monly accepted; but after reading what he has purchasing agent, and for the railroad mato say, the impression is deepened that at chine shop, foundry, mill, factory, mine, and the plan of battle as outlined before the fight copies of this book, and an answers a vast 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 INDUS-TRIAL DRAWING. By George Jepson. Oblong 12mo.; 28 pp.; 11 plates.

The aim of this little book is to present the 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 SELLEBS. 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 andex of industries, containing over 350,000 names and addresses of buyers and 33,000 subject of industrial drawing, so that a stu-

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, chinery, and apparatus used in these vast industries, from the raw material to the manuscript and from the producer to the Buckle, belt. L. consumer. It is indispensable as a work of Building construc-

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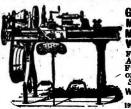
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(Continued from page 293.)

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 immediatey 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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Pr	Kiteee 9: inting presses, pneumatic folding mechanism for S. G. Gos 9:	36,545 L 36,711	)
Pr Pr	eclous metals from ores, extracting, I. Kitsee  Nitsee  Sinting presses, pneumatic folding mechanism for, S. G. Gos	36,508 i 36,349 s 36,390	
Pu Pu Pu	ller. See Bolt puller. illey, T. X. Jones 90 illey, window shade catch, Hoover & Fries 90	36,778 36,900 V	
Pu Pu Pu	ntp, R. Conrader	36,712 36,606 36,359	
Pu Py Re	nnch presses, table for, F. Thompson 9 rographical tool, H. M. Holton 9 ill fon railway tracks, tubular, P. P.	36,832 36,720 i	i
Re	Cookingham	37,022 37,003 36,850	t.
Ra	all joint, L. Larson	36,477 J 36,372	je
Re	ailway signal system, wireless, E. R.	00,200	v
R	allway hwit operating mechanism, C. W.	00,200	0
R	Squires 9: 9: 9: 9: 9: 9: 9: 9: 9: 9: 9: 9: 9:	36,683 36,989	t
Ra	allway tie, metal, H. J. Buell 9 allway tracks, apparatus for depositing and on, W. D. Ross	36,519 , 36,567 ,	t
R	grift	36,325	ľ
R	atchet wrench, J. Knowles 9	20 040	S
B	eel for coiling flats or other rolled sections	36,589	Ċ
Re	F. H. Danjels	36,930 36,694	E
R	iffe sight, J. D. Pedersen	36,474	8
	ivets, hand tool for extracting, Summers & Cooper		7
R	otary engine, J. R. Kinney	36,543 36,933 36,542	t
R	ubber, reclaiming devulcanized, E. E. A. G. Meyer	36,468 36,687	t
R	ulber, reclaiming devulcanized, E. E. A. G. Meyer ulbing post, S. B. Wasson ule and linotype slug holder, election square, B. D. Devo unner, detachable, S. Hand and, apparatus for cleaning and separation of E. M. Nichols	36,612 36,449	E
Sa	and, apparatus for cleaning and separation of, E. M. Nichols	936,801 936,616	1
Si Si	and, apparatus for cleaning and separation of, E. M. Nichols ash lock, Farmer & Church aw, band, A. Anderson aw handle, W. W. Taylor. aw handle, crosscut, J. Kallebner awmill, band, H. G. Dittbenner awmill set works and dog, automatic power, N. E. Rice aw setting, tool, L. G. McKam. cale, computing, A. De Vilbiss, Jr craper, forked or tined, G. F. Koenig. creen, N. Brandt creen, N. Brandt crew, set, C. G. Lundholm. caling device, packing case, C. C. Batch- elor caling vessels, J. A. Hicks	936,596 936,491 936,913	•
84	awmill, band, H. G. Dittbenner	936,314	1
88	aw setting tool, L. G. McKam Scale, computing, A. De Vilbiss, Jr	936,800 936,867 936,457	5
80	creen, N. Brandt	936,859 936, <b>54</b> 9	1
s	elor ealing vessels, J. A. Hicks adrill, Campbell & Howard. elective ringing k y, C. A. Simpson ervice box, H. C. Hubbell ewage and the like, apparatus for the bac- teriological treatment of, G. A. Lucas	936,289 936,893 936,408	1
8 8	elective ringing k y, C. A. Simpson	936,373 936,536	
10	The state of the s	, and	
8	ewing machine needles, presser foot attach- ment for, J. H. Titus	936,386	1
200.00	ewing machine, multiple needle, Dieni & Hemileb ewing machine needles, presser foot attachment for, J. H. Titus	937,027 936,421	
8	harpener, razor blade, D. M. Perine	936,935 936,802	
S	ing, A. R. McArthurheet supporting device, F. K. Fernald	936,799 936,876	
8	hips' plates, making composite, G. C.  Berg	936,514	
200	shoe upper fastening device, T. F. Whelan booting glasses, C. E. Cook.	936,391 936,987	
20202	shovel. Power shovel.  show case frame, A. A. Havenbill  Shutter bower, O	936,451 936,992	
	Bignal and tail light, P. C. Woodnutt	936,394 936,835	
8 8	Slags, deoxidizing, O. Thallner	936,313 936,382 936,967	
9 8	Smelter furnace, J. P. Welch Smelting furnace, ore, W. Kemp Smelting ore, J. P. Welch	937,030 936,781 937,031	
2 8	Socket piece for studding, etc., W. P. Rice. Soldering tool, L. Schemnitz Solenoid switch, rocking, A. T. Marshall	936,945 936,81 <b>6</b> 936,648	
	hips plates, making composite, G. C.  Berg thoe dauber, J. L. Weir	936,348	
9 I G	Sound reproducing machines record for W		
8	M. Berliner  Spark plug, J. C. Anderson  Speed changing mechanism, F. C. Brunhouse  speed driving mechanism, W. A. Pringle.  Speed driving mechanism, variable, P. T.  Kenny	936,300 937,034	
ll g	Speed driving mechanism, variable, P. T. Kenny Speed mechanism, variable, R. E. Rosewarne Spindle compound F. Soymour	936,326 936,363	1
8 8	Kenny Speed mechanism, variable, R. E. Rosewarne Spindle, compound, F. Seymour Spool, Compensating, F. E. Cole Spring, E. H. Wood Spring link, A. B. Day Square, bevel, D. E. Brandt Stacker, hay, L. J. Lindsay Stamp affling mechine, Hotchkins & Beach.	936,526 936,306	1
	Spring, D. D. W000 Spring link, A. B. Day Square, bevel, D. E. Brandt	936,971 936,865 937,020 936,332	1
8	Stacker, hay, L. J. Lindsay Stamp affixing machine, Hotchkiss & Beach, 936,630, Stapling machine, E. T. Greenfeld.	936,631	
1	осаринд прасвине, в. Т. Стесивен	000,8 <del>80</del>	(

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 Bhip 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.)

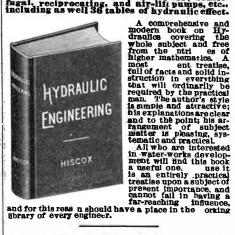
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TELEPHONE

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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 sub marine 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.



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