

Index

- AAS *see* atomic absorption spectroscopy
accidental death 305, 307
accidental discharge 191–7
accreditation of experts 292–3
AccuTec USA ammunition 73
ACP *see* Automatic Colt Pistol
AFTE *see* Association of Firearms and Toolmark Examiners
AIT *see* average incapacitation time
AK47s 212–13, 272
American proof mark 38
American Society of Crime Laboratory Directors (ASCLD) 296
ammunition 43–99
 base configurations 74–5
 bullet types 67–74
 calibres 46–7, 55
 cartridge cases 48–9, 52–4
 colour coding 64–7
 components 48–77
 forensic firearms examination 178–82, 197–203
 gunshot residues 253–6
 headstamps 64, 94–8
 historical development 43–8
 lubrication 75
 materials 67–8
 non-toxic shot 77–80
 penetration 61–2
 primer caps 50–2
 primers 48, 86–94, 253, 256
 propellants 48, 80–6
 shotguns 52, 56–64, 68–9
 terminology 48–9
 types 49–50
Angelli, Giovanni 166
angle of barrel elevation 112–13
annular rings 167–9
antimony contaminants 246–7, 259, 267
antimony sulfide 88, 89
arquebuses 3
ASCLD *see* American Society of Crime Laboratory Directors
associated particles 254–5, 264–5, 267–8, 299–300
Association of Firearms and Toolmark Examiners (AFTE) 292–3
Astra designs 19, 22
atomic absorption spectroscopy (AAS) 246–7
Automatic Colt Pistol (ACP) 55, 272–3

- automatic pistols 19
- average incapacitation time (AIT) 138–9
- background questions 293–4
- ball burnishing 157
- ballistic coefficients 111–12
- ballistic gelatine 136
- BallistiClean 73
- ballistics 101–43
 - cross-examinations 293
 - external 101, 109–24
 - internal 101, 102–9
 - terminal 101, 124–43
- Balthazard, Victor 146
- bandit-proof glass 207
- bar codes 286, 287–8
- barium contaminants 246–7, 259, 266
- barium nitrate 88
- barrels
 - choke 234–7
 - length 237–8
 - pressure 107–9
 - serial numbers 287–8
 - see also* rifling
- base configurations 74–5
- baton rounds 64
- battery cups 51–2
- bean bag ammunition 64
- Beaumont designs 15
- Belgian proof marks 36
- belted case cartridges 54
- Berdan, Colonel 45, 51
- Bergman designs 16
- binocular comparison microscopy 148
- black powder propellants 43, 55–6, 81–2, 161
- blackening 222–3
- blank ammunition 49
- bloodstained garments 231–2
- Blount ammunition 72–3
- blowback action 22
- boat-tailed bullets 74–5
- body armour 140–1
- bolt action rifles 23
- Borchardt, Hugo 16
- bore size 56–8
- bottle-necked cartridges 53
- Boxer, Colonel 45, 51
- breech face markings 147
- Brenneke slugs 59, 60–1
- British Forensic Science Society (FSS) 292–3
- British proof marks 34–5
- broach rifling 159
- Browning ammunition 95
- Browning designs 22
- Browning, John 17
- Brunswick rifles 11
- bullet-resistant glass 207
- bullet-resistant jackets/vests 140–1
- bullets
 - base configurations 74–5
 - definition 49
 - drop 120–1
 - flight noise 28–9
 - lubrication 75
 - performance 134–40
 - progressions 185
 - terminal ballistics 137
 - types 67–74
 - wipe marks 226
 - see also* forensic firearms examination
- button rifling 159–60
- calibre
 - cross-examinations 293
 - forensic firearms examination 197–200, 202–3
 - range of firing estimations 213–15
- cartridges
 - cases 48–9, 52–4, 102, 173–5
 - forensic firearms examination 173–5
 - headspace 25–7
 - headstamps 94–5
 - historical development 7–10, 44–5
 - nomenclature 54–6
 - range of firing estimations 234–5
 - shotguns 56–9
 - types 49–50, 53–6
 - see also* ammunition
- caseless ammunition 10, 49
- centre fire ammunition 45, 48, 49
- centre fire systems 9–10, 15
- centre punching 278, 280
- chamber markings 166–70
- chamber throats 178

- Charles I 15
chemical methods of number
 restoration 280–3
chemical range of firing estimations
 227–32
Chinese pistol rounds 74
chloracetophenone (CN) gas 49–50
o-chlorobenzalmalonitrile (CS) gas 49–50,
 63
Churchill, Robert 148
Churchill, Winston 17
clandestine ammunition 97–8
class characteristics 155–7, 170–1, 174,
 177
CLIS *see* Crime Laboratory Information
 System
CN gas *see* chloracetophenone gas
cocks 5
colour coding 64–7
Colt designs 15–17, 20
 ammunition 55
 gun-handling tests 272–3
 proof marks 33
Colt, Samuel 15
commercial headstamps 64, 95
comparison cameras 153
comparison microscopy 147–9, 182–6,
 294–7
contact wounds 128–9
contaminants
 firing ranges 58–9, 68, 70–1
 gunshot residues 245–7, 249–50,
 256–9, 266–7, 298–9
control samples 183
converted pistols 224–5
cordite 83
cotton waste 184
Crime Laboratory Information System
 (CLIS) 293
critical angles 200–1
Crocell 185–6
cross-examinations 291–303
 accreditation of experts 292–3
 background questions 293–4
 comparison microscopy 294–7
 Daubert standard 300–2
 gun-handling tests 300
 gunshot residues 297–300
 crowning 178
CS gas *see* o-chlorobenzalmalonitrile gas
cup fire ammunition 44
Czechoslovakian proof marks 36
- Dando, Jill 263–5
Daubert standard 300–2
Daws centre fire system 10
DDNP *see* diazodinitrophenol
Dean–Adams designs 15
death from firearms 305–9
death rates 308
decomposition 223–6
definitive proofs 33
delayed blowback mechanisms 22
delayed incapacitation 307
Delta Frangible Ammunition (DFA) 72
denier weave 140
dermal nitrate test 244–5
DFA *see* Delta Frangible Ammunition
diazodinitrophenol (DDNP) 73, 89, 91
disconnectors 22
Disintegrator 72
dispersion of shot 233–8
dithiooxamide (DTO) test 230
double action revolvers 20
double-base powders 83
Dragon's Breath 63
Dreys designs 22
Dreyse needle fire rifles 9, 87
drift 121
drilling 25, 278, 279–80
DShK heavy machine guns 212–13
DTO *see* dithiooxamide
dum-dums 69–70
dummy cartridges 50
dust shot 58
DWM designs 17
- EDX *see* energy-dispersive X-ray
eight-groove rifling 162
electrochemical machining 161, 164
electrolytic methods of number
 restoration 283–4
empirical testing prong 301
energy-dispersive X-ray (EDX)
 analysis 200
Enfield 15

- entry holes
 ballistics 126, 127–9
 forensic firearms examinations 197–200, 205–6
 range of firing estimations 217–18, 219, 224–5, 227–32
- environmental contaminants
 cross-examinations 298–9
 firing ranges 58–9, 68, 70–1
 gunshot residues 245–7, 256–9, 266–7
- etching
 chemical 280–3
 heat 285–6
 laser 286–7
- exit holes 126, 127–9, 197, 217
- experts *see* qualifying experts
- exploding bullets 68
- extended range of firing estimations 223
- external ballistics 101, 109–24
 angle of barrel elevation 112–13
 ballistic coefficients 111–12
 bullet drop 120–1
 cross-examinations 293
 drift 121
 form factors 110
 Journee's formula 116–19
 maximum altitude of missiles 113–22
 maximum range of missiles 112–22
 momentum 123
 muzzle energy 122
 sectional densities 110–11
 wind 119, 121
 yaw 121–2
- FAAS *see* flameless atomic absorption spectroscopy
- FBI *see* Federal Bureau of Investigation
- FDR (firearms discharge residue) *see* gunshot residue
- Federal Bureau of Investigation (FBI) 150–2, 245, 247
- Federal cartridge company 73
- ferret rounds 63
- ferrozine 272–6, 300, 306
- field gauge 26
- filing 277
- firearms discharge residue (FDR) *see* gunshot residue
- firing pins 176, 286–7
- flame throwers 63
- flameless atomic absorption spectroscopy (FAAS) 246–7
- flash hiders 30
- flash pans 4–5
- flechette 70
- flintlocks 5–6
- Flobert 8
- fluted chambers 166–9
- flyers 236
- FMJ *see* full metal jacket
- forensic firearms examination 145–210
 accidental discharge 191–7
 breech face markings 147
 bullet type 199–200, 205–6
 calibre 197–200
 chamber markings 166–70
 comparison microscopy 147–9, 182–6
 entry holes 197–200, 205–6
 historical development 145–54
 instrumentation 152–4
 penetration/trajectory through glass 204–8
 photomicrography 146–7
 ricochet analysis 200–4
 rifling 145–6, 152–65, 170–2, 174–8, 187–9
 stria comparisons 149–52, 155, 157, 168–91
- Forensic Science Society (FSS) 292–3
- Forensic Technology Inc. (FTI) 150–1
- form factors 110
- Forsythe, Alexander John 6–7, 87
- Forsythe scent bottles 7, 87
- Foster slugs 59–60, 61–2
- frangible ammunition 62, 70–4
- French proof marks 38
- frizzens 5
- Fry's reagent 282
- FSS *see* Forensic Science Society
- FTI *see* Forensic Technology Inc.
- fuel components 89
- full metal jacket (FMJ) bullets 71
- gain twist 155–6
- gas chromatography (GC) 245
- George, Barry 263–5

- German proof marks 37
glass, penetration through 204–8
Glazer safety slugs 71
go gauge 26
Golden Bullets 68
Gonzalez, Teodoro 244
Gravelle, Philip 147
Greenhill, George 12
Greiss test 229, 244
grenade dischargers 31
grenade launchers 50
grinding 277
grooves 154, 294
GSR *see* gunshot residues
gun-handling tests 271–6
 cross-examinations 300
 death from firearms 306
gunshot residues (GSR) 241–69
 ammunition 253–6
 conservation of particles 251–2
 contaminants 245–7, 249–50, 256–9,
 266–7, 298–9
 cross-examinations 297–300
 death from firearms 305–7
 distribution of particles 242, 252–5
 formation 241–2
 identification 243–7
 inorganic components 245–7
 metallic components 245–7
 minimum requirements 254–5, 263–5,
 299–300
 organic components 243–5
 range of firing estimations 211, 219–
 21, 227, 229–31
 retention of particles 251–2, 259–68
 sample collection 248–51
 scanning electron microscopy 241,
 247–51, 261–2, 265
 search parameters 265–6
 spherical particles 262, 263–4, 266–7
 statistical elimination of potential
 negatives 267–8
gutter wounds 14
gyrojets 10

H & K designs 28, 168, 170
hacquebuts 4
half-cock safety position 195

Hall, Dr A. L. 145
hammer rifling 160–1
hand cannons 1–2
handguns *see* pistols; revolvers
Harrison and Gillroy reagent 229–30,
 245–6
Hatcher, Major Julian 136
Hatton rounds 62–3
headspace 25–7
headstamps 64, 94–8
heat etching 285–6
heavy machine guns 25
heeled bullets 74–5
helical flutes 167–9
Henry VIII 3, 15
High Standard designs 28
high-performance liquid chromatography
 (HPLC) 245
high-velocity bullets 67
 ballistics 127, 135
 forensic firearms examination 198,
 203
hinged-frame revolvers 15, 20–1
hit distribution 137
hollow-point bullets 69
 ballistics 127–8, 134
 forensic firearms examination 198,
 201–3
holsters 196–7
homicide 305
hook cutter rifling 158
horizontal bullet recovery tanks 184
horizontal water tanks 184
hot air ignition 10
HPLC *see* high-performance liquid
 chromatography
Hume–Rothery reagent 282
Hungarian proof marks 39
8-hydroxyquinoline 272

IBIS *see* Integrated Ballistic Identification
 System
inadvertent discharge 195–7
incapacitation 307
indicative particles 254–5, 264–5, 267–8,
 299–300
individual characteristics 171–2, 174,
 177, 187–9

- infrared (IR) photography 231–2
 initiator explosives 89
 instant incapacitation 307
 Integrated Ballistic Identification System (IBIS) 150–1
 internal ballistics 101, 102–9
 barrel pressure 107–9
 cartridge case capacity 102
 cross-examinations 293
 internal pressure 102–3
 muzzle lift 105
 muzzle velocity 103–5, 117–18
 recoil 103, 105–7
 time of bullet in barrel 103
 interrogations *see* cross-examinations
 IR *see* infrared
 Italian proof marks 39

 jacketed bullets 67–8, 69, 71
 Jacobus, Marianus 1–2
 Japanese proof marks 40
 Journee's formula 116–19
 junk science 301–2

 Kevlar 140–1
 keyholing 13
 Kiefuss, Johann 4
 kinetic energy 130–1
 Kollner, Gaspard 11
 Kotter, Augustus 11
 Krupp, rifling 161
 KTW ammunition 74

 laminated glass 204–8
 Lancaster designs 161–2, 164
 lands 154, 294
 laser etching 286–7
 Le Bourgeois, Mann 6
 lead contamination
 firing ranges 58–9, 68, 70–1
 gunshot residues 246–8, 267
 lead mapping 157
 lead shot 49, 77–80
 lead styphenate 88
 leade 178
 Lee Enfield designs 30
 Lefauchaux designs 7
 Lesmok ammunition 85

 lip fire ammunition 44
 lock mechanisms 191, 192–4
 locked breech mechanisms 22, 23
 long recoil rifles 23–4
 Longbow frangible bullets 72
 longitudinal fluted chambers 166, 168, 169
 Louis XIII of France 6
 low-temperature oxygen plasma ashers 260, 261
 Luballoy ammunition 68
 lubrication 75
 Luger designs 16–17, 22
 Lunge reagent 229, 244–5

 M16 rifles 30
 machine guns 25
 magazines 21–2
 magnesium smoking 179–82
 magnetic particle method 284–5
 Magnum ammunition 56, 63
 forensic firearms examination 173–4, 198–9, 201
 gunshot residues 255
 scorching 222
 magnum pistols 17
 Makarov designs 55
 manufacturing marks 183–4
 Marshall list 139–40
 Marshall test 229, 244
 matchlocks 2–3
 mathematical stria comparisons 186–91
 Mauser designs 17, 19, 55
 maximum altitude of missiles 113–22
 maximum effective range 119–20
 maximum range of missiles 112–22
 mechanical noise 29
 mercury fulminate 6–7, 87
 micro stria *see* stria comparisons
 micro-grooved barrels 155
 military ammunition 64–7, 95–8
 miquelets 6
 mischmetal 266–7
 moderators 83–4
 momentum 123, 130–1
 multiple-shot suicides 307–9
 muskets 6

- muzzle
 attachments 27–31
 brakes 29–30
 counter weights 30
 energy 122
 lift 105
 velocity 103–5, 117–18
- NAA *see* neutron activation analysis
- Nagant revolvers 156–7
- nail driving cartridges 50
- National Integrated Ballistic Identification Network (NIBIN) 150–1
- NCNM *see* non-corrosive non-mercuric
- needle fire rifles 9, 87
- neutron activation analysis (NAA) 246
- NIBIN *see* National Integrated Ballistic Identification Network
- nipples 7
- nitrites, tests for 228–9, 243–4
- nitrocellulose 82–6, 245
- 2-nitroso-1-naphthol 274
- no-no gauge 26
- Nobel, Alfred 82
- non-corrosive non-mercuric (NCNM)
 primers 88
- non-lead bullets/primers 178–82, 230–1
- non-toxic bullets/primers 70–4, 88–9
 forensic firearms examination
 178–82
 range of firing estimations 230–1
- non-toxic shot 77–80
- number restoration 277–89
 bar codes 286, 287–8
 barrels 287–8
 chemical methods 280–3
 electrolytic methods 283–4
 firing pins 286–7
 laser etching 286–7
 magnetic particle method 284–5
 non-recoverable methods of
 removal 279–80
 removal methods 277–8
 surface preparation 280
 theory 278–9
 ultrasonic captivation 284
- nutration 132–3
- Nyclad ammunition 67–8
- obturation 8, 10, 52
- OCI *see* Outstanding Crime Index
- ogivals 69
- one-shot stops 139–40
- Outstanding Crime Index (OCI) 150–2
- oval-bore rifling 162, 164
- over-stamping 278
- oversized chambers 167, 168
- oxidizers 89
- oxygen plasma ashers 260, 261
- Parabellum designs 55, 92
- paradox rifling 154
- paraffin test 244–5
- Pauly paper caps 7
- PDT *see* ferrozine
- peening 278
- pellets
 definition 49
 size 58–9
- penetration 61–2
 potential 124–6
- percussion priming systems 6–7, 15, 48
- perforated chambers 167–9
- peripheral cameras 153–4
- permanent cavities 126–7, 134
- photomicrography 146–7
- pill locks 7
- pinfire ammunition 44
- pinfire systems 7–8
- pistols
 classification 19
 gunshot residues 242
 historical development 2, 6, 16–18
 operation 19, 21–2
 range of firing estimations 219–26
 self-loading 16–18, 21–2
 single shot 19
 see also revolvers
- pitch 294
- plasma-ashed taping 260, 261
- polygonal rifling 162, 163, 176, 178
- polygroove rifling 162
- potassium chlorate 87–8
- power tool cartridges 50
- precession 132–3
- pressure barrels 108
- pressure waves 28

- primer caps 50–2
- primers 1
 - accidental discharge 92–4
 - ammunition 48, 86–94
 - definitions 48, 86–7
 - formulations 89–92
 - gunshot residues 253, 256
 - historical development 87–8, 90–1
 - non-toxic 88–9
- priming pans 4–5
- professional associations 292–3
- progressive rifling 155–6
- proof marks 32–41
- propellants
 - ammunition 48, 80–6
 - ballistics 102–3
 - range of firing estimations 222–3, 231–2
- provisional proofs 33
- pump action rifles 24
- Purdy designs 56
- Pyradox 82

- qualifying experts 291–303
 - accreditation 292–3
 - background questions 293–4
 - comparison microscopy 294–7
 - Daubert standard 300–2
 - gun-handling tests 300
 - gunshot residues 297–300
- quick-draws 196–7

- range of firing estimations 211–39
 - blackening 222–3
 - bloodstained garments 231–2
 - bullet wipe marks 226
 - calibre 213–15
 - chemical tests 227–32
 - decomposition 223–6
 - entry/exit holes 217–18, 219, 224–5, 227–32
 - extended 223
 - external ballistics 112–22
 - gunshot residue 211, 219–21
 - non-toxic, non-lead primers 230–1
 - pistols and rifles 219–26
 - scorching 220–2
 - shot dispersion 233–8
 - shotguns 232–9
 - X-ray photography 212–19
- rapid incapacitation 307
- ratchet rifling 163
- Reagan, Ronald 68
- reaming marks 164
- rebated cartridges 54
- rebound safety position 195
- recoil 103, 105–7
 - boosters 31
 - compensators 29–30
- recovery methods for fired bullets 184–6
- relative incapacitation index (RII) 137–8
- relative stopping power (RSP) 136–7
- relevancy prong 301
- reliability prong 301
- Remington ammunition 72, 73, 95–6
- reproofs 33
- Republic of Ireland proof mark 37
- returning velocity 118–20
- revolvers
 - gunshot residues 242
 - historical development 8, 15–16
 - operation 20–1
- ricochet analysis 200–4
- rifled slugs 70
- rifles
 - classification 22
 - gunshot residues 242
 - historical development 9–10
 - operation 22–4
 - range of firing estimations 219–26
- rifling 10–14, 67
 - ballistics 121–2
 - class characteristics 155–7, 170–1, 174, 177
 - cross-examinations 293–4
 - forensic firearms examination 145–6, 152–65, 170–2, 174–8
 - forms 161–4
 - individual characteristics 171–2, 174, 177, 187–9
 - meters 152–3
 - methods 157–61
 - terminology 154–5
 - types 154–5
- RII *see* relative incapacitation index
- rimfire ammunition 44–5, 48, 49
- rimfire systems 8–9, 15
- rimless cartridges 54
- rimmed cartridges 54

- rocket-propelled bullets 10
- round-nosed bullets 69, 198, 201–3
- RSP *see* relative stopping power
- Russian proof marks 41

- saboted ammunition 60, 61–2, 70
- safety mechanisms 191, 195
- scanning electron microscopy (SEM)
 - cross-examinations 298–9
 - forensic firearms examinations 200
 - gunshot residues 241, 247–51, 261–2, 265
 - range of firing estimations 211, 223, 227
- scent bottles 7, 87
- Schonberger designs 16
- scoop flutes 167–9
- scorching 220–2
- scrape cutter rifling 158–9
- sectional densities 110–11
- self-cocking revolvers 20
- self-loading pistols 16–18, 21–2
 - forensic firearms examination 157
 - gunshot residues 242
- self-loading rifles 23–4
- SEM *see* scanning electron microscopy
- semi-automatics *see* pistols
- semi-jacketed bullets 69
- semi-rimmed cartridges 54
- serial numbers 276
 - bar codes 286, 287–8
 - barrels 287–8
 - chemical restoration 280–3
 - electrolytic restoration 283–4
 - firing pins 286–7
 - laser-etched 286–7
 - magnetic particle method 284–5
 - non-recoverable methods of
 - removal 279–80
 - removal methods 277–8
 - restoration 277–89
 - surface preparation 280
 - theory behind restoration 278–9
 - ultrasonic captivation 284
- serpentes 3
- Shaw, Joshua 7, 87
- short recoil rifles 23
- shot
 - definition 49
 - non-toxic 77–80
 - shot dispersion 233–8
- shotguns
 - ammunition 52, 56–64, 68–9
 - barrel choke 234–7
 - barrel length 237–8
 - bore size 56–8
 - gunshot residues 242
 - historical development 6
 - operation 24–5
 - range of firing estimations 232–9
 - shot dispersion 233–8
 - slugs 59–64
- single action revolvers 20
- single-base powders 82–3
- single shot pistols 19
- single shot rifles 22–3
- SinterFire ammunition 73
- skid marks 156
- skin penetration 120
- slug barrels 154
- slugs 59–64
- smg *see* sub-machine guns
- Smith & Wesson 8, 15, 161
- snap caps 50
- snaphaunces 5, 15
- sodium rhodionate test 227–8, 245–6
- soft body armour 140–1
- soft point bullets 69
- solid frame revolvers 20–1
- sound suppressors 27–9
- Spanish proof marks 35
- Spectra 141
- spherical particles of GSR 262, 263–4, 266–7
- spitzers 69
- spread of shot 236–7
- Starr and Savage 15
- stellate tearing 128–9, 219
- Steyr designs 16
- straight-cased cartridges 53
- Strasbourg tests 138
- streamlined bullets 74–5
- stria comparisons 149–52
 - chamber markings 168–70
 - class characteristics 170–1, 174, 177
 - comparison microscopy 182–6
 - control samples 183
 - cross-examinations 295–7
 - formation of stria 174–6

- individual characteristics 171–2, 174, 177, 187–9
- life expectancy of stria 172
- magnesium smoking 179–82
- manufacturing marks 183–4
- mathematical proofs 186–91
- objectivity 190–1
- problematical areas 176–82
- purposeful eradication 172
- recovery methods for fired bullets 184–6
- rifling 155, 157
- weapon type 172–4
- stud gun cartridges 50
- sub-machine guns (smg) 25
- suicide cases 275–6, 305, 307–9
- supersonic crack 28
- swage rifling 160–1
- swing-out cylinders 15–16

- tallyron 153–4
- tallysurf 153
- tapered case cartridges 53
- target vulnerability 137
- tear-gas cartridges 49–50, 62, 63
- teat fire ammunition 44
- tempered glass 205, 206–8
- temporary cavities 126–7, 134
- terminal ballistics 101, 124–43
 - bullet performance 134–40
 - bullet-resistant jackets/vests 140–1
 - cross-examinations 293
 - misconceptions 126–31
 - momentum and kinetic energy 130–1
 - penetration potential 124–6
 - tumbling 133–4
 - wound ballistics 124, 126–40
 - wounding capabilities 134–40
- terminal velocity 113–16, 118
- tetrazine 88, 91
- Tewari test 229, 244
- thin layer chromatography (TLC) 245
- THV *see* Très Haute Vitesse
- TLC *see* thin layer chromatography
- TMD *see* trace metal detection
- total metal jacket (TMJ) bullets 71
- touch poles 1
- toughened glass 205, 206–8

- trace metal detection (TMD) 271–6, 306
- Très Haute Vitesse (THV) 73–4
- trigger pressure 191, 194
- true flintlocks 6
- tube locks 7
- tumbling 133–4, 202–3
- twist rates 12–14

- ultrasonic captivation 284
- ultraviolet (UV) detection 272, 274–5
- UMC *see* Union Metallic Cartridge
- undetermined manner of death 305
- Union Metallic Cartridge (UMC) 73, 95
- unjacketed bullets 67
- UV *see* ultraviolet
- Uzi designs 25

- velocity
 - momentum and kinetic energy 130–1
 - muzzle 103–5, 117–18
 - recoil 106–7
 - returning 118–20
 - terminal 113–16, 118
- VeloDog designs 55
- vertical bullet recovery tanks 184–5
- vertical water tanks 184
- vierlings 25
- Villela's reagent 282
- von Dreyse, Johann Nikolaus 9

- wadcutters 69, 197
- wadding 184, 234–5
- Walker test for nitrites 228–9, 243–4
- Webley designs 15, 17, 20, 55
- welding 278, 279–80
- wheel locks 3–5
- Whitworth designs, rifling 161, 163
- Winchester ammunition 73
- wind 119, 121
- window glass 204
- wound ballistics 124, 126–40
- wounding capabilities 134–40

- X-ray photography 212–19

- yaw 13
 - external ballistics 121–2
 - terminal ballistics 127, 132–3