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# Common Terminology:

#### Gear

-noun

Machinery.

- a part, as a disk, wheel, or section of a shaft, having cut teeth of such for a size, and spacing that they mesh with teeth in another part to transmit or re force and motion.
- b an assembly of such

1 . parts.

- one of several possible arrangements of such parts in a mechanism, as a
  - c steam carriage transmission, for affording different relations of torque and . speed between the driving and the driven machinery, or for permitting the driven machinery to run in either direction.
- ${\tt d}$  a mechanism or group of parts performing one function or serving one
- . purpose in a complex machine: steering gear.

# Cog

```
-noun
1 (not in technical use) a gear tooth, esp. one of hardwood or metal, fitted
. into a slot in a gearwheel of less durable material.
2 a cogwheel.
.
```

# Sprocket

#### -noun

Machinery.

- a Also called chainwheel, sprocket wheel. a toothed wheel engaging with a
- 1.. conveyor or power chain.
  - b one tooth of such a

#### . wheel.

•

# Common Abbreviations:

- n. Rotational velocity. (Measured, for example, in r.p.m.)
- $\omega$  Angular velocity. (Radians per unit time.) (1 r.p.m. =  $\Pi/30$  radians per second.)
- N. Number of teeth.

<u>Gear terminology:</u>

- Gear or wheel. The larger of two interacting gears.
- **Pinion**. The smaller gear in a pair.

• **Path of contact**. The path followed by the point of contact between two meshing gear teeth.

• Line of action, also called 'Pressure line'. The line along which the force between two meshing gear teeth is directed. It has the same direction as the force vector. In general, the line of action changes from moment to moment during the period of engagement of a pair of teeth. For involute gears, however, the tooth-to-tooth force is always directed along the same line -- that is, the line of action is constant. this implies that for involute gears the path of contact is also a straight line, coincident with the line of action -- as is indeed the case. Further note on tooth force: If two rigid objects make contact, they always do so at a point (or points) where the tangents to their surfaces coincide -- that is, where there is a common tangent. The perpendicular to the common tangent at the point of contact is called the common normal. Ignoring friction, the force exerted by the objects on each other is always directed along the common normal. Thus, for meshing gear teeth, the line of action is the common normal to the tooth surfaces.

Axis. The axis of revolution of the gear; center line of the shaft.

• **Pitch point** (p). The point where the line of action crosses a line joining the two gear axes.

• **Pitch circle**. A circle, centered on and perpendicular to the axis, and passing through the pitch point. Sometimes also called the '**pitch** line', although it is a circle.

• **Pitch diameter** (D). Diameter of a pitch circle. Equal to twice the perpendicular distance from the axis to the pitch point. The nominal gear size is usually the pitch diameter.

• Module (m). The module of a gear is equal to the pitch diameter divided by the number of teeth.  $^{\left[ 13\right] }.$ 

• **Operating pitch diameters**. The pitch diameters determined from the number of teeth and the center distance at which gears operate.<sup>[2]</sup>

$$d_w = \frac{2a}{u+1} = \frac{2a}{\frac{z_2}{z_1}+1}.$$

Example for pinion:

• **Pitch surface**. For cylindrical gears, this is the cylinder formed by projecting a pitch circle in the axial direction. More generally, it is the surface formed by the sum of all the pitch circles as one moves along the axis. Eg., for bevel gears it is a cone.

• Angle of action. Angle with vertex at the gear center, one leg on the point where mating teeth first make contact, the other leg on the point where they disengage.

• Arc of action. The segment of a pitch circle subtended by the angle of action.

• **Pressure angle**  $(\emptyset)$ . The complement of the angle between the direction that the teeth exert force on each other, and the line joining the centers of the two gears. For involute gears, the teeth always exert force along the line of action, which, for involute gears, is a straight line; and thus, for involute gears, the pressure angle is constant.

• Outside diameter  $(D_\circ)\,.$  Diameter of the gear, measured from the tops of the teeth.

• **Root diameter**. Diameter of the gear, measured from the base of the tooth space.

• Addendum (a). The radial distance from the pitch surface to the outermost point of the tooth. a =  $(D_o - D) / 2$ .

• **Dedendum** (b). The radial distance from the depth of the tooth trough to the pitch surface. b = (D - root diameter) / 2.

• Whole depth  $(h_t)$ . Whole depth (tooth depth) is the total depth of a tooth space, equal to addendum plus dedendum, also equal to working depth plus clearance.<sup>[2]</sup>

• **Clearance**. Clearance is the distance between the root circle of a gear and the addendum circle of its mate.<sup>[2]</sup>

• Working depth. Working depth is the depth of engagement of two gears, that is, the sum of their operating addendums.<sup>[2]</sup>

• **Circular pitch** (p). The distance from one face of a tooth to the corresponding face of an adjacent tooth on the same gear, measured along the pitch circle.

• **Diametral pitch**  $(P_d)$ . The ratio of the number of teeth to the pitch diameter. Eg., could be measured in teeth per inch or teeth per centimeter.

• **Base circle**. Applies only to involute gears, where the tooth profile is the involute of the base circle. The radius of the base circle is somewhat smaller than that of the pitch circle.

• Base pitch  $(p_b)$ . Applies only to involute gears. It is the distance from one face of a tooth to the corresponding face of an adjacent tooth on the same gear, measured along the base circle. Sometimes called the 'normal pitch'.

• **Interference**. Contact between teeth other than at the intended parts of their surfaces.

• Interchangeable set. A set of gears, any of which will mate properly with any other.

#### <u>Helical gears:</u>

• Helix angle  $(\Psi)$ . The angle between a tangent to the helix and the gear axis. Is zero in the limiting case of a spur gear.

• Normal circular pitch  $(p_n)$ . Circular pitch in the plane normal to the teeth.

• Transverse circular pitch (p). Circular pitch in the plane of rotation of the gear. Sometimes just called "circular pitch".  $p_n = p \cos(\Psi)$ .

• Several other helix parameters can be viewed either in the normal or transverse planes. The subscript " n " usually indicates the normal. *Worm gears:* 

• Lead. The distance from any point on a thread to the corresponding point on the next turn of the same thread, measured parallel to the axis.

• **Linear pitch** (p). The distance from any point on a thread to the corresponding point on the adjacent thread, measured parallel to the axis. For a single-thread worm, lead and linear pitch are the same.

• Lead angle  $(\lambda)$ . The angle between a tangent to the helix and a plane perpendicular to the axis. Note that it is the complement of the helix angle which is usually given for helical gears.

• **Pitch diameter**  $(D_w)$ . Same as described earlier in this list. Note that for a worm it is still measured in a plane perpendicular to the gear axis, not a tilted plane.

• Subscript " " denotes the worm, " " denotes the gear.

# RANK 1 DEVICES

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Shells must be packed tightly for maximum stopping power. Use caution while assembling. Buckshot Shell An all-around speciality shell for use in hunting and warfare. Parts List: Black Powder Dron Filings Fig. 1 - Shell Diagram Be sure to obtain high quality lead Shell Cases pellets from a reputable dealer. Fig. 1 - Common Blast Patterns

# Buckshot Shell

#### Rank 1 Device

#### Components:

At a forge combine:

- Black Powder
- Iron Filings
- Shell Cases

All component tags must be placed into a plastic card holder sleeve with the item tag. A Buckshot Shell is a Single-Use Item.

# Effect:

If you use a Buckshot Shell you may point a firearm at a target and call "By My Gesture, Double Two Damage."



### Chain Net

Rank 1 Device

#### Components:

At a forge combine:

- Chain
- Small Housing
- Spiral Spring

All component tags must be placed into a plastic card holder sleeve with the item tag. A Chain Net is a Single-Use Item.

# Effect:

If you use a Chain Net you may throw a packet at a target and call "Root by Device."



# Device #62, Serrated

### Rank 1 Device

#### Components:

At a forge combine:

- Small Blade
- Small Housing
- Torsion Spring

All component tags must be placed into a plastic card holder sleeve with the item tag. A Device #62, Serrated is a Single-Use Item.

### Effect:

If you use a Device #62, Serrated you may throw a packet at a target and call "5 Damage by Device."



# Dynamic Pulse Inducer

### Rank 1 Device

#### Components:

At a forge combine:

- Pistol Grip
- Small Antenna
- Small Housing

All component tags must be placed into a plastic card holder sleeve with the item tag. A Dynamic Pulse Inducer is a Single-Use Item.

### Effect:

If you use a Dynamic Pulse Inducer you may wave a firearm or weapon in an arc and call "Disengage."



# Galvanic Inductor

#### Rank 1 Device

### Components:

At a forge combine:

- Conductive Wiring
- Galvanic Cell A
- Small Housing

All component tags must be placed into a plastic card holder sleeve with the item tag. A Galvanic Inductor is a Single-Use Item.

# Effect:

If you use a Galvanic Inductor you may throw a packet at a target and call "Agony by Lightning."

Fits all belt-mounted and backpack based galvanic tank models. Galvanic Spot Welder Use of tinted goggles F. 31 advised during operation. Fig. 1 - Galvanie Tank Parts List: Conductive Wiring Galvanic Lead Galvanic Cell C All purpose, portable repair solution for various devices and automata. Fig. 1 - Welding Apparatus

# Galvanic Spot Welder

#### Rank 1 Device

#### Components:

At a forge combine:

- Conductive Wiring
- Galvanic Cell C
- Galvanic Lead

All component tags must be placed into a plastic card holder sleeve with the item tag. A Galvanic Spot Welder is a Single-Use Item.

### Effect:

If you use a Galvanic Spot Welder you may touch a packet to a target and call "Repair Device by Device," or "Cure Maim to Automaton by Device."



#### Mechanoscope

#### Rank 1 Device

#### Components:

At a forge combine:

- Basic Gauge
- Lodestone
- Small Movement

All component tags must be placed into a plastic card holder sleeve with the item tag. A Mechanoscope is a Single-Use Item **SEE BELOW FOR DETAILS**.

#### Effect:

If you use a Mechanoscope you may touch a packet to a target and call "Diagnose X to Automata" where X is Damage, a Physical Trait (Crystal, Earth, Force, Ice, Silver, Thorns, Weapon, Web, and Wind), or Stable, Unstable, Unconscious, or Dead. So long as neither you nor your target moves, you may try to Diagnose all possible Damage/Traits/States/etc. once each. At the end of this diagnostic session, the Mechanoscope is used up and all components are of no further use, as per standard Single-Use Items.



# Speed Loader

### Rank 1 Device

### Components:

At a forge combine:

- Black Powder
- Cartridges
- Small Housing

All component tags must be placed into a plastic card holder sleeve with the item tag. A Speed Loader is a Single-Use Item.

### Effect:

If you use a Speed Loader you may touch a packet to a target and call "Refresh 2 Marksmanship."

# RANK 2 DEVICES

Autointegrating Parator 19
Bowel Disruptor 16
Flashbang Grenade 1'
Fragmentation Grenade 18
Galvanic Spasmodic Pistol 19
Universal Plate 20

Diamond tipped drill bit (Fig. 1-20) Autointegrating Parator Device recommended to insure puncture of both standard and reinforced automata plating. Simple-to-use apparatus for the repair of damaged internal automata systems. Parts List: Conductive Wiring Large Movement Brass Flate Turn depth indicator knob (Fig. 1-10) to approximate burrowing distance and puncture at damage site. Fig. 1 - Onterior

# Autointegrating Parator

#### Rank 2 Device

#### Components:

At a forge combine:

- Brass Plate
- Conductive Wiring
- Large Movement

All component tags must be placed into a plastic card holder sleeve with the item tag. An Autointegrating Parator is a Single-Use Item.

#### Effect:

If you use an Autointegrating Parator you may touch a packet to a target and call "Heal 2 to Automaton by Device."

Bowel Disruptor An unpleasant, yet effective defense item that utilizes galvanic pulses to disrupt an Depress trigger (Fig. 1-22) to fire galvanic probe into target area and induce loss of muscular control. Fig. 1 - Side View attacker's regularity Parts List: Advanced Gauge Galvanic Cell C Pistol Grip Fig. s - Front View Fig. 4 - Rear View Fig. 1 - Alternative Probe Designs

# Bowel Disruptor

#### Rank 2 Device

#### Components:

At a forge combine:

- Advanced Gauge
- Galvanic Cell C
- Pistol Grip

All component tags must be placed into a plastic card holder sleeve with the item tag. A Bowel Disruptor is a Single-Use Item.

### Effect:

If you use a Bowel Disruptor you may throw a packet at a target and call "Quick Stun by Lightning."

Flash Bang Grenade For use with launcher or hand-thrown. Non-lethal multi-sensory distraction grenade, suitable for advance or retreat. 19 Fig. 5 - Grenade/House Onteraction Diagram Parts List. Fig. 1 - Exterior Aluminum Grenade Case Saltpetre Best for use around convers or in conjunction with tinted goggles and ear plugs. Fig. 1 - Interior

# Flashbang Grenade

#### Rank 2 Device

#### Components:

At a forge combine:

- Aluminum
- Grenade Case
- Saltpetre

All component tags must be placed into a plastic card holder sleeve with the item tag. A Flashbang Grenade is a Single-Use Item.

You MUST have Grenade Use to Use or Carry a Grenade.

#### Effect:

If you use a Flashbang Grenade you must perform a 5 second roleplay of readying the grenade. Then you may throw a grenade rep (e.g., a specialized thrown weapon) at a target and call "Agony and Slam by Explosion."



# Fragmentation Grenade

#### Rank 2 Device

#### Components:

At a forge combine:

- Ball Bearings
- Black Powder
- Grenade Case

All component tags must be placed into a plastic card holder sleeve with the item tag. A Fragmentation Grenade is a Single-Use Item.

You MUST have Grenade Use to Use or Carry a Grenade.

### Effect:

If you use a Fragmentation Grenade you must perform a 5 second roleplay of readying the grenade. Then you may throw a grenade rep (e.g., a specialized thrown weapon) at a target and call "5 Damage and Maim Leg by Explosion."

Galvanic Spasmodic Pistol Depressing the trigger (Fig. 2-30) launches a pronged, galvanicly charged device capable of delivering a shock intense enough to cause loss of muscle control. Parts List: Conductive Wiring Galvanic Cell B Pistol Grip Simplistic design easy enough to be used by children. Not recommended for use by children. Fig. 1 - Projectile

# Galvanic Spasmodic Pistol

#### Rank 2 Device

#### Components:

At a forge combine:

- Conductive Wiring
- Galvanic Cell B
- Pistol Grip

All component tags must be placed into a plastic card holder sleeve with the item tag. A Galvanic Spasmodic Pistol is a Single-Use Item.

### Effect:

If you use a Galvanic Spasmodic Pistol you may throw a packet at a target and call "Disarm by Lightning."



### Universal Plate

#### Rank 2 Device

#### Components:

At a forge combine:

- Quick Set Glue
- Steel Plate
- Strapping

All component tags must be placed into a plastic card holder sleeve with the item tag. An Universal Plate is a Single-Use Item.

#### Effect:

If you use an Universal Plate you may touch a packet to a target and call "Refresh 2 Armor by Device."

# RANK 3 DEVICES

Antiductive Field Generator	22
Aspidrical Field Generator	23
Galvanic Web Grenade	24
Nicicous Grenade	25
Subsonic Wave Grenade	26

All-in-one, galvanically powered kinetic disruption system for the protection of soldiers and civilians alike. Antiductive Field Generator Fig. s - Coil Adjustment Diagra Parts List: Kinetic Reservoir Large Housing Parabolic Projector Set Magnetron Variance Knob (Fig. 1-1) to desired level of kinetic dampening, taking into account the number of ferrous objects carried by the user. Fig. 1 - Side Vien Fig. 1 - Front Vien

# Antiductive Field Generator

#### Rank 3 Device

#### Components:

At a forge combine:

- Kinetic Reservoir
- Large Housing
- Parabolic Projector

All component tags must be placed into a plastic card holder sleeve with the item tag. An Antiductive Field Generator is a Single-Use Item.

### Effect:

If you use an Antiductive Field Generator you may touch a packet to yourself and call "Grant Defense by Device: Reduce by Force." The next time you are struck by an attack which deals more than 1 Damage and has no trait (i.e., you get stabbed or shot for X Damage, but the attacker does not say 'by Fire' or some such), you must call "Reduce by Force," and you only take 1 Damage. This effect expires at Reset.

Aspidrical Field Generator	The latest in galvanic inductor technology allows a complete and portable defence solution ideal for battlefield engineens and medical personnel.	$F_{i}, t - Main Autoby$
Depress switch (Fig. 1-12) to generate a field of electrical force that shields the user from harm.	IT IT IT IT IT IT IT IT IT IT	Parts List: Galvanic Cell D Kinetic Reservoir Parabolic Projector

# Aspidrical Field Generator

### Rank 3 Device

#### Components:

At a forge combine:

- Galvanic Cell D
- Kinetic Reservoir
- Parabolic Projector

All component tags must be placed into a plastic card holder sleeve with the item tag. An Aspidrical Field Generator is a Single-Use Item.

### Effect:

If you use an Aspidrical Field Generator you may touch a packet to yourself and call "Grant Defense by Device: Shield by Force." The next time you are struck by any ranged attack, you may call "Shield by Force," and you take no effect from the attack. This effect expires at Reset.

Non-lethal grenade that deploys an electrified micromesh chain net for maximum Galvanic Web Grenade Pull pin (Fig. 1,2-1) and throw. For best results, use in open areas free of intervening objects. disabling power. Fig. 4 - Net Trajectory Parts List: Chain Galvanic Cell C Onsulated Grenade Case 12 Fig. 1 - Internal, Stage 1 Fig. 1 - Onternal, Stage 1 Fig. s - Micronet Mesh. Diagram

# Galvanic Web Grenade

#### Rank 3 Device

#### Components:

At a forge combine:

- Chain
- Galvanic Cell C
- Insulated Grenade Case

All component tags must be placed into a plastic card holder sleeve with the item tag. A Galvanic Web Grenade is a Single-Use Item.

You MUST have Grenade Use to Use or Carry a Grenade.

#### Effect:

If you use a Galvanic Web Grenade you must perform a 5 second roleplay of readying the grenade. Then you may throw a grenade rep (e.g., a specialized thrown weapon) at a target and call "Paralyze by Lightning."

A vicious, self-righting grenade that deploys a spinning mesh of razor wire for maximum casualties. Nicicous Grenade Remove cap (Fig. 1-20) and throw Fig. 5 - Barbed Wire Variation within 5 seconds. handling of barbed Parts List: Grenade Case Precise Movement mesh is inadvisable without proper hand and arm protection. → 🗅 Razor Wire Fig. 1 - Onternal View Fig. 1 - Correct Launch Procedure

# Nicicous Grenade

#### Rank 3 Device

#### Components:

At a forge combine:

- Grenade Case
- Precise Movement
- Razor Wire

All component tags must be placed into a plastic card holder sleeve with the item tag. A Nicicous Grenade is a Single-Use Item.

You MUST have Grenade Use to Use or Carry a Grenade.

#### Effect:

If you use a Nicicous Grenade *you must perform a 5 second roleplay* of readying the grenade. *Then* you may throw a grenade rep (e.g., a specialized thrown weapon) at a target and call "Death by Device."

Subsonic Wave Grenade Pepress trigger (Fig. 1,2-7) and lob in high are for Non-leathal grenade capable of emitting debilitating tones in a variety of frequencies and volumes. Fig. r - Ring, Closed best effect. Fig. 1 - Ring, Open Fig. 1 - Onterio Parts List: Grenade Case Large Movement Sonic Oscillator Use of ear plugs is encouraged. Fig. 4 - Dise Fig. 8 - Sound Amplifier

# Subsonic Wave Grenade

#### Rank 3 Device

#### Components:

At a forge combine:

- Grenade Case
- Large Movement
- Sonic Oscillator

All component tags must be placed into a plastic card holder sleeve with the item tag. A Subsonic Wave Grenade is a Single-Use Item.

You MUST have Grenade Use to Use or Carry a Grenade.

### Effect:

If you use a Subsonic Wave Grenade you must perform a 5 second roleplay of readying the grenade. Then you may throw a grenade rep (e.g., a specialized thrown weapon) at a target and call "Stun by Device."