Thursfield's idea of the plan of attack at Trafalgar differs somewhat from those commonly accepted; but after reading what he has to say, the impression is deepened that at Trafalgar, as in many other fights of that day, the plan of battle as outlined before the fight was greatly modified to suit the exigencies of the hour. This work will possess a particular interest for American readers, because so large a portion is devoted to an appreciative survey of the achievements of John Paul Jones. Mr. Thursfield is the first English writer of prominence to remove the stigma which was attached to Jones's name by the calumnious writers of his day, and reveal him as the admirable character that he was. One of the most valuable chapters is that in which full justice is done to Admiral Duncan, the hero of Camperdown, whose exploits and general professional ability seem never to have received adequate recognition until late in his career.

SECOND APPENDIX TO THE SIXTH EDITION OF DANA'S SYSTEM OF MINERALOGY. By Edward S. Dana and William E. Ford. New York: John Wiley & Sons, 1909. 8vo.; 114 pp. Price, $1.50.

During the ten years of mineralogical investigation which this appendix covers, a large amount of material has been published. An evidence of this is to be found in the two hundred new names which are given in the classified list in the introduction. About sixty of these new names on account of the completeness of their descriptions seem to have a warrant for their acceptance as new species. The other names are either of imperfectly described minerals or variety names of well-recognized species. The descriptions of the new species included in this book are given concisely but completely. It was found, however, impracticable to follow the plan adopted in the System and the First Appendix of recalculating all the angles and crystal constants of the new species. This has been done in a few cases, but in the majority of the descriptions the figures of the authors have been accepted without verification. In the cases of some of the new species with complex crystals it has been impossible to give the complete lists of the forms identified upon them. The method followed has been to give the more common and prominent forms and to indicate the number of those not listed.

THE MAKING OF SPECIES. By Douglas Dewar, B.A., and Frank Finn, B.A. New York: John Lane Company, 1909. 8vo.; 400 pp. Price, $2.50, postage extra.

The authors' aim in writing this book has been twofold. In the first place, they have attempted to place before the general public in simple language a true statement of the present position of biological science, and in the second place they have endeavored to furnish the scientific men of the day with food for reflection. As the British nation seems to be slowly but surely losing, through its conservatism, the commercial supremacy it had the good fortune to gain during the last century, so is it losing, through the unwillingness of any of her scientific men to keep abreast of the times, that scientific supremacy which she gained in the middle of the last century by the labors of Charles Darwin and Alfred Russell Wallace. It is not among Englishmen but among Americans and Continentals that the world has to look for advanced scientific ideas. The authors fear that this book will come as a rude shock to many scientific men. What they attack is not Darwinism, but that which is erroneously called Neo-Darwinism. Neo-Darwinism is a pathological growth on Darwinism which, we fear, can be removed only by a surgical operation. The book is a beautifully printed one and will doubtless interest all naturalists.

THE ELEMENTARY PRINCIPLES OF INDUSTRIAL DRAWING. By George Jepson. Oblong 12mo.; 28 pp.; 11 plates.

The aim of this little book is to present the subject of industrial drawing, so that a student after he has become familiar with its contents, will have mastered all the essential principles as applied to mechanical and architectural drawing. While the book presents all the principles of industrial drawing, it is not a graded course of lessons, although if desired an elementary or more advanced course can be compiled from its contents. The author is an instructor in descriptive geometry, machine drawing, and shop work in the Massachusetts Normal Art School, and was for many years master of the Evening Science School of the city of Boston. The book appears to be an excellent one.

HENDRICKS'S COMMERCIAL REGISTER OF THE UNITED STATES FOR BUYERS AND SELLERS. New York: Samuel E. Hendricks Company, 1909. Quarto; 1220 pp. Price, $10.

This is the eighteenth annual edition of Hendricks's Commercial Register of the United States. It is a complete and reliable annual index of industries, containing over 350,000 names and addresses of buyers and 33,000 business classifications. Full lists are given of manufacturers and dealers in everything employed in the manufacture of material, machinery, and apparatus used in these vast industries, from the raw material to the manufactured article and from the producer to the consumer. It is indispensable as a work of reference for the architect, engineer, contractor, manufacturer, jobber, retailer, exporter, purchasing agent, and for the railroad machine shop, foundry, mill, factory, mine, and plantation. We have occasion to use several copies of this book, and it answers a vast number of our inquiries for manufacturers. It is a book which we can thoroughly commend.

Legal Notices

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending

October 12, 1909,

AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

Abdominal support, J. S. Allred ... 936,752
Advertising device, C. A. Myers ... 936,344
Aeroplane, C. W. Cheney ... 936,303
Air brake system, G. E. Congdon ... 936,415
Air compressor, J. H. Dailey ... 936,609
Air compressor, E. J. Rohrbacher ... 936,813
Air compressor, A. Neumann ... 936,932
Air cushion seat, D. B. O'Kelly ... 936,934
Air ships, propeller mechanism for, C. M. Lee ... 936,916
Alfalfa shredder, W. B. Kraft ... 936,783
Anchor, ground, Simpson & Franchot ... 936,824
Animal trap, Dunn & Vought ... 936,429
Animal trap, H. M. Voter ... 936,836
Annealing furnace, F. H. Daniels ... 936,611
Armor plates and other articles of steel and alloys of steel, manufacture of, F. Giolitti ... 936,315
Ash sieve, D. E. Preston ... 936,737
Audiphone receivers, magnetic regulator for, C. E. Williams ... 936,503
Auger, earth, F. Palmer ... 936,350
Automobile, B. A. Alperin ... 936,595
Automobile attachment, H. S. Delamere ... 936,860
Axle lubricator, J. N. Rickards ... 936,740
Bale tie, H. O. Fry ... 936,882
Bales, cotton marker for, Long & Otidys ... 936,918
Balloon, J. A. Steinmetz ... 936,680
Bank, F. E. Jordan ... 936,780
Barrels and other like containers, lining for, T. Scherf ... 936,817
Basin plug, wash, J. D. Winfree ... 936,393
Bearing, roller, H. V. Smith ... 936,485
Bearing, yielding, S. C. Anker-Holth ... 936,753
Bearings, means for producing lubricating, F. J. Randall ... 936,739
Bed, S. Ellery ... 936,873, 936,874
Bedclothing airing device, A. H. Stetson ... 936,827
Bed, cooling, H. W. Hock ... 936,897
Bed springs, device for tightening wire, F. B. Townsend ... 936,958
Beehive, D. I. Comsa ... 936,604
Bellows support, J. Sampere ... 936,670
Belt cleaner, J. A. Bowen ... 936,297
Belt cleaner, T. Healey ... 936,887
Belt for transmitting power, laminated, Gondie & Myers ... 936,532
Belt guide, G. H. Tenpas ... 936,830
Berth, sleeping-car, P. Rublyovitch ... 936,814
Bevel, square, and calipers, combined, J. J. Szymanski ... 936,746
Beverages, manufacturing fermented, E. W. Kuhn ... 936,328
Billiard cue, W. M. Dunn ... 936,614
Binder and the like, looseleaf, J. H. Hewitt ... 936,891
Blank feeding device, A. F. Jones ... 937,001
Blast furnace, E. B. Cook ... 936,308
Block. See Keel block.
Blowpipe, J. H. Flower ... 936,769
Boat plug, J. W. Danford ... 936,312
Boat releasing device, automatic, C. Hunt ... 936,632
Bobbin spindle, C. Jenkins ... 936,904
Body protector, C. W. Fraser ... 936,442
Boiler check, double valve, Schafer & Hills ... 936,571
Boiler furnace, E. H. Montgomery ... 936,651
Boiler superheater, steam, F. J. Cole ... 936,412
Bolt puller, E. Blomberg ... 93 ,755
Book, loose leaf, L. D. Hamacher ... 936,448
Book support, adjustable, B. T. Phelps ... 936,936
Book, triplicate sales, W. G. Wilson ... 936,504
Boot and shoe cleaner, Predmore & Estell ... 936,662
Boots and shoes, elastic tread for, P. W. Pratt ... 936,810
Booths or the like, parcel, cash, and wind protecting attachment for, J. C. Moore ... 936,551
Boring bar, J. J. Steinbrunn ... 936,955
Boring machine, log, G. H. Lambert ... 936,330
Boring spindles, outboard bearing for, C. I. Shirley ... 936,576
Bottle closure, H. W. Maurer ... 936,467
Bottle holder, infant's feeding, L. G. Black ... 936,293
Bottle, non-refillable, J. S. Bromhead ... 936,860
Bottle opener and cigar cutter, combined, J. L. Sommer ... 936,678
Bottle stopper, E. J. Bricker ... 936,515
Bowl holding rack, A. Insinger ... 936,725
Box or can, F. Westerbeck ... 936,841
Box or carton, G. B. Conley ... 936,986
Braided fabric, Thun & Lucke ... 936,492
Braided fabric and making it, H. Z. Cobb ... 937,021
Braiding machine, R. C. Rahm ... 936,356, 936,357
Brake applying device, automatic, E. P. Jessop ... 936,905
Brake rod coupling jaws, G. F. Hinkens ... 936,453
Bread box, Thompson & Morrison ... 936,957
Bread mixing machine, E. Mechini ... 936,920
Brush for cleaning glasses, hand, O. Bethsold ... 937,019
Brush, polishing, J. A. Brewer ... 936,699
Brushing machine, shoe, G. E. Russell ... 936,948
Buckle, belt, L. M. Rosenberg ... 936,565
Building construction, O. N. Mueller ... 936,342
Bulb support, F. Gorman ... 936,446
Bullet mold, F. L. Putney ... 936,475
Bust developer, J. G. Eganhouse ... 936,434
Cabinet, ironing board, B. A. Stocking ... 937,014
Cabinet, weight, M. C. Brown ... 936,406
Cables or conductors, machine for making, G. R. Kress ... 936,728
Cableway, portable, J. H. Dickinson ... 936,425
Calendar pad, H. T. Avery ... 936,848
Camera focusing hood, E. P. Comrie ... 936,307
Can cover, oil waste, P. Anderson ... 936,509
Can heading machine, G. H. Stewart ... 936,956
Cane cutter, L. H. Breaud ... 936,404
Caoutchouc and similar substances, apparatus for washing, F. Kempter ... 936,635
Cape, W. W. Pelton ... 936,351
Car and engine retracker, J. L. Ford ... 936,439
Car coupling, H. J. Dean ... 937,023
Car door, grain, A. J. Denton ... 936,764
Car fender, G. H. Carter ... 936,703
Car fender, C. T. Koenigsberg ... 936,782
Car fender, H. Simpson ... 936,953
Car squeeze, O. H. Dempsey ... 936,523
Car ventilator, railway, J. E. Ward ... 936,686
Cars, supplemental wheel for motor, A. E. Whitney ... 936,750
Carbureter, K. Maybach ... 936,337
Card holder, O. A. Bremer ... 936,756
Carpet fastener, stair, W. A. Price ... 936,940
Carpet securing means, M. A. V. Odell ... 936,347
Carrier. See Garment carrier.
Carrying mechanism, R. Rein ... 936,942
Casting machine, Soss & Christianson, 936,378, 936,480
Casting metal pots, etc., mold for, J. Power 936,939
Cattle guard, G. W. Youngs ... 936,974
Cement, process and apparatus for the manufacture of Portland, C. F. McKenna ... 936,555
Child's chair, J. E. Wallace ... 936,685
Chuck, J. A. Leland ... 936,644
Chuck for grinding stem ware, A. B. Knight 936,912
Churn, J. L. Arnold ... 936,400
Churn, J. Middlebrook ... 936,921
Cigarmaker's table, S. J. Clark ... 936,411
Circuit for propagating wave forms, D. C. Jackson ... 936,538
Clam shell, J. D. Pennewell ... 936,560
Clock, J. Petrillo ... 936,352
Closet seat, R. Gunton ... 936,714
Cloth cutting machine, A. H. De Voe ... 936,424
Clothesline holder, P. Curran ... 936,420
Clothesline prop, W. F. Briggs ... 936,982
Clutch electric control, friction, H. M. Abernethy ... 936,284
Coat, R. E. Peary ... 936,805
Coating metallic surfaces, C. J. Kirk ... 936,637
Cock, ball, H. S. Rumsey ... 936,742
Cock, safety, Swimmer & Neelen ... 936,581
Coffee free from caffein, obtaining, K. H. Wimmer ... 936,392
Coil support, I. L. Griffith ... 936,622
Combination and bath fitting, Martin & Brams ... 936,791
Commutator brush, V. G. Apple ... 936,692
Computing and recording machine, W. H. McFarland ... 936,652
Concentrating apparatus, G. F. Rendall ... 936,563
Concrete burial vaults, mold for casting, C. M. Brown ... 936,861
Concrete mixing machine, W. M. Ewing ... 936,875
Concrete railway tie, J. P. Donovan ... 936,428
Concrete railway ties, apparatus for molding, J. P. Donovan ... 937,026
Concrete steel constructions, fixture support for, L. P. Alford ... 936,690
Concrete walls, mold construction for, J. Mueller ... 936,798
Concrete work in the water, building, E. H. Kirk ... 936,638
Condenser, J. Anderson ... 936,397
Controller, automatic, F. R. Fishback ... 936,878
Conveyer, B. M. Steele ... 936,745
Conveyer, C. W. Levalley ... 936,917
Cooking utensil, F. A. Musser ... 936,343
Copper from cuprous residues, recovery of, D. Crispo ... 936,762
Cotton chopper, A. D. Baker ... 936,693
Crate and protector, W. T. Claycomb ... 936,984
Crate, foldable shipping, E. C. Rollins ... 936,946
Crate, folding, E. Benson ... 936,696
Crate, folding shipping, J. B. Porter et al. 936,735
Cream dipper, A. C. Butts, Jr ... 936,757
Crystallizers, stirrer for, Crozier & Dyer ... 936,608
Cuff shaper, S. M. Cole ... 936,761
Cultivator, D. F. Deppe ... 936,765
Cultivator, H. B. Reynolds ... 936,943
Cultivator, F. Upshaw ... 936,961
Cultivators and other agricul ural implements, attachment for riding, C. N. Simpson ... 936,823
Current motor, alternating, F. Eichberg ... 936,615
Curtain fastener, J. Grizzell ... 936,884
Curtain holding mechanism, window, Donahoe & Taylor ... 936,427
Curtain roller, H. Tripp ... 936,387
Curtain roller and curtain pole support, extensible combined, J. W. Thoreau ... 936,583
Cuspidor, Gregory & Shumway ... 936,774
Cuspidor, W. J. Heim ... 936,888
Cutlery polisher, P. E. Shee ... 936,371
Cutting shears, J. R. Searight ... 936,574
Cycle attachment, motor, H. T. Adams ... 936,845
Damper for furnaces, C. G. Atwater ... 936,288
Defibrating machine, J. S. Gillies ... 936,995
Dental apparatus, A. Jameson ... 936,539
Dental instrument, W. H. Manning ... 936,732
Dental press, F. O. Jaques, Jr ... 936,633
Dispensing container, O. L. Parmenter ... 936,803
Dispensing machine, C. M. Jewell ... 936,906
Display apparatus, H. M. Webster ... 936,497
Display rack, J. H. Best ... 936,855
Dividers, proportional, A. L. Black ... 936,857
Dogging device, O. M. Krebs ... 936,784
Door fastener, emergency exit, J. E. Hankins ... 936,718
Door mat, C. J. Peterson ... 937,010
Door, spring, W. H. Jordan ... 936,908
Dough forming machine, G. H. Petri, 936,660, 936,661
Draft gear, H. T. Krakau ... 936,547
Driving and controlling device, W. A. Brauer 936,298
Dust pan, convertible, A. S. Epperson ... 936,990
Dye and making same, orange to red tetrazo, A. Schedler ... 936,367
Dye, azo, Jansen & Neelmeier ... 936,321
Dye, azo, M. Kahn ... 936,456
Dye, azo, O. Schmidt ... 936,951
Egg beater, Chase & Milton ... 936,410
Electric arc light, F. P. Cobham ... 936,305
Electric circuit controller and interrupter, C. A. Tucker ... 936,584
Electric circuit interrupter, H. R. Stuart ... 936,578
Electric drill, Duntley & Kimman ... 936,870
Electric light bracket, E. I. Drent ... 936,869
Electric switch, H. D. Grinnell ... 936,775
Electric wiring, molding for, W. H. G. Kirkpatrick ... 936,639
Electrical circuit breaker, C. Aalborg ... 936,594
Electrical coil, M. C. Rypinski ... 936,669
Electrical discharge apparatus, N. J. Neall ... 936,656
Electrical distribution system, F. G. Beetem 937,018
Electrical oscillations, receiving system for high frequency, F. K. Vreeland ... 936,684
Electrical switch, chronometric, J. L. Scheuble ... 936,950
Electrically operated automatic switch, W. A. Lacke ... 936,329
Electromagnetic switch, J. D. Ihlder ... 936,724
Electroplating objects, mechanical arrangement for, W. Pfanhauser ... 936,472
Electrotype molds, preparing, G. E. Dunton 936,871
Elevating and loading mechanism, W. W. Brower ... 936,517
Elevator. See Portable elevator.
Elevator safety appliance, J. T. Albert ... 936,285
Embossing and printing, simultaneously, G. H. Marsh ... 936,335
Engine frame, internal combustion, L. W. Noyes ... 936,558
Engine starter, L. Burnham ... 936,700
Engine starting device, explosive, H. Wayte 936,964
Engines, beating roll for refining, E. A. Jones ... 936,540
Engines, speed controlling mechanism for explosive, Miller & Metcalf ... 936,795
Envelop, N. J. Macdonald ... 936,790
Explosions, apparatus for utilizing energy derived from, W. H. Smyth ... 936,677
Explosive engine, W. J. Wright ... 936,972
Extension table, E. Tyden ... 936,494, 936,586
Fan, spring, D. Roberti ... 936,668
Feed bag, N. P. Abel ... 936,975
Feed device, J. H. Adams ... 937,017
Fence post, O. M. Reed ... 936,562
Fertilizers, making solid, B. F. Halvorsen 936,317
Fifth wheel, J. A. Burrell ... 936,983
Films or flakes, making metallic, T. A. Edison ... 936,525
Fire alarm, automatic, C. D. Miller ... 936,923
Fire escape, J. H. Thornburg ... 936,385
Fire extinguisher, W. A. Staff ... 936,487
Fire extinguisher, D. H. Conkling ... 936,985
Fire extinguishing apparatus, automatic alarm device for, Henley & Crowder ... 936,889
Fire extinguishing syringe, A. Hruby ... 936,320
Firearms, combined firing pin and ejector for, J. D. Pedersen ... 936,806
Fish stringer device, W. G. Callender ... 936,701
Flanging machine, J. Brenzinger ... 936,598
Flower pot stand, P. Foy ... 936,619
Flue plug and ferrule, combination, J. H. Gillon ... 936,444
Flushing device for water closet tanks, J. F. Young ... 936,396
Flushing tank, automatic, Friel & Crusoe 936,709
Folding machine, Adams & Wallace ... 936,506
Folding mechanism, S. G. Goss ... 936,710
Folding seat, portable, Wilckerling & Rediske ... 936,502
Footboard, A. Krutsinger ... 936,786
Forming die, I. H. Hill ... 936,999
Fuel handling apparatus, fluid, R. S. Mitchell ... 936,470
Funnel, J. F. Beatty ... 936,511
Furnace for uniformly heating metals, W. N. Best ... 936,856
Furnace or forge, W. Scrimgeour, Jr ... 936,573
Furnaces, flue and valve system for regenerative, J. B. McKennan ... 936,931
Furnaces, plant for heating the gas and air for combustion in gas, O. Zahn ... 936,844
Gage roll support, C. E. Marsh ... 936,647
Game apparatus, W. Kruse ... 936,785
Game apparatus, J. Stern, reissue ... 13,025
Garbage receptacle, M. Carlucci ... 936,702
Garment carrier, O. Rangnow ... 936,811
Gas and air, mechanism for the production of a constant mixture of, F. W. Wolff 937,016
Gas burner, W. V. D. Kelley ... 937,002
Gas conduit coupling, H. M. Holton ... 936,721
Gas engine, B. E. Halverstadt ... 936,318
Gas impregnated liquids, apparatus for dispensing, M. J. Levin ... 936,462
Gas producer, R. B. Kernohan ... 936,636
Gate, D. F. Beard ... 936,290
Gate, J. W. Hawkins ... 936,719
Gate, J. Q. Primm ... 936,738
Gate, W. E. Robinson ... 936,812
Gear cutting machine attachment, E. J. Flather ... 936,879
Gearing, J. W. Belyeu ... 936,291
Gearing, J. S. Smart ... 936,376
Generators, sludge faucet for carbide gas, F. L. H. Sims ... 936,375
Glass, apparatus for making sheet or plate, J. J. Quertinmont ... 936,664
Glass articles, machine for making hollow, P. T. Sievert ... 936,822
Glass machine, wire, N. Franzen ... 936,880
Glass, method and apparatus for making wire, J. J. Quertinmont ... 936,663
Glass, process and apparatus for making wire, J. J. Quertinmont ... 936,665
Glass tube cutter, C. E. Skinner ... 936,674
Glove pocket, Fields & Seblin ... 936,437
Gold dredges, collecting means for, T. J. Barbour ... 936,754
Golf club bag, F. C. Breakspear ... 936,698
Grain drill, L. E. Robey ... 936,741
Grain spout, C. L. Gardner ... 936,772
Graphite lubricator, F. G. Wilson ... 936,970
Graphophone, T. H. Macdonald ... 936,646
Grease cup, compression, L. W. Durst ... 936,872
Grinding machine, A. C. Warner ... 937,035
Grinding milling cutters or similar tools, machine for, P. A. Kustner ... 936,915
Grinding pan, Middleton & Cobbe ... 936,794
Gun, E. H. Searle ... 936,369
Guns, hand grip for, F. A. Freeman ... 936,528
Hammer, power, W. Graham ... 936,316
Handcuff, M. Mitchell ... 936,797
Hanger. See Wire hanger.
Harness and warp stop motion, combination, Anner & Marnel ... 936,847
Harvester, pea, A. McMahon ... 936,733
Harvester, potato, J. Lood ... 936,333
Hat brim press to form welt edges, C. E. Sackett ... 936,364
Hat hook, A. M. Hortenbach ... 936,899
Hay gatherer, N. Fryman ... 936,621
Hay retainer, C. H. Whitney ... 936,500
Heat, means for utilizing solar, M. L. Severy ... 937,013
Heels, making boot and shoe, W. P. Boeworth ... 936,295
Hide supporting device, H. S. Crombie ... 936,522
Hoe seeder, L. A. Sandoe ... 936,366
Hoist, portable, Klaus & Gudient ... 936,911
Holder, I. Herzfelder ... 936,777
Holding attachment, G. P. Schmidt ... 936,671
Horn, H. J. Kingsley ... 936,910
Horses, ice creeper for, I. R. Whisler ... 936,966
Horseshoe calk, J. E. Dolan ... 936,988
Hose cock, H. Vinette ... 936,496
Hose coupling, N. M. Rosendahl ... 936,566
Hose coupling, A. A. Hill ... 936,627
Hose coupling, E. J. Hannold ... 936,886
Hose support, J. W. Fitz Gerald ... 936,488
Hot air register, E. C. Fox ... 936,440
Hypodermic medication, means for, B. G. Strong ... 937,029
Ice cream freezer, Thomson & Schmitt ... 936,384
Ice, device for cutting plate, R. H. Kirk ... 936,544
Ice making and harvesting apparatus, plate, D. J. Havenstrite ... 936,452
Ice, manufacturing and harvesting, R. J. Berryman ... 936,978, 936,979
Ice, manufacture of artificial, R. J. Berryman ... 936,977
Igniters or sparkers, timer for, H. Rose ... 936,564
Implement holder, S. C. Lawlor ... 936,460
Incubator electric alarm, C. L. Kulp ... 936,914
Index compiling device, W. A. Antilotti ... 936,287
Induction motor, S. R. Bergman ... 936,292
Induction motor, C. Robinson ... 936,360
Insulator, electric, J. A. Wells ... 936,840
Internal combustion engine, E. Chapman ... 936,409
Jar holder, W. J. McCallum ... 936,927
Jars, device for releasing the caps or covers for glass fruit, G. E. Searing ... 936,575
Journal box, J. G. Smith ... 936,675
Journal box, adjustable, P. J. Joecken ... 936,455
Journal boxes, means for packing waste in, L. C. Condit ... 936,704
Junction, wall, floor or other box, D. Conlan, Jr. ... 936,705
Keel block, H. Smoke ... 936,676
Kilns, disintegrating and removing annular salamanders in nodulizing, A. Brautigam 936,981
Knife, K. J. Wilson ... 936,592
Knob attachment, A. H. Franklin ... 936,441
Knob, glass, G. W. Graham ... 936,533
Knockdown box, R. A. Simpson ... 936,484
Lacing hook making machine, H. H. Eaton 936,430
Lacing hook or stud setting machine, H. H. Eaton ... 936,431
Ladder, F. L. Union ... 936,681
Ladder and ironing board, combined step, L. King ... 936,909
Lamp, M. I. Cohen ... 936,521

Lamp, aseptic deflector, G. C. Werner	936,499
Lamp attachment, vehicle, A. G. Thomson	936,831
Lamp, blast, L. Schemnitz	936,815
Lamp bracket, adjustable, C. E. Stevens	936,379
Lamp, electric, G. L. Van Wart	936,747
Lamp, incandescent gas, A. Rector	936,476
Lamp, incandescent gas, O. Wiederhold	936,501
Lamp socket, cluster, H. J. S. Lewis	936,463
Lamp socket, cluster, R. B. Benjamin	936,512
Lamp working apparatus, Luce & Silvernail	937,005
Lamps, making filaments for electric incandescent, W. von Bolton	936,403
Lathes, turret tool holder for, J. Burt	936,301
Laundry iron, electric, H. C. Newman	936,556
Lead pipe, reinforced, E. P. Wardwell	936,839
Lens holder, J. B. Schrock	936,368
Leveling instrument, hydrostatic, J. J. Bunting	936,407
Lids or covers having beaded rims, device for drawing and pressing, K. Christian	936,603
Life saving apparatus, P. Kotlar	936,546
Lifting jack, J. E. Crowle	936,309
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Plow draft attachment, C. F. Strnad	936,829
Plow, gang, J. O. Fjarli	936,768

A SIMPLE METHOD OF TEACHING EXPERIMENTAL PHYSICS.

(*Continued from page 293.*)

taneously. The needle traces an undulating line which cuts the base line in a series of points whose distances from the zero point are proportional to 1, 4, 9, 25, etc., that is, to the squares of the times. In this way the laws of falling bodies can be verified to within 1 per cent. This is a much closer approximation than can be obtained with Atwood's or Morin's apparatus, with which the beginning and end of the fall cannot be determined very accurately.

In other experiments the drum is driven by a cord, passing over the pulley and a grooved wheel 6 inches in diameter, attached to a simple driving clock, such as is used to turn a spit. With this arrangement the gradual diminution of the amplitude of succesive oscillations of the pendulum, and the more rapid diminution brought about by attaching to the pendulum a paddle dipping into water, can be studied. The isochromism of small oscillations can be shown by giving the drum a uniform velocity of rotation, by means of the driving clock or of a weight which is stopped after it has fallen a certain distance. Then the base line and the undulations having been traced as before, the wave length, or distance between consecutive intersections of the two lines, is found to be constant, no matter what the amplitude or height of the wave may be, provided that it is small.

Chassagny's apparatus for compounding vibrations in the same plane (Fig. 2) comprises two wheels mounted on parallel shafts. The first wheel is turned by a crank and drives the other by means of a belt. The ends of a fine violin string are attached to pegs inserted in the faces of the wheels at unequal distances from their centers, and the middle part of the violin string, which is kept taut by a spring, passes round a pulley, which turns freely on a vertical rod, attached rigidly to the horizontal axle of the nave of a bicycle wheel mounted in bearings. When the crank is turned both wheels revolve, and the horizontal displacement of the pulley, at any instant, is equal to the algebraic sum of the horizontal displacements of the two pegs. The movement of the pulley is followed accurately by a writing point which is attached to the other end of the bicycle nave. This point presses against a strip of smoked paper wrapped round a drum, which is turned by the engagement of a toothed wheel on its shaft with an endless screw on the crankshaft. The amplitudes of the two vibrations whose combined effect is sought are varied by varying the distances of the pegs from the axes of the two wheels; the phases are varied by setting one wheel, at the start, more or less in advance of the other by means of pointers attached to the wheels and fixed graduated circles behind them; the periods are varied by employing wheels of diameters proportional to the periods desired. For example, two wheels of nearly equal diameters give a graphical record of the phenomena of "beats."

Vibrations in mutually perpendicular planes are combined by means of an apparatus based on the same principle (Fig. 3). The resultant curves are traced on smoked glass so arranged before a lantern that the curves can be immediately projected on a screen and explained and studied at leisure, with a thoroughness that is not possible with the evanescent projections of Lissajous's figures made in the usual way, by reflecting a pencil of light from mirrors attached to tuning forks.

Chassagny's apparatus for the study of refraction consists of a glass globe supported by fixing its horizontal neck in a copper sleeve. If the neck is regarded as one pole of the globe, the opposite pole is indicated by an interruption in a copper meridian, and the equator is graduated in intervals of five degrees. Water is poured into a funnel attached to the upper side of the neck until its surface

(*Concluded on page 305.*)

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above described, powerful electric motors are started by throwing in a switch. The e motors derive their energy from storage batteries c tai ed in the boat, and drive the propellers. The same storage batteries furnish current for numerous auxiliary motors used for pumping, steering, handling torpedoes, etc.

The motion of the boat when under way is controlled by two sets o rudders; one of these sets, kno n as the vertical rudders, directs the boat's course to port or starboard just as does the rudder of an ordinary ship. In addition, there are provided horizontal rudders, which serve to co trol the motion of the boat in a horizontal plane; that is to say, the depth at which she runs is regulated by these rudders. For steering in the horizontal plane, instruments are provided, so that the boat may be navigated with the same degree of accuracy as boats on the surface. The first of these instruments is known as a periscope. This consists of a vertical tube which extends from above the surface of the water to a few feet within the submarine. At the top of the tube is an object glass; at the bottom an eye-piece. Two reflecting mirrors, one at the top, the other at the bottom of the vertical tube, cause the image to be transferred from the object glass to the eye-piece. The operator can turn the periscope so as to sweep the whole horizon. To the writer, who recently made a five-hour trip in one of our latest boats, the view was as clear as though he were at the surface looking through an ordinary field glass. Hence when running submerged with the top of the periscope just out of the water, the navigator can see with perfect ease surrounding objects. If for any reason it should be desired to run at a still greater depth, compasses are provided by which the course may be steered with accuracy. For steering, submerged, in the vertical plane, instruments are provided which in a way take the place of the compass. One of these is a large pressure gage, which indicates the depth at which the boat is running. Another is a form of spirit level, which indicates the inclination of her axis. By the use of this, the man controlling the horizontal rudder is able to r n at a perfectly even depth. While in the submerged condition, the boat is of course amply illuminated by electri lights. There are no ports or windows in the boat, and so far as sensations are concerned, one is unable to determine whether he is running on the surface or submerged.

The arm of the submarine is the automobile torpedo. A number of these may be carried. They are discharged through torpedo tubes located in the bow of the boat. Any modern type of automobile torpedo may be used. In view of the fact that the submarine is enabled to approach unseen to within a few yards, if desired, of the most powerful battleship, a long-range torpedo is not required. For this reason the weight devoted to motive power in the ordinary torpedo may be largely used to increase the destructive power, so that the proper arm for the submarine would be far more powerful and destructive than the ordinary auto obile torpedo.

While the project of the submarine is comparatively old, it has so happened that but few of them have been used in real war. The first case on record is that of a little hand-power submarine boat built by David Bushnell in 1776. Having obtained permission from the American general in command to use this submarine against the English fleet anchored north of Staten Island, he instructed a sergeant named Ezra Lee in its use. After several attempts, Lee made an attack on one of the ships. His purpose was to fix a torpedo to her side, then go away and allow it to explode, thus destroying the ship. Unfortunately, the ship was sheathed with copper, and he was unable to attach his mine. Lee then drifted away from the shi , having abandoned his mine, which, after drifting about for an hour, exploded, throw

(Concluded on page 307.)

ing up a great volume of water, and thus warning the English of the great danger they had escaped.

Another case on record is that of the Confederate submarine "David," which, during the blockade of Charleston in the civil war, was manned by volunteers, and by hand power was propelled out to the U. S. S. "Housatonic," which she destroyed by the explosion of a mine in contact with her hull.

During the Spanish-American war the modern submarine had not made its appearance. During the Russian-Japanese war both sides ordered boats, but the war was finished before these vessels became available. At present all the leading naval powers are acquiring submarines in large numbers, so that during the next war we may expect to see them figure largely in the various operations.

In the trip in a submarine above referred to the Editor was impressed with the smoothness and accuracy with which the submarine went through her submerged evolutions. The movements, quick response, etc., of the boat were such as to inspire complete confidence in her stability and general efficiency.

There can be no question that the submarine has at last "come into its own." Among the captains of the battleships and the line officers in general at Provincetown, there was noticeable a growing respect for these craft, due to the varied and accurate work which the flotilla had accomplished during the summer maneuvers. There has been a steady but slow growth in the speed of the submarine. Its control is now perfect, and its radius of action is being rapidly increased. Our largest boats have a radius of about one thousand miles; and two are under construction on the Pacific coast which will have a cruising radius of about three thousand miles. This means that the submarine is taking on full seagoing qualities. It must no longer be regarded as restricted to seacoast operation. The time is not far distant when an admiral searching for the enemy upon the high seas may include a submarine flotilla in his fleet. The profound significance of this fact upon strategy and tactics will be appreciated by every naval expert.

In his study of living beings, the physiologist has one guiding principle which plays but little part in the sciences of the chemist and physicist, namely, the principle of adaptation. Adaptation or purposiveness is the leading characteristic of every one of the functions to which we devote in our text-books the chapters dealing with assimilation, respiration, movement, growth, reproduction, and even death itself. Spencer has defined life as "the continuous adjustment of internal relations to external relations." Every phase of activity in a living being is a sequence of some antecedent change in its environment, and is so adapted to this change as to tend to its neutralization and so to the survival of the organism. This is what is meant by adaptation. It will be seen that not only does it involve the teleological conception that every normal activity must be for the good of the organism, but also that it must apply to all the relations of living beings. It must therefore be the guiding principle, not only in physiology, with its special pre-occupation with the internal relations of the parts of the organism, but also in the other branches of biology, which treat of the relations of the living animal to its environment and of the factors which determine its survival in the struggle for existence. Adaptation therefore must be the deciding factor in the origin of species and in the succession of the different forms of life upon this earth.

In consequence of the part played by the gas-lighting equipments of the trains involved in some recent accidents, states a contemporary, the Prussian railway authorities have decided to convert all their sleeping cars now fitted for gas lighting (some 170 cars) for electric lighting.

Steam trap, W. Wanstall	936,963
Steamer, egg, B. Wells	936,965
Steel castings, manufacture of, J. K. Griffith	936,623
Sterilization vessel, G. Van Eyck	936,767
Stitching machine, book, F. Kugler	936,643
Stock and die, J. E. Dundore	936,311
Stone sawing machine, Wallner & Owens	936,748
Stove, portable, W. B. Seeley	936,482
Stovepipe cutter, C. H. Hanshue	936,450
Strainer, G. F. Grimm	936,997
Strap seal, Baruch & Dessauer	936,852
Sweeper, vacuum, Matchette & Monkos	936,465
Swing, G. W. Schilling	936,818
Switch, C. Carson	936,601
Switch points, mechanism for rolling, W. D. Eynon	936,436
Switch stand, B. R. Scott	936,819
Switching device, O. Rennert	936,666
Tag and buckle, combined, R. G. Hitt	936,896
Talking machine, R. L. Gibson	936,531
Tape scoring apparatus, C. Thibodeau	936,383
Tapping means, liquor, J. F. Terry	936,877
Target practice apparatus, H. H. Cummings, 936,418	936,419
Taximeter, C. H. Pearson	936,559
Telegraph, printing, J. C. Barclay, 936,849,	937,032
Telegraphone, H. R. Stuart	936,490
Telephone, H. Eccles	936,432
Telephone system, F. C. Unger	936,495
Telephone trunking system, C. A. Simpson	936,374
Telescope, terrestrial, G. A. H. Kellner	936,541
Thimble, sewing, C. E. Iles	936,902
Thread finishing machine, silk, E. Pohl	936,473
Ticket and holder for same, continuous railway, Proctor & Elkin	936,354
Ticket, railway or other, A. Moyon	936,925
Tie plates, making rolled metal, W. L. De Remer	936,423
Tile making machine, W. J. McCracken	936,928
Time recorder, J. Alsenz	936,691
Tire, W. B. Connell	936,416
Tire, H. L. Walbridge	936,837
Tire, D. Moriarty	936,924
Tire setting machine, D. R. Evans	936,435
Toaster, electric, W. S. Andrews	936,597
Toilet closet, R. A. Brooks	936,516
Tongs, A. Bing	936,980
Tongs, lifting, J. Parrett	937,028
Tongs, pipe, E. M. Hedlund	936,319
Tool, finishing, J. J. Barth	936,695
Tool, pressure driven reciprocating, A. Palmros	937,009
Tooth, artificial, F. Rose	936,361
Tooth, artificial, J. W. Ivory	936,903
Toy, automatic, C. W. Cheney	936,602
Toy cannon, C. L. Wood	936,689
Track laying apparatus, R. C. Spandau	936,679
Train controlling mechanism, O. Gibson	936,443
Train manipulation, system and device for indicating, L. B. Stillwell	936,488
Trains, resetting mechanism for recording, O. White	936,591
Transfer press, Sloane & Owsley	936,954
Transportation system, C. Worthington	936,395
Transportation, system of river, Lane & Mathews	936,336
Trap, J. Pozsony	936,808
Trap door lift, A. G. Boggess	936,294
Trolley, G. G. Miller	936,341
Trolley clip, J. C. Michaelson	936,340
Trousers supporter, S. Levin	936,787
Truck, J. H. Smith	936,825
Truck frame, A. L. Hastings	936,626
Tube cleaning apparatus, J. G. Frerichs	936,620
Tube filling and tamping machine, T. A. Edison	936,433
Tunnel attachment, J. A. Horne, 936,628,	936,629
Turbine for driving boiler tube cleaners, H. T. Weinland et al	936,498
Turbine, steam, R. A. McKee	937,006
Turn table, J. R. Beattie	936,854
Twisting machine, T. Nunn	936,346
Type setting and distributing machine, A. G. Halfpenny	936,776
Typewriter cabinet, J. D. Cleaton	936,864
Typewriter printing mechanism, R. W. Uhlig	936,833
Typewriter ribbon feeding mechanism, R. W. Uhlig	936,834
Type writing machine, J. Felbel	936,617
Valve, air control steam, J. A. Hecks	936,535
Valve, gate, E. D. Jefferson	936,454
Valve, steam engine, J. C. Glenn	936,773
Vehicle seat, J. Benson	936,513
Vehicle top, collapsible, C. J. Tucker	936,960
Vehicle top door, F. E. Heylmann	936,892
Vehicle wheel, V. E. Van Cantfort	936,587
Vehicle wheel, J. H. Scott	936,820
Vehicles uphill, device for assisting, S. H. Stevens	936,828
Vending machine, M. H. Johnston	936,726
Vending machine, liquid, Sage & Mitchell	936,365
Ventilator. See Car ventilator.	
Violin, J. E. L. Winecoff	936,505
Violin tailpiece, N. C. Hale	936,624
Wagon, dumping, W. S. Livengood	936,730
Wagon seat riser, R. N. Collins	936,414
Wall bracket, W. C. Morrill	936,552
Wall of plastic material, such as concrete, etc., retaining or quay, G. P. Wood	936,843
Wall plug, H. I. Jeffers	936,322
War machine, J. Bouscal	936,296
Wardrobe for bedsteads, H. B. Williams	936,969
Washboiler, I. Mozley	936,926
Washer, gasket, H. Mueller	936,554
Washing machine, H. S. Judd	936,634
Washing machine, H. Kraut	936,642
Washing machine, J. J. Fuchs, Jr	936,770
Watchmakers' lathes, tool rest for, F. W. Derbyshire	936,422
Water, Attachment for regulating and indicating the temperature of running, C. E. & W. H. Krueger	936,548
Water closet, H. W. Ward	936,388
Water closet, J. C. Duner	936,706
Walter closet coupling, H. S. Maddock	936,919
Water closet, ventilated, J. K. Pennington	936,561
Water purifier, electric, M. R. Frei	936,993
Water tube boiler, R. Hutchison	936,723
Wedge blocks and doyle pins, apparatus for cutting, S. Smith	936,744
Weigher, automatic grain, A. G. Yerk	936,593
Weighing apparatus, automatic, W. E. Nickerson	936,557
Weighing machine, W. W. Rosenfield	936,362
Weighing machine, automatic, C. A. Douglass, et al	936,613
Weighing machine for liquids, hydraulic, A. Rak	936,358
Well cleaning out device, T. B. Hyland	936,901
Wheel, F. E. Felts	936,708
Wheel, A. C. Gillam	936,994
Wheel chock, G. N. Crawford	936,417
Wheelbarrow, L. Wigh	936,968
Wickerwork, E. M. Calef	936,520
Wind screen, G. H. Beaton	936,853
Windmill mechanism, I. C. Rust	936,568
Window screen, A. B. Hill,	936,895
Window tent, J. G. Allen	936,846
Wire basket, Porter & Jenkins	936,736
Wire crimping machine, meshed, A. Shuman	936,673
Wire fabric making device, F. H. Hamblin	936,625
Wire hanger, F. L. Sessions	936,670
Wire netting stretcher, H. J. Byrnes	936,600
Wire stretcher, E. A. & C. W. Wheeler	936,749
Wood, preserving, J. M. Nelson, Jr	937,008
Woolen, E. Leurent	936,461

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