pare favorably with those of the American annuals. In the introduction the editor has summarized the progress of the year in saying: "If the year just closing has not been remarkable for the introduction of any new photographic process of cardinal importance, steady progress and improvement in most branches has still to be recorded."

PUBLICATIONS OF THE LICK OBSERVATORY OF THE UNIVERSITY OF CALIFORNIA. Vol. III. 1894. Sacramento: State Office. 1894. Pp. 229.

This report contains not only the purely astronomical work, but also papers treating of apparatus and materials. It will be a sine qua non in every astronomical library but it is also of interest to all cultured readers. The moon supplies a great part of the text, and a most superb series of plates from negatives taken at the observatory illustrate the contour of the lunar surface.

THE REPAIR AND MAINTENANCE OF MACHINERY. By Thomas Walter Barber. With about 400 illustrations. London: E. & F. N. Spon. New York: Spon & Chamberlain. 1895. Pp. x, 466. Price $3.50.

This practical work seems to really cover, to a certain extent, a new field, relating as it does to the repairing of broken parts of machines. The book is excellently printed and contains a very full text, and it is impossible to believe that it does not fill a most excellent field, and it will doubtless be very acceptable to the practical machinist in this country. It is elaborately illustrated and contains a good index.

THE MECHANISM OF WEAVING. By T. W. Fox. London and New York: Macmillan & Co. 1894. Pp. xx, 472. Price $2.50.

This work naturally does not lend itself to review. It is enough to say that it appears to embody an elaborate treatment of the subject, with numerous illustrations and full and satisfactory index. In its make-up it is worthy of all commendation; the illustrations are particularly clear and the type and paper most attractive, while as a sample of ornamental and suggestive binding it is especially to be noticed.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion: about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(6349) S. W. asks: 1. Having given 6 inches as length of coil and 1½ inch as diameter of iron core, how many ampere turns are required to magnetize the said core to saturation, and how great (approximately) would be the lifting power of the electro magnet so formed? A. Owing to leakage and to the fact that there is no real saturation point, no exact answer can be given. A very large number of ampere turns can be given with increase of the magnetic power on account of the long air path. 2. If I place two electro magnets end to end with poles near togcther, is the combined attractive power increased, i. e., will the magnets each pull more than they would acting separately on armatures? A. The combined power will be the same if similar poles face the same way.

(6350) T. H. B. writes: 1. Are all points of the earth's surface at the same potential (electrically)? I have heard it said that, owing to presence of certain minerals, metals, or acids in certain combinations, the potential might be higher at one place than at another, and that, owing to this difference of potential, a current might flow in a telegraph wire joining these two places, sufficiently strong to operate instruments in circuit, even when all batteries were removed from the wire. (The line of course being grounded at the terminals.) I have heard that this experiment has been successfully tried on certain lines removed from any sources of induction. Is the current present in the wire due to conditions stated, or is it due to other sources, and is not such a current, if it exist, properly called an earth current? A. Earth currents so called act as described. Their cause is obscure, but they are due to chemical changes. Telegraphic messages have been transmitted by them. 2. What becomes of the energy of a coiled spring when dissolved (under tension) in acid? I have seen the answer to this question in an earlier copy of the SCIENTIFIC AMERICAN, but cannot recall it. A. The so-called energy is simply the capacity to convert heat into mechanical energy. If a spring does work, its temperature falls. By solution in an acid this capacity is destroyed; there is no destruction of energy

(6351) H. C. R. writes: 1. Do you consider a plastered ceiling safe that has been saturated with water during a cyclone; and then again soaked before the roof could be repaired? A. No; not safe. 2. Would not the vibrations of a powerful church organ tend to bring down such a ceiling? A. Yes. 3. Can such a ceiling be thoroughly examined by simply inspecting the keys from above? A. No. 4. Is it not possible for the keys to appear all right, while the plastering has given way below? A. Yes.

(6352) R. W. K. asks: In designing a generator, is it necessary that there should be from five to seven times the weight of iron in the field as in the armature? Is it necessary that the spaces between the pole pieces should be five times the air gap? A. The factors given merely represent good general practice; there is nothing absolute about them.

(6353) A. T. asks if following dimensions and windings of dynamo will generate 30 amperes with a potential of 52 volts at the brushes: Length of wrought iron field magnets 8½ inches by 5 inches diameter, wound with 28 pounds of No. 18 double cotton covered wire, 10 layers, 140 turns on each leg of magnet. Armature 4¼ inches diameter, 6 inches long, best laminated iron core, wound with No. 12 double cotton covered wire, 32 coils, 4 convolutions in each coil, speed about 1,800 revolutions per minute, general shape of dynamo about same as 60 light dynamo in SUPPLEMENT, No. 865. A. If you succeed in getting the above results, you will do well. If shunt wound, the product of your armature and field resistance should equal the square of the external resistance, or say three ohms.

(6354) J. P. G. asks: In making a Gramme size 3½ inch diameter armature of 12 sections, is it absolutely necessary to wind each section in even layers and convolutions if wires on each section are of equal length? A. To secure a uniform current there should be an equal number of turns of wire in each section; the length is not necessarily identical.

(6355) A. B. says: I take the liberty to offer a suggestion to your answer to F. G. C.'s query, No. 6329, in SCIENTIFIC AMERICAN of December 22, for telling the points of the compass by the aid of the sun and a watch. If the hour hand of the watch be pointed at the sun—the watch lying flat—half way between the hour hand and twelve on the dial will be south. After south is located the other points are easily determined. Doubtless a compass would be more correct, but the method given will be found correct enough for ordinary requirements.

(6356) S. R. H. writes: I have a few questions that I would be glad to have answered in SCIENTIFIC AMERICAN. How far could a person live below the surface of the earth, say for instance 1, 2, or 3 miles deep? Would the air become too dense or compact for them? Is it not a fact that the earth's surface acts as a medium line for the center of gravity, atmospheric and water pressure? How far above the earth's surface is the air considered to be pure and healthy, to contain no poison matter? A. The depth at which a person can live below the surface of the earth depends upon the condition of temperature and the constitutional ability of the person to bear heat. The internal heat of the earth increases 1° Fah. for every 50 to 70 feet of vertical depth in various regions, so that from 2,000 to 3,000 feet in depth is about the limit that a man can work. In parts of the earth which have been subject to volcanic action, as in some of the mining districts, the temperature rises somewat more than 1° in 50 feet, and 120° is the temperature at about 1,500 feet in depth. At this temperature labor is very difficult and forced ventilation has to be resorted to, and by this resource a depth of 4,000 feet may be attained in the undisturbed strata of the earth. The earth's surface is the plane of demarkation for atmospheric and water pressure. The barometer indicates decreased pressure as we go down in mines, the same as in ascending in the air. Water also increases in pressure as the distance beneath the sea. The atmosphere has no known difference in composition at the greatest heights observed. It is its lightness or rarity that affects the lungs at great heights.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

January 8, 1895,

AND EACH BEARING THAT DATE.

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

Abacus, L. D. Myers 532,282
Advertising board, H. D. Streator 532,111
Aging or treating spirits, R. C. Scott 532,389
Alarm. See Burglar alarm. Low pressure alarm.
Amalgamator, A. Tanner 532,114
Anchor, E. Rettig 532,184
Animal trap, P. H. Sisson 532,343
Annealing box, W. H. Bailey 532,134
Antimony, double salts of O. O. B. Froelich 532,150
Applicator, S. J. Bradley 532,359
Automatic sprinkler or fire extinguisher, W. Esty 532,269, 532,270
Axle straightening and setting machine, G. L. Collis 532,030
Band, clasping, T. W. Jones 532,070
Barrel leveling and trussing machine, D. A. Gordon 532322
Basket or carrier for bottles or other articles, H. M. Kolb 532,324
Bath apparatus, portable shower, W. E. Dobbins 532,267
Battery. See Storage battery.
Belt tightener, R. M. Whitney 532,255
Bench hook, A. McFarland 532,387
Bicycle, W. C. Dailey 532,143
Bicycle support, A. M. Ribbany 532,287
Blacking box holder, A. L. Higgins 532,375
Blacking casing, L. Nearing 532,283
Blowing engine or compressor, W. E. Good 532,051
Board. See Advertising board.
Boiler. See Hot water boiler. Pipe boiler. Wash boiler.
Boiler brace, P. McGregor 532,386
Books, device for handling, Pfund & Jacobi 532,425
Boomerang, F. G. Faxon 532,233
Boot or shoe sole or heel paring machine, C. H. & R. H. Southall 532,170
Boot or shoe soles, cutter for trimming, J. J. Mabray 532,171
Boots, machine for finishing wool, C. H. Woodbury 532,352
Bottle filling apparatus, A. Grap 532,235
Bottle necks, tool for forming, F. Achtenhagen 532,191
Bottles, tool for forming flaring lips on, G. L. Jenkins 532,378
Box fastener, W. H. Howe 532,067
Brace. See Boiler brace. Folding brace.
Braided moulds, method of and device for finishing coverings of, F. Markgraf 532,280
Brake. See Carriage brake. Hoisting apparatus brake. Pneumatic brake.
Brake, J. Gardner 532,048
Brick drier, W. T. Nicholls 532,178
Brick kiln, C. J. Holman 532,154
Brick machine, Rolfe & Johnson 532,196
Brick or tile cutting machine, J. Thompson 532,222
Brick truck, A. T. Bemis 532,356
Brush mould, W. Morrison 532,210
Brush, wire, J. F. Bigelow 532,259
Buckle, W. F. Sweet 532,433
Buckle, suspender, J. Kennedy 532,381
Burglar alarm, electric, Scholes & Myers 532,291
Burner. See Hydrocarbon burner. Oil burner.
Burner for use of crude petroleum, etc., Foster & Hammel 532,271
Bust developer, G. C. Hardesty 532,236
Button, collar, F. C. Craw 532,229
Button, separable, F. S. Nelson 532,284
Caisson for erecting bridge piers, Cbechong & Balensiefer 532,140
Calculator, Loomis & Phillips 532,383
Camera diaphragm, M. Levy 532,326
Car bolster, H. R. Stanford 532,107
Car coupling, Downey & Hummer 532,315
Car coupling, J. E. Forsyth 532,045
Car coupling, C. Frost 532,272
Car coupling, J. W. Hayward 532,058
Car coupling, C. Heise 532,323
Car coupling, E. C. Inderlied 532,275
Car coupling, W. McNames 532,087
Car coupling, H. Rienow 532,337
Car coupling, Russell & Perry 532,102
Car draught attachment, railway, J. Timms 532,115
Car fender, J. E. McBride 532,086
Car fender and brake, railway, J. T. Matthews 532,385
Car guard, street, W. H. Paugh 532,393
Car platform life-saving apparatus, street, W. H. Rodgers 532,339
Car safety attachment, R. Bustin 532,360
Car wheel and axle, mine, I. Barker 532,017
Cars, motor suspension for electric street, S. Harris 532,057
Carboy holder, J. O. Ratbbun 532,094
Card grinding machine, C. Mills 532,331
Carriage brake, Brown & Welch 532,137
Carriage provided with heating apparatus for transporting food, etc., J. Lay 532,325
Case. See Egg case. Shipping case. Show case.
Cash register, W. G. Latimer 532,423
Casks, drums, etc., securing heads of, G. Powell 532,248
Cereal reducing machines, receiving trough and cutter for, H. D. Perky 532,286
Check row wire, mechanism for reeling, W. E. Surface 532,112
Chimney lifter, F. Rbind 532,336
Clamp. See Trolley wire clamp.
Clay shingles, die or mould for making, Murray & Welch 532,065
Clippers, gauge or guard plate for hair, J. K. Priest 532,335
Clipping machine, electric hair, P. Shannon 532,188
Clock level, W. J. Marsball 532,078
Clothes line reel, Woodward & Geisler 532,130
Clothes to clothes lines, device for attaching, O. McShane 532,242
Clutch, Akerley & Horton 532,258
Clutch, friction, W. H. Lindsay 532,162
Coal separator, J. R. Richardson 532,427
Coffee roaster, D. H. Marsball 532,207
Coffin handle, detachable, J. Klar 532,073
Collar fastener, horse, P. H. Dubois 532,039
Combination wrench, G. W. Dunsworth 532,041
Combing machine attachment, wool, Smith & De Vries 532,217
Computing machine, R. E. McClelland 532,241
Conductor, M. D. Law 532,161
Conductor support, J. C. Love 532,164
Cooker, steam feed, C. Wood 532,131
Cooking vessel, C. Baumgardner 532,226
Coop, etc., folding, T. A. Allen 532,303
Coop for poultry, shipping, M. L. Reeves 532,212
Copy holder, C. Spiro 532,346
Copying bath, capillary, Thorp & Gifford 532,404
Cotton press, S. D. Murray 532,386
Coupling. See Car coupling. Thill coupling.
Cultivator, R. S. Chaney 532,313
Cultivator, B. F. Harford 532,055
Curling iron, O. G. Dunnom 532,317
Curling iron, Howard & Hellstrom 532,066
Curtain stretcher, W. A. Cochran 532,416
Curtain stretcher, C. Linder 532,382
Cutter. See Potato cutter.
Displaying reading matter, device for, H. B. Butts 532,024
Distilling and sterilizing water, apparatus for, J. Nagel 532,390
Ditching machine, H. M. & A. J. Fuller 532,369
Door, E. Hines 532,201
Door, flexible, E. Brown 532,021
Door holder, H. Fletcher 532,367
Door stop, L. Funk 532,151
Draught equalizer, Smith & Barto 532,345
Drawing and evening sliver, machine for, W. V. Threlfall 532,405
Drier. See Brick drier. Portable drier.
Drying kiln, W. G. Galloway 532,418
Drill. See Hand drill.
Duplicating apparatus, A. D. Klaber 532,205
Dust collecting system, H. L. Day 532,144
Dust separator, McNaughton & Seymour 532,389
Dye, blue disazo, A. Weinberg 532,125
Easel, desk, R. M. Hitch 532,063
Eaves trough, W. S. Harris 532,056
Egg case, W. A. Humfeld 532,156
Electric conductor tension device, J. C. Love 532,166
Electric wires, crossarm for support of, E. J. Bullock 532,260
Elevator and dump, R. Bullis 532,022
Elevator guide post clamping device, M. Christopherson 532,414
Elevator safety device, S. P. Kay 532,158
Ellipsograph, J. Hottinger 532,155
End gates, locking device for wagon, J. T. Duncan 532,040
Engine. See Blowing engine. Gas engine. Gas, oil or vapor engine. Gas or petroleum engine. Hydrocarbon engine. Rotary engine. Steam engine.
Engine attachment, steam, M. H. Molloy 532,083
Entrails, machine for cutting and cleaning, Reyels & Ebert (r) 11,463
Envelope, A. D. Klaber 532,206
Escutcheon, C. R. Uhlmann 532,223
Fastening and driving tool therefor, metallic, J. J. A. Guibaud 532,052
Feedwater purifier, J. Mohr 532,082
Fence, L. M. Shirtcliff 532,292
Fence machine, wire weaving, E. S. Morgan 532,240
Fence post, Pitney & Gardner 532,246
Fermenting vat, C. Hauger 532,373
File cutting machine, A. Weed 532,123
Firearm, gas-operated, C. Johnson 532,380
Fire escape, J. J. Haller 532,054
Fire extinguisher, automatic, W. Esty 532,268
Fireproof ceiling, C. F. W. Doebring 532,037
Fireproof wall, C. F. W. Doebring 532,038
Fluid under pressure, means for transmitting, W. S. Halsey 532,198
Folding brace, I. O. Harsh 532,058
Furnace. See Hot water furnace. Siphon furnace.
Furnace, U. P. Smith 532,218
Furnace air distributer, Burnshire & Click 532,309
Furniture, adjustable support for school, T. R. Roulstone 532,396
Game apparatus, C. W. Zaremba 532,132
Garment supporter, G. D. Nichols 532,244
Garment supporter, C. W. Stimson 532,402
Gas, apparatus for making and purifying, R. H. Laird 532,075
Gas burners, automatic safety attachment for, H. H. Cummings 532,142
Gas engine, J. A. Charter 532,314
Gas, oil, or vapor engine, J. Robison 532,088
Gas or petroleum engine, P. Bilbault 532,412
Gas or vapor and air mixing and spraying device, J. Robison 532,099
Gear cutting machine, L. E. Whiton 532,127
Generator. See Steam generator.
Glove holder, S. Free 532,319
Grain cleaning and separating machine, C. Closz 532,415
Grate raking and cleaning attachment, J. G. Ernst et al 532,194
Grave implement, S. Todd 532,116
Grinder, knife, C. Seybold 532,104
Guard. See Car guard. Railway cattle guard. Window guard.
Guns, cocking mechanism for breakdown, H. Park 532,090
Guns, ejecting mechanism for breakdown, J. Rider 532,096
Hame, W. Fischer 532,318
Hame fastener, W. H. Johnson 532,422
Hammock, G. B. French 532,047
Hand drill, J. Defatsch 532,145
Harrow, J. B. Morrison 532,332
Harrow and seeder, combined, S. H. Raymond 532,426
Harvester, corn, J. J. Osburn 532,392
Harvester reel, J. H. Fulton 532,320
Hat and clothes book, Stinebcomb & Danner 532,109
Hat sweats, device for attaching reeds and flanging, C. G. Ives 532,276
Hay press, H. O. Hem 532,060
Hay rake, A. E. Mattwich 532,079
Heater. See Hot water heater. Lamp heater. Steam or hot water heater.
Heater, H. Gutschmidt 532,273
Heel and sole for boots, etc., elastic or anticoncussion, L. Rogers 532,429
Hinge, adjustable, J. K. Fagan 532,044
Hoisting apparatus brake, A. Bolzani 532 227
Hook. See Bench hook. Hat and clothes hook. Transfer hook. Whiffletree hook.
Hook and eye, S. I. Slade 532,401
Horses, undercheck for, J. R. Buchanan 532,308
Hose carriage, B. L. Stowe 532,432
Hose rack, B. L. Stowe 532,403, 532,431
Hot water boiler, A. Burt 532,139
Hot water furnace, W. C. Johnson 532,069