, 296
- Struts, 56, 98, 99, 107
- Struts, The Strength of, 98, 99
- Struts, Testing, 70, 107
- Submarine Vessels, Mr. J. F. Waddington, On, 451
- Suez Canal, Traffic of the, 422
- Sugar in Cement, 28, 56, 117, 220
- Sugar Machinery, Improved, 68, 77
- Sugar in Mortar, 332
- SUPPLEMENTS:
- Compound Converted Engines of the s.s. "Manauense," Messrs. D. Rolls and Sons, May 20th, 1887
- Compound Engines of the s.s. "Poplar," The Central Engineering Co., February 4th, 1887
- Compound Passenger Engine, North-Eastern Railway, Mr. T. W. Worsdell, June 3rd, 1887
- Forth Bridge, The New Queensferry Cantilever Pier in Course of Construction, Sir John Fowler and Mr. Benjamin Baker, February 4th, 1887
- Hammersmith Bridge, The New, Sir Joseph Bazalgette and Mr. Edw. Bazalgette, April 22nd, 1887
- Locomotive Engines on the South-Western Railway from 1851 to 1886
- Triple Expansion Engines of the Royal Mail Steamer, "Oroya," The Barrow Shipbuilding Co., May 6th, 1887
- Swanwick Sewage Farm, 46
- TANGYIE, Messrs., Machinery at the Manchester Exhibition, 442
- Tanks and Reservoirs, Repairing, Mr. Wm. T. Lees, 417
- Tap Cinder, 75
- Tarbottom, Mr. Marriott Ogle, 218
- Tay Bridge, The New, 370, 373, 376
- Tees Bay, Effect of Tipping Slag in the, 492
- Telegraph Cables, French, 174
- Telegraphy, The Past and Present, Mr. E. Dodd, On, 277
- Telephones, Mr. J. R. Brydges, 161
- Telford and the Shropshire Roads, 58
- Temperature and Pressure in Jamaica, 384
- TENDERS:
- Birmingham Central Tramways Co., Limited, 269
- Bristol Docks, Mr. John Ward Girdlestone, Engineer, 107
- Corporation of Leicester, 415
- Corporation of Leicester, Flood Works, 253
- Hornsey Local Board, 314
- Leicester Public Baths, 361
- Macadam Roadway, 459
- New Main Sewers, 333
- Railway Fencing, 459
- Southampton Waterworks, 253
- Swanwick Sewage Farm, 46
- Wirral Rural Sanitary Authority and Wirral Highway Board, 253
- Wrought Iron Hurdle Fencing, 459
- Tenders for Rabbit-proof Fence along the South Australian Border, 146
- Terni Steelworks, The, 246
- Terni Steelworks, Notes on, Sir B. Samuelson, 428
- Testing Columns and Struts, 70, 107
- Tests of Steel Shafting, 200
- Thames Bridge Below the Tower, A Second, 487
- Thames Embankment, A New, 18
- Theoretic Diagrams, 485, 501
- Theory and Practice, 180
- Thermometers, 407
- Thornycroft Fire-boxes, 485
- Threshing Implement from Tunis, Archaeological, 436
- Thwaite-Neville Warehouse Crane, The, 97
- Tilbury Docks, 29
- Tin, Important Discovery of Stream, 164
- Tire, Corrugated, Mr. Fox, 453
- Tonnage of Shipping at the Beginning of 1887, 148
- Tonnage of Vessels commenced during the Last Quarter of 1886, 145
- Toothed *v.* Rope Gearing, 375
- Torpedo Boat Casualties, 404, 484, 501
- Torpedo Boat Catchers, 53
- Torpedo Boat for the Chinese Navy, High Speed, 312
- Torpedo Boat for the Italian Government, Trial of, Messrs. Yarrow and Co., 326
- Torpedo Boat, Results of a Series of Speed Trials at Cherbourg on a, M. L. de Bussy, 257
- Torpedo Boat, Trial of the Fastest, in H.M.'s Navy, 396
- Torpedo Boat Trials, 375
- Torpedo Boat Trials, Mr. Robert Mansel on, 325
- Torpedo Boat for Turkey, 128
- Torpedo Boat, Twin-screw, 237
- Torpedo Boats, 70
- Torpedo Boats' Boilers, 437
- Torpedo Boats and Machinery, Mr. Chas. Smith on, 277
- Torpedo Cruiser, "El Destructor," 26, 27
- Torpedo, The Lay, 191
- Traction Engine and Crane Combined, Messrs. Burrell and Co., 482, 483
- Trade Depression, 41
- Tramway Trains, 436
- Transformers for Electric Distribution, Note on, Dr. S. P. Thompson, 475
- Trent Canal, The, 136
- Trent Navigation Scheme, The, 426
- Trial Trip, A Remarkable, 326
- Trinity House, Spherical and Conical Buoys, 230
- Turbine, 500-H.P. Victor, 46
- Turbines at the Manchester Exhibition, 484
- Turret Pulley and Wheel-boring Machine, Upright, Messrs. John Bertram and Sons, 502
- Twin Gas Producer, Mr. B. H. Thwaite's, 77
- Twin-screw Torpedo Boats, "Wiborg" and "Destructor," Mr. Biles on the, 257
- Twin Screws, 314
- Twin Screws, Some Recent High-speed, Mr. E. A. Linnington, 292
- Tynemouth Fortifications, The, 217
- Types of Some New Cruisers, 185
- "UNION" Storage Battery, The, 17
- United States Navy, The, 310
- United States Railway Catastrophes, 216
- Units of Weight, Mass, and Force, 253
- Utilisation of Old Setts, Broken Flags, and Stone Refuse, &c., 436
- VACUUM Sugar Evaporating Plant, 68, 77
- Valetta Dispute, The, 114
- Valve, The Dennis Fullway, 238
- Value of Science to the Engineer, 229
- Valve, Automatic Air, Messrs. Watson and Sons, 411
- Valve, Fothergill's, Figs. 1, 2, 410
- Valve, Pasquier's Safety Stop, 46
- Valve with Removable Seat, Mr. J. C. Willis Figs. 8 and 9, p. 395
- Ventilation of Sewers, The, 484
- Vice, The Ewbank, 470
- Victoria University, 52
- Vyrnwy Masonry Dam—Liverpool Waterworks 9, 10, 34, 35, 65
- Vyrnwy Waterworks, 56, 70, 98, 117, 136, 144
- WAGES in Great Britain, 1, 21, 41, 63, 124, 166, 206, 245, 328, 412, 498
- Wages in the Royal Dockyards, 501
- Wages at Swindon, 98
- Wakefield Water Supply, The, 240
- Wales and Adjoining Counties, 18, 38, 60, 80, 100, 120, 138, 160, 182, 202, 222, 242, 262, 282, 302, 322, 342, 364, 386, 406, 430, 450, 474, 494, 514
- War Stores for the Service, Report of the Royal Commission on the System of Adopting and Passing, 458
- Water Gauge, Eddington and Stevenson's, 176
- Water-raising Machines, 226
- Water Supply, 17
- Water Supply in Canton, 228
- Water Supply in the City, 337
- Water Supply from Wells, 403
- Water-tight Bunker Doors, 35
- Webb, Mr. F. W., on Railway Brakes, 335
- Weeks' Annular Pipe-heating Apparatus, 77
- Weighley, New Technical Institute, 402
- Wells and Borings of the Southampton Waterworks, Mr. W. Matthews, 403
- West Ham, Corporation of, 29
- Westinghouse Automatic Brakes on Inclines, Use of, 414
- Westinghouse Brake, The, 229
- Wharf at Kurrachee, Screw Pile, 43, 49
- Whiteley's, The Electric Light at, 124, 129
- Whitworth, Mr. Joseph, 75
- Whitworth's Inventions, 98
- Whitworth's Work, 73
- Williams' Steam Stamp Ore Crusher and Amalgamator 231
- Winding Engines and Winding Drum, Lady Windsor Pit, Black Rock Colliery, Ynysbwl, 190
- Wirral Rural Sanitary Authority and Wirral Highway Board, 253
- Witham Outfall Works, Mr. J. E. Williams' Report on, 514
- Wooten Engine, Performance of a, 449
- Working Stress of Iron and Steel, Notes on the, 48
- Workshop Roofs for Indian State Railways, 413
- World's Yearly Budget of Letters, The, 24
- YACHT Building, Fifty Years of, Mr. Dixon Kemp, 265
- Yorkshire Coal-fields, 57

