DETAILED INDEX

Α Accuracy of quant. methods, 412, 644, 668, 730, 747, 839, 855a Adsorption measurements, 371, 706 Air, detn. of A in -, 517 detn. of CO2 in -, 218 detn. of Kr in -, 594 Alkalis, detection of —, 568 detn. of -, 512, 631, 816 excitation in analysis of ---, 210 geochemistry of -, 401, 619 quant. analysis of —, 265 Alkalis and alkaline earths, apparatus for flame spectra of -, 709 Alloys, (see Metallic —) analysis of — by homologous pairs, 200 Aluminum, detn. of Cu in -, 41, 301 detn. of Cu, Fe, Mg, Mn, Si, Zn, in --, 683 detn. of Cu, Fe, Mn, Si, Ti in -, 678 detn. of Fe, Si in --, 926 detn. of Fe, Si, Ti in --, 286, 287 detn. of Mg. in --, 566 detn. of Na in --, 342 detn. of Ni in -, 385 purity of -, 398 visual detn. of Ca, Li, Ni, Sr in -, 787, 788 Aluminum and alloys, detn. of impurities in -, 64, 87, 911b detn. of Zn in -, 302 quant. analysis of ---, 820, 910 Aluminum alloys, detn. of Mg in -, 755 detn. of Si in -, 567 detn. of Cd, Cu, Fe, Mg, Mn, Ni, Si, Sn, Zn, in ---, 562 detn. of Cu, Fe, Mg, Ti, in --, 807 quant, analysis of -, 806 visual quant, analysis of —, 791

```
Aorta, detn. of Ca, Mg in human —, 351
  quant, analysis of human —, 338
Apparatus (see also Arc, Electrodes, Galvanome-
    ter, Grating, Holder, Microphotometer,
    Photocells, Spark, Spectroscopes and Spec-
    trographs), 88, 116, 154, 184, 253, 300, 707,
    741, 862
  discharge-for quant. analysis, 625
  for direct comparison of intensities, 455
  for excitation of two sparks, 918
  for flame spectra, 709
  for projection of spectrograms, 485
  for weak light sources, 327, 518
  high-frequency spark —, 254, 432
  in industry, 268
  mechanically interrupted spark —, 305, 382,
     383, 407, 408, 487, 856
Applications, during the war, 2
  in industrial laboratories, 27, 98, 417
  in iron and steel laboratories, 165, 204, 392
  of photocells to spectrography, 525
  to agriculture, 167, 489, 530, 761
  to astronomy, 11, 146, 278, 550, 666
   to biology, 54, 164, 167, 393, 435, 460, 486,
     530, 881
   to chemistry, 59, 395, 419, 443, 497, 530
   to chemistry and medicine, 59, 395, 419, 497,
     498, 530
   to criminology, 118, 213, 289, 294, 361, 368,
     394
   to electroplating, 724
   to industrial control, 380, 819, 867
   to medical diagnosis, 905
   to medical research, 374, 419
   to microchemistry, 168, 337
   to mineralogy, 34, 167, 244, 395, 497, 536,
     573, 595
   to metal industries, 186, 281, 282, 355, 421,
   to metallurgy, 40, 115, 227, 263, 304, 467, 526
   to platinum industry, 681
   reviews of --, 15, 16, 24, 30, 38, 138, 207, 208,
     248, 249, 316, 318, 331, 444, 449, 462, 478,
     496, 524, 532, 553, 561, 607, 613, 627, 649,
     684, 699, 708, 844, 865, 908
```

Aluminum-magnesium alloys, quant, analysis of

Animal metabolism, heavy metals in —, 659

visual quant, analysis of —, 911

Amazonites, alkalis in —, 686

Animal organism, Zn in ---, 4

Antimony, detection of —, 353

-,909

Arc, a.c.—for quant. analysis, 723, 757	detn. of Pb in —, 582, 583, 584, 720
analysis by cathode layer of —, 266, 804	elements in —, 151, 175
for powdered salts, 37	Pb in —, 359, 818
interrupted —, 312, 728b, 836, 874, 880, 912	Blood serum, detn. of Na in —, 513
oscillating —, 228	Bones, F in —, 215
sensitive vacuum —, 36	Boron, detn. of—by distillation, 420, 835
spark lines in —, 12	geochemistry of —, 315
spectra of low m.p. metals, 3	in aluminum silicates, 14
voltaic —method, 863	Brain, detn. of Ca, Cu, Fe, K, Mg, Mn, Na,
Arsenic, detection of —, 353	P, Pb, in —, 821a.
geochemistry of —, 508	Brass, detn. of Al, Fe, Mn, Ni, Pb, Sn in -, 237
Artery, elements in —, 346	Bronzes, quant. analysis of prehistoric —, 697
Ash, detn. of Al in biol. —, 296	_
Assaying, spectral analysis in -, 196	C
Astronomy, applications to —, 11, 146, 278, 550,	Cadmium, detection of —, 277
666	detn. of impurities in -, 638
quant. analysis in —, 146, 278, 666	purity of —, 645
sensitive lines in,, 11	Calcium, analysis of —, 97
Atlas of arc spectra, 65, 598	detn. of —, 630
Fe spectra, 608	detn. of Sr in —, 279
spark spectra, 129, 760	Calcium oxalate, detn. of Mg in —, 352
Atomizer for salt solns., 126, 130, 457, 692	Canned food, detn. of Cu, Fe, Pb, Sn in -, 802
Axes, Sn in prehistoric —, 7	detn. of Pb in —, 636
В	Carbon, purification of electrode —, 202, 548, 648, 680, 700
Band spectra in analysis, 274, 343, 882, 883	Carbon electrodes, purity of —, 728a, 870, 890,
Barlum, analysis of —, 97	924, 925
geochemistry of —, 774	Carcinoma, Cr and Mo in —, 481
Beryllium, detection of —, 152, 306	Carnallite, detn. of Rb in —, 321
geochemistry of —, 313	Cassiterite, analysis of —, 241
Beryls, elements in —, 711	Cathode-layer method of analysis, 266, 804
Bibliography of spectral analysis, 677	Cerebrospinal fluid, detection of Pb in —, 434
Bile, elements in —, 492	detn. of Pb in —, 606
Biological ashes, detn. of Al in —, 296, 641a	Chick tissues, elements in —, 601
Biological fluids, detn. of Ca, K, Mg, Na, in,	Chromium and nickel, visual detection of —, 191
915	Chromium, sensitive lines and spectral series of
Biological materials (see also Organs, Plants,	—, 32
Tissues)	Cobalt, detection of impurities in —, 829
analysis of —, 925	Columbium, detn. of —, 830
detn. of Au in, 233	Comparator for spectrograms, 144, 527, 853
detn. of Bi in —, 837	Concretions, analysis of —, 500
detn. of Pb in —, 597, 838	Copper, detection of impurities in —, 534
Biology, adsorption method in —, 578	detn. of Ag, As, Bi, Pb, Sb in —, 376
applications to —, 54, 164, 167, 393, 435, 460,	detn. of Ag, As, Bi, Pb, Sb, in —, 470
486, 530, 881	detn. of As, Bi, Fe, Pb, Sb, Sn in —, 887
Bi-multiple spectra method for quant. analysis,	detn. of As, Bi, Pb, Sb, Sn, in —, 588
366	detn. of Au, Sb in —, 730
Bismuth, detn. of Pb in —, 113	detn. of Bi in —, 209, 330, 557
Te in —, 229	detn. of Bi, Mo, Sb, Sn in —, 539
Blende, analysis of—by pyroelectric concn.	detn. of elements in —, 471, 591, 592
method, 784	detn. of Ge in —, 587
Blood, Al in —, 262	detn. of Sb in —, 759
analysis of —, 733	detn. of Sn in —, 572

Copper-lead alloys, quant, analysis of —, 555 Eyes, Au in —, 501 Copper shale, analysis of —, 194 mineral content of —, 275 Co-precipitation, study of —, 352, 458, 633 Corundum, detn. of Cr, Ga, Ti, V in -, 744 False identifications, 614, 635 Criminology, applications to —, 118, 368, 394 Films, analysis of metallic -, 405 detection of Hg in -, 213 Flame analysis, ionization potentials in —, 655, detection of metals in -, 289 656 identification of lead bullets in -, 361 Flame method, 167, 530, 643, 692, 768 identification of stolen telephone wire in -, effect of Al in -, 769 294 in microchemical analysis, 168 Cupferon, use of—in spectral analysis, 577 review of -, 570, 761 D Flame, spark in —, 132, 177, 317, 654 Densitometer (see Microphotometer) use of oxyacetylene -, 31, 762 Diffusion of Hg in Sn foil, 199 Flames, apparatus for —, 709 Dilution method of quant. analysis, 558, 559, 756 atomized salt solns. in -, 126, 130, 692, 762 Discharge tube for small quantities, 675 detn. of Cu, K, Mg in --, 130 from volcano, elements in -, 69 **Duralumin**, detn. of Fe, Mg, Mn, Si in —, 465 detn. of Mg in -, 566 Fluorine detection, by SiF4, 776 detn. of Mg, Mn, Si in -, 516 in minerals and bones, 215 detn. of Cu, Fe, Mn, Si in -, 840 in opal glass, 80 in water, 541 exam. of-surface changes, 812 Food, (see Canned Food) E Fruit, elements in citrus -, 891 Electrode holder, 757 (see also Holder) Fuels, detn. of Pb in -, 149 Electrodeposition method of concn., 91, 199, Pb in —, 66 233, 234 Fulgurator as atomizer, 126 Electrodes, colloidal—for solns., 29, 46, 893 G magnesium as -, 68 "pastille" -, 165 Gadolinium, detection of —, 882 Gallium, geochemistry of -, 256 prepn. of gold -, 369 purification of -, 628 purification of carbon -, 202, 548, 648, 680, visual detn. of-in solns., 897 purity of carbon -, 870, 890, 924, 925 Galvanometer support, 849 Garnets, analysis of -, 540 Electrolytic concn. method of quant. analysis, Gas mixtures, quant. analysis of --, 307, 515, 445, 669, 794, 901 Electroplating, applications to —, 724 517, 626 Gas tubes, analysis of com. -, 673 Elektron metal, visual detn. of Al, Mn, Zn in --, 821 prepn. of -, 25 Gases, analysis of -, 907 Europium, sensitive lines of -, 427, 884 detection of intermediate products in -, 148 purity of —, 859 Excitation, by a.c. arc, 723 detection of noble-in He, 748 corrections for variations in -, 525, 651, 824 in enameling iron, 529 in minerals, 662 effects of electrode shape on —, 856 effects of polarity in -, 713, 746, 833 quant. analysis of -, 211, 219 spectroscope for analysis of -, 85 factors in arc and spark —, 904, 929 ultimate rays of -, 178 mutual effects of elements in -, 317, 390, 827a, Gases and metalloids, detection of —, 170, 738 831 Gem-stones, identification of -, 852a of spectra, 99, 333 Geochemistry, of alkali metals, 401, 619 of spectra by explosives, 876 of As, 508 potentials for sensitive lines, 367

of B, 315

of Ba, 774

sensitivity of methods of -, 312

Eye lens, analysis of —, 166

of Be, 313	multiple-for electrodes, 734
of Ga, 256	multiple-for spark electrodes, 292
of Ge, 400	Hollow cathode, for analysis of gas mixtures,
of Li, 805, 911a	517
of noble metals, 314	Homologous-pairs method of quant. analysis,
of Sc and Y, 257	112, 113, 157, 200
Germanium, analysis of —, 387	_
detection of —, 247	Į.
detn. of —, 587	Illumination of spectrographs, 89, 293, 450, 590,
in minerals, 136	757
in silicate minerals, 173	Indium, detection of —, 216, 277
in topaz, 137	visual detn. of—in solns. 896, 897a
Glass, analysis of —, 718, 719	Industrial control, applications to —, 380, 819,
detn. of F in opal, 80	867, 886a
detn. of Fe in -, 792	Intensity of lines and concn. of element, 108
elements in early Chinese -, 798, 888	Intensity measurement, 276, 283, 341, 701
Glass optics, analysis by -, 261, 328, 415, 519,	app. for direct —, 455, 679
520, 521, 522, 523, 634	by varying source distance, 340
Gold, detn. of impurities in —, 26	Internal standard method, 57
detn. of traces of, 58	Interrupted arc, 312, 728b, 836, 874, 880, 912
Gold electrodes, prepn. of, 369	Ionization potentials in flame analysis, 655, 656
Gold and alloys, detn. of Pb in -, 79, 124	
Gold alloys, detection of Pb in, 155	Iron, C in —, 1, 604 control of production, 1, 878a, 920
Gold ores and slimes, detn. of Sn in -, 863	detn. of Cr, Si in —, 763
Gold particles, detn. of Cu, Pt in -, 772	detn. of Cu, Cr, Mn, Mo, Ni, Si in —, 878a,
Gold and silver, detn. of ratio of —, 323	920
Gold-silver alloys, Fe in -, 463	detn. of elements in —, 139, 230, 231, 472
Graphite, detn. of V in Passau -, 823	
Grasses, detn. of Cu in wire -, 898	detn. of Ge in —, 587 detn. of Si in —, 386, 441, 451, 668, 850
Grating spectrograph, 378, 598, 740, 808	
stigmatic mounting of concave —, 25	gases in enameling —, 529
Guinea pig, Au in —, 894	purity of —, 845, 889
Gum acacia, elements in —, 418	rapid detn. of elements in —, 280, 878a, 920
	visual detn. of Si in —, 416
н	Iron and alloys, analysis with glass optics, 261,
Hafnium, sensitive lines of —, 663	328, 415, 519, 520, 521, 522, 523, 634
Half-cylinder sector method, of quant. analy-	Iron alloys, analysis of —, 622
sis, 739	Iron arc, description of —, 6
Halite, elements in —, 858	Iron ores, detn. of Al in —, 861 Iron preparations for medicine, Cu and Mn in
Helium, detection of Ne, A, Kr, Xe, in —, 748	A = 0
H and Ne in —, 621	, 358 Iron and slag, analysis of, 685
sensitive line of —, 737	Iron spectra, atlas of —, 608
Hemocyanins, Cu in —, 388	Iron and steel, detn. of C, Cr, Mn, Mo, Si in
High-frequency spark, 254, 551, 670, 687, 696,	
930	—, 902 Iron and steel laboratories, applications in —,
Histochemistry, applications to —, 428 (see also	204
Tissues)	201
History, of spectral analysis, 72, 120, 618, 623,	K
653, 813, 814	
of spectroscopy, 45	Kaolin, detn. of Ga in —, 127
Holder, for arc electrodes, 174	detn. of Ru in, 160
for series of arc electrodes, 714	Kimberlite minerals, analysis of —, 540
for spark electrodes, 793	Kinematic method of quant. analysis, 466

L

Lanthanum, detection of-by band spectrum, detn. of -, 579 Lead, detn. of -, 260 detn. of impurities in --, 829 detn. of Ag, As, Bi, Cd, Cu, Fe, Hg, Sb, Sn, Tl, Zn, in --, 237 detn. of Ag, Bi, Cu, Ni, in -, 574, 705 detn. of Bi, Cu, Sn in -, 385 detn. of Bi, Sn in --, 112 detn. of Ca, Mg, Ni, in -, 556 detn. of Cu in -, 320 detn. of Sb in -, 140 detn. of Sn in -, 95, 286, 287 visual detn. of Ca, Li, Na, Sr, in -, 787, 788 Lead alloys, detn. of Au, Bi, Cu, Li, Tl, Zn, in **—**, 259 detn. of Sb, Sn in -, 831 quant. analysis of ---, 291, 295, 832 Lead bullets, identification of -, 361 Lead cable-sheath alloys, quant. analysis of ---, 335, 380, 385 Lead minerals, elements in -, 664 Lead poisoning, 582, 583, 584, 736 Lead-tin alloys, elements in —, 141 Length-of-line method, 172, 879 Lithium, analysis of -, 97 detn. of -, 558, 559 geochemistry of -, 805, 911a Liver, Cu in ---, 429 elements in --, 182, 436, 531 Fe in —, 533 Local analysis of metals or alloys, 919 Log-sector method, 139, 232, 295, 642, 725, 928 accuracy of -, 644 for solns., 298 in iron analysis, 139, 230, 231 Schwarzschild relation in --, 365 Lungs, elements in —, 308 quartz dust in -, 851 М

Magnesium alloys, detn. of Mn, Si in —, 652 quant. analysis of ---, 926, 927 Magnesium as electrodes, 68 Magnesium, types of — lines, 13, 22 Manganese in rat diet, 272 Manganese-cobalt mixtures, quant. analysis of **—**, 599 Marine invertebrates, elements in —, 923

Meconium, detn. of elements in ---, 446

Medical diagnosis, quant. analysis in -, 905 Medical research, applications to -, 374, 419 Mercury, detection by high frequency spark, detection in glass app., 74 purity of —, 424 Mercury poisoning, 771 Metabolism, heavy metals in animal —, 659 Metal industry, application to —, 186, 281, 282, 355, 421 Metallic alloys, detn. of Ba, Ca in -, 689 detn. of Cr in -, 811 qual, analysis of -, 153 quant, analysis of —, 106, 133, 201, 688 structure of -, 687 visual photometer for rapid analysis of -, Metallic films, analysis of —, 405 Metalloids, detection of —, 170, 738 detn. of - in metals, 783 Metalloids and gases, detection of -, 170 Metallurgy, applications to ---, 40, 115, 227, 263, 304, 467, 526 atlas for analysis in -, 65, 598 Metals, analysis of -, 190, 421 analysis of - by heavy current, 75 arc spectra of low m.p. -, 3 detn. of As, P, Sn. in -, 783 detn. of traces of -, 797 purity of -, 394, 397, 931, 932 quant. analysis of non-ferrous -, 237, 448, 469, 572a soln. method of quant. analysis of -, 171, 339 Metals and alloys, local analysis of -, 919 Meteorites, As and Ge in —, 214 detn. of Ge in -, 581 detn. of elements in -, 403 elements in —, 52, 236, 336, 546, 589, 752, 753, Method, band spectrum —, 274, 343 bi-multiple spectra — of quant. analysis, 366 cathode-layer -, 266, 804

dilution — of quant. analysis, 558, 559, 756 direct comparison — of semi-quant. analysis, 825

direct photoelectric - of quant. analysis, 537, 631, 848

electrodeposition -, 91, 199, 233, 234 electrolytic concn. — of qual. analysis, 445, 669, 794, 901

exploded wire — for analysis of W, 82 half-cylinder sector — of quant. analysis, 739 high-frequency spark —, 254, 551, 670, 696

interrupted-arc —, 312, 836
kinematic — of quant. analysis, 466
length-of-line — of quant. analysis, 172, 879
log-sector — of quant. analysis, 139, 232, 295,
365, 6 44 , 928
microspectroscopic —, 538
multiple-film —, 544
photon-counter — of quant. analysis, 785
pyroelectric concn. —, 545
"ratio-quantitative" —, 329
relative line spreading —, 841
soln. — of quant. analysis, 171, 339, 889
soln. spray in spark —, 457
spark-in-flame -, 132, 177, 317, 654
"star-trail" quant. —, 224
step-diaphragm — of quant. analysis, 303,
381, 452, 483, 484
step-sector — of quant. analysis, 804
step-wedge — of quant. analysis, 726, 822
"synthetic spectrum" —, 557
"test" — for quant. analysis of solns., 183
variable inductance — of quant. analysis, 571
visual extinction by wedge cell —, 786
voltaic arc, 863
wedge — of quant. analysis, 295, 447
without-standard-curve — of quant. analysis,
220, 284
Methods, discussion of qual. —, 114, 120, 242,
312, 899
discussion of quant, 57, 115, 120, 122, 123,
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, 164
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, *f64 of spectroscopy, 88, 116
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, 164 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, f64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, *t64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438 Sn in —, 827
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, *t64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438 Sn in —, 827 Microburet, for quant. analysis of solns., 563
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, *t64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438 Sn in —, 827 Microburet, for quant. analysis of solns., 563 Microchemistry, applications to —, 168, 337
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, *t64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438 Sn in —, 827 Microburet, for quant. analysis of solns., 563
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, *t64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438 Sn in —, 827 Microburet, for quant. analysis of solns., 563 Microchemistry, applications to —, 168, 337
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, *t64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438 Sn in —, 827 Microburet, for quant. analysis of solns., 563 Microchemistry, applications to —, 168, 337 Microphotometer, 96, 527, 647, 921 Milk, Al in —, 262
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, t64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438 Sn in —, 827 Microburet, for quant. analysis of solns., 563 Microchemistry, applications to —, 168, 337 Microphotometer, 96, 527, 647, 921 Milk, Al in —, 262 elements in —, 189, 372, 482
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, *t64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438 Sn in —, 827 Microburet, for quant. analysis of solns., 563 Microchemistry, applications to —, 168, 337 Microphotometer, 96, 527, 647, 921 Milk, Al in —, 262 elements in —, 189, 372, 482 Mineral analysis by quartz spectrograph, 53,
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, t64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438 Sn in —, 827 Microburet, for quant. analysis of solns., 563 Microchemistry, applications to —, 168, 337 Microphotometer, 96, 527, 647, 921 Milk, Al in —, 262 elements in —, 189, 372, 482 Mineral analysis by quartz spectrograph, 53, 406
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, t64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438 Sn in —, 827 Microburet, for quant. analysis of solns., 563 Microchemistry, applications to —, 168, 337 Microphotometer, 96, 527, 647, 921 Milk, Al in —, 262 elements in —, 189, 372, 482 Mineral analysis by quartz spectrograph, 53, 406 Mineralogy, applications to —, 34, 167, 244,
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, t64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438 Sn in —, 827 Microburet, for quant. analysis of solns., 563 Microchemistry, applications to —, 168, 337 Microphotometer, 96, 527, 647, 921 Milk, Al in —, 262 elements in —, 189, 372, 482 Mineral analysis by quartz spectrograph, 53, 406 Mineralogy, applications to —, 34, 167, 244, 395, 497, 536, 573, 595
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, t64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438 Sn in —, 827 Microburet, for quant. analysis of solns., 563 Microchemistry, applications to —, 168, 337 Microphotometer, 96, 527, 647, 921 Milk, Al in —, 262 elements in —, 189, 372, 482 Mineral analysis by quartz spectrograph, 53, 406 Mineralogy, applications to —, 34, 167, 244, 395, 497, 536, 573, 595 Minerals (see also Amazonites, Beryls, Ores,
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, t64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438 Sn in —, 827 Microburet, for quant. analysis of solns., 563 Microchemistry, applications to —, 168, 337 Microphotometer, 96, 527, 647, 921 Milk, Al in —, 262 elements in —, 189, 372, 482 Mineral analysis by quartz spectrograph, 53, 406 Mineralogy, applications to —, 34, 167, 244, 395, 497, 536, 573, 595 Minerals (see also Amazonites, Beryls, Ores, Rocks, etc.)
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, t64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438 Sn in —, 827 Microburet, for quant. analysis of solns., 563 Microchemistry, applications to —, 168, 337 Microphotometer, 96, 527, 647, 921 Milk, Al in —, 262 elements in —, 189, 372, 482 Mineral analysis by quartz spectrograph, 53, 406 Mineralogy, applications to —, 34, 167, 244, 395, 497, 536, 573, 595 Minerals (see also Amazonites, Beryls, Ores,
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, t64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438 Sn in —, 827 Microburet, for quant. analysis of solns., 563 Microchemistry, applications to —, 168, 337 Microphotometer, 96, 527, 647, 921 Milk, Al in —, 262 elements in —, 189, 372, 482 Mineral analysis by quartz spectrograph, 53, 406 Mineralogy, applications to —, 34, 167, 244, 395, 497, 536, 573, 595 Minerals (see also Amazonites, Beryls, Ores, Rocks, etc.)
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, *t64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438 Sn in —, 827 Microburet, for quant. analysis of solns., 563 Microchemistry, applications to —, 168, 337 Microphotometer, 96, 527, 647, 921 Milk, Al in —, 262 elements in —, 189, 372, 482 Mineral analysis by quartz spectrograph, 53, 406 Mineralogy, applications to —, 34, 167, 244, 395, 497, 536, 573, 595 Minerals (see also Amazonites, Beryls, Ores, Rocks, etc.) analysis of —, 73, 86, 104, 105, 244, 440, 477, 662, 758
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, t64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438 Sn in —, 827 Microburet, for quant. analysis of solns., 563 Microchemistry, applications to —, 168, 337 Microphotometer, 96, 527, 647, 921 Milk, Al in —, 262 elements in —, 189, 372, 482 Mineral analysis by quartz spectrograph, 53, 406 Mineralogy, applications to —, 34, 167, 244, 395, 497, 536, 573, 595 Minerals (see also Amazonites, Beryls, Ores, Rocks, etc.) analysis of —, 73, 86, 104, 105, 244, 440, 477, 662, 758 detn. of B, Ni, Sn in —, 886
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, t64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438 Sn in —, 827 Microburet, for quant. analysis of solns., 563 Microchemistry, applications to —, 168, 337 Microphotometer, 96, 527, 647, 921 Milk, Al in —, 262 elements in —, 189, 372, 482 Mineral analysis by quartz spectrograph, 53, 406 Mineralogy, applications to —, 34, 167, 244, 395, 497, 536, 573, 595 Minerals (see also Amazonites, Beryls, Ores, Rocks, etc.) analysis of —, 73, 86, 104, 105, 244, 440, 477, 662, 758 detn. of B, Ni, Sn in —, 886 detn. of Be, Ge in —, 789
discussion of quant. —, 57, 115, 120, 122, 123, 142, 145, 154, 211, 253, 312, 839 discussion of quant. — in biology, t64 of spectroscopy, 88, 116 Mica, detn. of alkalis in —, 439, 440 detn. of Li in —, 438 Sn in —, 827 Microburet, for quant. analysis of solns., 563 Microchemistry, applications to —, 168, 337 Microphotometer, 96, 527, 647, 921 Milk, Al in —, 262 elements in —, 189, 372, 482 Mineral analysis by quartz spectrograph, 53, 406 Mineralogy, applications to —, 34, 167, 244, 395, 497, 536, 573, 595 Minerals (see also Amazonites, Beryls, Ores, Rocks, etc.) analysis of —, 73, 86, 104, 105, 244, 440, 477, 662, 758 detn. of B, Ni, Sn in —, 886

detn. of Ga in —, 256, 828 detn. of Sc and Y in —, 257 detn. of U in -, 78 elements in chromite -, 836b elements in gem —, 62 elements in Japanese -, 751 elements in silicate --, 9 elements in tungsten —, 17 elements in volcanic -, 44, 67, 76 F in --, 215 Ga in zinc —, 217 Ge in -, 136 Ge in silicate —, 173 In in —, 717 Pt metals in -, 288 rare earths in -, 545, 826 rare elements in —, 50, 507 Minerals and rocks, detn. of Be in —, 413 Molecular spectra in analysis, 274, 343, 882, Multiple-film method of analysis, 544

Ν

Nephelites, Be, Ga, Rb, Sr, in —, 565

Nickel, examn. for Mo, 379
test of purity of —, 243
Nickel and chromium, visual detection of —, 191
Nickel and nickel alloys, detn. of Ba in —, 381
Nickel and nickel sulfate, detn. of As, Cu, Pb,
Sb in —, 801
Nitrogen, A in —, 517, 528
Noble metals, detn. of enrichment of —, 425
geochemistry of —, 314
Non-ferrous alloys, detn. of Al, Ba, Cr, Mg, Ni
in —, 698
Non-ferrous metals and alloys, quant. analysis
of —, 237, 448

O

Optical methods, in control and research laboratories, 30
Ore dumps, detn. of Mo and V in —, 885
Ores, analysis of —, 868
Au in —, 322
detn. of Cs, Li, Rb in —, 564
detn. of Ni and Sn in —, 773
elements in manganese —, 720a
elements in Mississippi —, 620
elements in sulfide —, 423
Organic material, detn. of Pb in —, 636
Pb in —, 71

—, 252

Organs (see also Aorta, Liver, Lungs) Poisoning, detn. of metals in -, 836a Ba, Sr in --, 504, 617 detn. of Cu in --, 503, 603, 612, 615, 616 mercury —, 771 elements in -, 151, 195, 370 elements in Japanese -, 269 Sb in —, 430 Zn in —, 4 Oscillating arc, for analysis, 228 518 Paper-making materials, spectrograph for analysis of —, 877 Pegmatite dikes, rare elements in -, 507 680, 700 ores, detn. of Sn in -, 770 **Photocells**, application of — to control of excitation, 525, 824 Q Photoelectric, direct — method of quant. analy-Quartz, Au in —, 475 sis, 537, 631, 848 elements in -, 632 Photographic photometry, 128, 159, 283, 341, 381, 452, 511, 650, 804 Photographic plates, for spectroscopy and astronomy, 267, 334, 646 R in quant. analysis, 264, 276 Photography of spectra, 61, 89, 267, 334, 646 Photometer, non-recording —, 468 polarization - for rapid analysis of alloys, 356, 682, 764 Photometric eyepiece, for visual quant. analysis, 362 Photon-counter method, of quant. analysis, 785 702 Plant ashes, detn. of Ca, Fe, K, Mg, Mn, P in of Hf, 663 --, 842 elements in -, 454 Plant food, quant. analysis of —, 795 Plants (see also Fruit, Grasses, Potato, Wood) Al in —, 131, 162, 203, 212 844, 865, 908 analysis of -, 761 detn. of B in -, 420, 843 detn. of Cr in -, 479 detn. of elements in --, 780 detn. of Mo in —, 480 detn. of P in -, 860 detn. of Rb in -, 175 detn. of Zn in —, 661, 817, 892 elements in —, 728, 875 917 Platinum, detection of impurities in —, 396 detn. of impurities in ---, 26 steel works, 373, 414 detn. of — in alloys, 873 tissues, 344, 345 detn. of Ir, Pd, Rh in -, 156 Platinum industry, applications to -, 681 Platinum metals, in South African minerals, 288 815, 847, 886a, 909a residual spectra of ---, 702 Platinum metals and alloys, detn. of Ir, Rh, in

lead -, 582, 583, 584, 736 thallium --, 222, 580, 782a Potassium, detn. of --, 630 detn. of - by flame, 906 Potato plant, absorption of Rb by -, 510 Prism spectrograms, evaluation of -, 258 Prism spectrograph, for weak light sources, 327, Projection app. for spectrograms, 485 Purification of electrode carbon, 202, 548, 648, Pyroelectric concn. method, 545, 784

Quartz spectrograph, for biol. analysis, 727 mineral analysis with --, 53, 406

Radium, detn. of Ba in -, 499 Rare earths, analysis of —, 28, 223, 660 detection of - in minerals, 545 "Ratio-quantitative" method of analysis, 329 Reference spectrum for visible region, 391 Residual spectra, of Au, Ir, Os, Pd, Pt, Rh, Ru, Reversed spectrum, use of — in analysis, 47 Review of applications, 207, 208, 248, 249, 316, 318, 331, 444, 449, 462, 478, 496, 524, 532, 553, 561, 607, 613, 627, 649, 684, 699, 708, Review of applications, to metal analysis, 535, 624, 715, 834, 871, 872, 917 to mineral analysis, 536, 595 Review of flame methods, 570 Review of deGramont method, 33, 34 Review of methods, 43, 48, 77, 81, 83, 84, 147, 179, 185, 187, 297, 456, 495, 537, 553, 613, 624, 641, 721, 735, 767, 775, 844, 864, 900, Review of methods, for mining laboratory, 809 Review of quant. methods, 72, 111, 221, 226, 285, 357, 375, 384, 426, 444, 458, 542, 810,

Rhenium, detection of —, 354, 743

sensitive lines of ---, 710

quant. analysis of —, 150, 158, 547, 549, 602, Rocks, analysis of —, 718 minor constituents in igneous, --, 509 723, 790, 855 quant. analysis of -, by log sector, 298, Pt in —, 180 rare elements in —, 402 473, 642, 691 **Ruby,** Cr in —, 273 source for quant. analysis of -, 914 visual detn. of Ga in ---, 897 S visual detn. of In in -, 896, 897a **Salts**, quant. analysis of —, 324 visual method for quant. analysis of -, 786 Samarium, detection of ---, 883 Zn in —, 183 **Sand,** detn. of Fe in —, 731, 732 Sorting of steels, 380, 461, 639, 639a, 745 **Scandium**, geochemistry of —, 257 Spark, effect of resistance on —, 135 Sector (see Log -, Half-Cylinder -, Step -) high-frequency —, 254, 311, 432, 551, 930 Segregation of Pb in Au, 125 low-voltage -, 134 Sensitive line of He, 737 mechanically interrupted —, 305, 382, 383, Sensitive lines, for glass optics, 261, 328, 415, 407, 408, 487, 856 519, 520, 521, 522, 523, 634 use of "break" -, 42 of Eu, 427, 884 valves for - excitation, 404 of Hf, 663 Spark-in-flame method, 132, 177, 317, 654 of noble metals, 702 detection of La, Y, Yb, by —, 778 Sensitivity, of intercombination lines, 694, 695 Spark lines in arc, 12 of lines in astronomy, 11 Spark stand, multiple — for quant. analysis, limiting -, 91, 119, 360, 394, 464, 569 limiting -, of alkalis, 816 Sparks, quant. analysis by two -, 918 limiting — of noble gases, 748 Spectra, excitation of —, 99 Sensitivity variation, with excitation, 107, 110, general discussion of -, 8, 89, 90, 102, 128, 312, 347, 350 161, 409, 417, 478 mutual effects of elements on —, 390, 543 Spectral analysis, fundamentals of -, 154, 161, Series, ultimate rays and spectral —, 19, 63 181, 253, 458 sensitive Cr lines and -, 32 history of -, 72, 120, 618, 623, 653, 813, 814 Silicates, B in aluminum —, 14 Spectrochemical analysis, definition of —, 690 Silicon band spectrum in rocks, 49 Spectrograms, illumination of — for high sensi-Silicon detn. in fused salts and steel, 10 tivity, 916 Silumin, detn. of Co, Cu, Fe, Mg, Si, in —, 803, reading of Féry —, 35 **9**11b Spectroscope for sorting steels, 461 Silver, detection of Cd, Pd in —, 464 Spectroscopes and spectrographs (see Apparadetn. of Pt, Rh in -, 651 ratus, Grating, Quartz --) 45, 88, 102, 103, purity of at. wt. -, 18 121, 300, 707, 742 Silver alloys, est. of Pt in —, 101 Spectroscopy, 45, 56, 409, 478 Silver and gold, detn. of ratio of -, 323 photographic plates for —, 267, 334, 646 Silver-gold alloys, analysis of —, 766 Sperrylite, analysis of —, 779 Skin, Ag in —, 309 Spinal fluid, elements in --, 796 detn. of Pb in —, 609 Stars, atmospheres of —, 550 Sodium nitrate, detn. of elements in —, 586 "Star trail" quant. method, 224 **Soils,** analysis of —, 761, 768, 878 Steel, analysis of ---, 21, 833a Cr in —, 479 C in -, 604 elements in -, 454, 728, 875 detn. of Al, Cu, Ti in -, 703 Rb in - 175 detn. of Cr, Mn in -, 913 Solution method of quant. analysis, 171, 339, detn. of Cr, Mn, Ni, in -, 363, 364 889 detn. of Cr, Mo, Sn, V, W in —, 100 Solution spray-in-spark method, 457, 569 detn. of Cr, W in -, 704 Solutions, analysis of —, 188 detn. of Cu, Cr, Mn, Ni in -, 593 colloidal electrodes for -, 29, 46, 893 detn. of Cu, Cr, Ni, Si in -, 230, 231 microburet for -, 563

Steel (Continued): detn. of Mn, Si in -, 712, 903 detn. of Si in -, 10, 392 detn. of Sn in -, 922 detn. of V in -, 109, 799 Mo in —, 183 quant. analysis of -, 806 W in -, 494 Steel analysis, by length of line method, 879 by log sector method, 230, 231, 593 Steels, detn. of Co, Cr, Mn, Mo, Ni, Si, V, W, in —, 764, 765 flakes in Cr-, Ni-, 605 sorting of —, 380, 461, 639, 639a, 745, 873a visual method for quant. analysis of -, 554, 671, 873a Step-diaphragm method, 303, 381, 452, 483, 484, 602 Step-sector method, 804 Step-wedge method, 726, 822 Step-wedge, prepn. of Sb —, 866 Strontium, analysis of —, 97 Sulfur, elements in volcanic --, 854 Sun, quant. analysis of —, 146, 278 "Synthetic spectrum" method of quant. analysis, 557

T

Tantalum, detn. of -, 830 Tectites, analysis of -, 658 Teeth, elements in —, 722, 869 **Tellurium**, detection of —, 353 "Test" method for solns., 183 Textiles, elements in —, 205, 206 Thallium, detection of —, 277 Thallium poisoning, 222, 580, 782a Thyroid glands, elements in -, 600 Tin, detn. of Ag in —, 259 detn. of Al, Cd, Zn, in -, 800 detn. of Bi, Cd, Pb, in -, 112 detn. of impurities in —, 26, 410, 829 detn. of Pb in --, 283, 556, 637, 674 Tin alloys, quant. analysis of —, 295 Tin deposits, elements in —, 474 Tin foil, diffusion of Hg in —, 199 Tin in prehistoric axes, 7 Tissues (see Organs, Plants, Skin, etc.) Ag in skin —, 309 Al in —, 131, 162, 203, 212 Au in —, 389, 431, 453, 488, 490 Au, Ag in ---, 251 detn. of Ag in -, 611

detn. of Au in -, 399, 610 detn. of Cu in -, 505 detn. of Hg in --, 771 detn. of Mn in animal -, 506, 657 detn. of Ni in animal —, 491 excitation of spectra of --, 347 high-frequency spark method for -, 311, 348, 349, 350 metal deposits on -, 502 metals in animal -, 193, 197, 198, 245, 271, 289, 290, 332, 337, 370, 552, 601, 781 metals in pathological human -, 270 Na in animal -, 93 Pb in animal —, 176, 235, 255, 736, 818 review of methods for -, 344, 345, 676 Th in animal —, 310 Tl in animal --, 580, 672 Topaz, Ge in --, 137 Tourmalines, elements in -, 693 Tungsten, detection and sensitivity of - in arc spectra, 94 exploded wire method for -, 82 Tungsten minerals, elements in -, 17 Tungsten ores, detn. of W in -, 782

U

Ultimate rays (see Sensitive lines, Wave lengths)
of spectra —, 5, 19, 129, 169, 367
in arc spectra —, 51, 63
in gases, 178
Uranium, detn. of — in minerals, 78
Urine, detn. of K, Ca, Mg, Na, in —, 460, 602
detn. of Hg in —, 433
detn. of Pb in —, 596

V

Vanadium, detn. of — in fused salts, 20 detn. of — in minerals and steel, 109
Variable inductance method of quant. analysis, 571
Visible reference spectrum, 391
Visual method for detn. of Si in iron, 416
Visual method for quant. analysis of solns., 547,

549, 786
Visual method for quant. analysis of steels, 554,

671 Visual photometer for rapid analysis of alloys, 356, 682, 764

Visual quant. analysis, photometric eyepiece for -, 362

W

Water, analysis of —, 777 analysis of natural -, 23, 60, 240, 757a detn. of alkalis and alkaline earths in natural ---, 325 qual. analysis of mine -, 794 Waters, analysis of mineral - by homologous pairs, 667 detection of Cs, K, Rb in mineral -, 493 detn. of Cs in mineral -, 585 detn. of Cs, Rb in mineral -, 246 fluorides in --, 239, 541 Water supplies, analysis of public —, 585a Wave-length scale for spectrograms, 6, 117 Wave-length tables, 39, 55, 70, 92, 192, 238, 326, 476, 514 for flame spectra, 758 for qual. analysis, 729 of arc spectra for metallurgical analysis, 377 of arc and spark spectra of iron, 442 of principal lines, 70, 129, 163, 299, 367, 411, 760, 846, 852 Wave lengths (see Sensitive lines, Ultimate rays) false identification of --, 614, 635

for visual analysis, 143 of sensitive lines, 5, 437 Wedge method of quant. analysis, 295, 447 Wood, elements in —, 640, 665

Υ

Yttrium, geochemistry of -, 257

Z

Zinc, detn. of Cd in -, 857 detn. of Cd, Cu, Fe, Pb, in --, 560 detn. of Cd, Fe, Pb, in -, 225, 575, 705 detn. of impurities in -, 716 detn, of Pb in -, 712 in animal organism, 4 purity of --, 397 quant. analysis of -- by wedge method, 447 Zinc alloy die castings, quant. analysis of -576, 705 Zinc blende, color and composition of --, 895 Zinc minerals, Ga in —, 217 Zinc oxide, detn. of Cd in —, 319 detn. of Cd, Pb in -, 629, 808 Zinc works, analysis of waste products of —, 750 Zircons, elements in --, 749