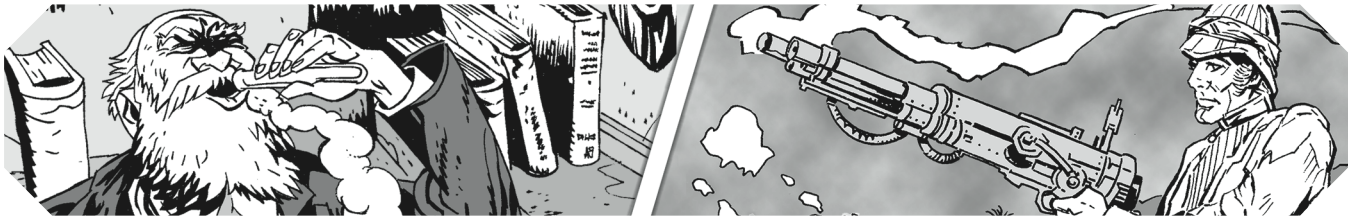
GURPS® Fourth Edition

STEAMPUNK 2

Steam and Shellfire™



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Introduction

This is the second volume of the ***GURPS Steampunk*** series, which builds on and updates (but does not supersede) the original ***GURPS Steampunk*** for Third Edition. It is a catalog and collection of steampunk gadgets, equipment, and *stuff,* suitable for use in a range of campaigns (some of them not necessarily labeled as "steampunk"). It can stand alone, but it *is* part of a series. Gamers may find that they get the most out of it if they read it in conjunction with ***GURPS Steampunk 1: Settings and Style.*** That volume discusses what "steampunk" actually means, and how to replicate the tropes in roleplaying games.

Steampunk as a genre is about *stuff* as much as it's about anything. Interesting, weird, somewhat cumbersome stuff, with gears on it, as often as not, but even those who are into steampunk for the style express that style through costumes and props. So, a book of stuff is an important element in this series – and can be used to add a touch of steampunk to many other games.

This volume is actually the *third* supplement for Fourth Edition with "Steampunk" in the title. One important category of equipment rated its own publication – ***GURPS Vehicles: Steampunk Conveyances.*** That is complimentary to this supplement, covering just the gear that moves people around.

Publication History

This is the first edition of ***GURPS Steampunk 2: Steam and Shellfire.*** However, some of the material in here is adapted from other ***GURPS*** supplements, albeit often with revisions to fit the new edition or the genre. Specific sources include ***GURPS Steampunk, GURPS Steam-Tech,*** and ***GURPS Castle Falkenstein*** for ***GURPS*** *Third Edition,* and ***GURPS High-Tech, GURPS Horror, GURPS Ultra-Tech,*** and ***GURPS Infinite Worlds: Britannica-6*** for ***GURPS*** *Fourth Edition.* The *Calculating Machines* rules in Chapter 1 borrow some ideas from the article "Thinking Machines," by Thomas Weigel, in *Pyramid #3/37: Tech and Toys II.*

> *Steampunk as a genre is about stuff as much as it's about anything. Interesting, weird, somewhat cumbersome stuff, with gears on it . . .*

About the Author

Phil Masters is a ***GURPS*** author of very long standing, and the author of ***GURPS Steampunk 1: Settings and Style*** and ***GURPS Vehicles: Steampunk Conveyances,*** among many other books for the game. A roleplaying game of his own creation, ***The Small Folk,*** is also available through Warehouse 23. He communicates with his publishers from across the ocean using the most sophisticated telegraphic apparatus (which is directly connected to advanced calculating machinery), favors rational styles of costume, and in general affects the mannerisms of a dubious sophisticate.

About *GURPS*

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Rules and statistics in this book are specifically for the ***GURPS Basic Set,*** *Fourth Edition.* Page references that begin with B refer to that book, not this one.

Chapter One
The Fundamentals of Technology

The room was illuminated only by the intruders' portable electrical torches, of Miss Anastasia Quayle's personal design, which made much of it hard to see. However, Oswald Finchley was far from certain that he wished to see much more. The yellow electric light showed all too many pistons and cranks, swinging back forth inexorably with the grinding of metal on metal and the hiss of steam.

"Do you really believe that we should be here?" Oswald inquired nervously.

"Of course not," Miss Quayle replied absently, examining a bank of complex brass-geared devices on one wall. "Sir Terrence would be most annoyed, I'm sure." She paused, and then produced a screwdriver from somewhere – Oswald believed that she carried them in her sleeves – and handed Oswald her torch. "Now, be a good fellow and keep that on my work, please."

As Oswald obeyed, she set to removing an iron plate from the wall, pocketing the screws that had held it in place as they came away and then lowering the plate to the floor. "Is that wiring?" Oswald asked, peering into the void that she had exposed.

"Of course it is," Miss Quayle replied briskly. "Did you not wonder how Sir Terrence governed these engines?"

"I did not even know that they were here."

"And how did you think that Sir Terrence's factory was powered?" Miss Quayle said, as if to a child. "Steam, of course – and yet, you told me yourself after you had sight of his account books – almost no engineers in his employ! In fact, to judge by the dust on those stairs, no one has been down here for months."

"Then how ***are*** *these engines managed?"*

"By those, of course!" Miss Quayle gestured briskly with the screwdriver, before it disappeared once more into her sleeve. "Analytical engines! Instructed by telegraph!"

"Most ingenious," Oswald replied, squinting at the intricate brass devices once more.

"And convenient," Miss Quayle said, producing a portable telegraph key and a small notebook from her reticule. "This codebook that I found in Sir Terrence's desk while you were fascinated by his books of account now makes perfect sense. And she who commands the codes, commands the power!"

Steampunk works by viewing the fundamentals of Steam Age technology – steam power; electricity and synthetic chemistry seen as novelties; and large-scale industrialization – through an Information Age lens, frequently adding a large dose of information technology. This chapter is about those basics and how to work with them in a steampunk game.

Terminology and Concepts

This book uses some specialized terms and concepts, many of which were introduced and discussed in more detail in ***GURPS Steampunk 1: Settings and Style.***

Cinematic Technology: Technology which makes for dramatic stories and is given more-or-less plausible explanations, but which would be totally impossible according to modern scientific understanding. Steampunk cinematic technology may have *period superscience* explanations embedded in the description, or may just involve gadgets with wildly optimistic performance.

Clockpunk: A variant on steampunk featuring a lot of clockwork or other pre-Steam Age technological style.

Effective TL: Steampunk settings often make use of the idea of divergent tech levels (p. B513). In such cases, the effective TL is a value equal to the sum of the two parts of the prevailing TL. For example, a TL(5+2) world has an effective TL of 7.

Period Superscience: When steampunk devices use the superscience designator ^, rather than representing some branch of science or technology that *might* be real or feasible but which hasn't been discovered yet, it usually indicates "period" superscience. These ideas were once seriously proposed or even widely accepted, but have now been disproved or superseded. Whole historic fields of knowledge, such as alchemy, now rate as period superscience.

Raygun Gothic: The style of technological design associated with "pulp" science fiction, from the period 1918-1939. This is, strictly speaking, later than the steampunk period as usually defined, but raygun Gothic style – characterized by aviator helmets, goggles, and ornate devices (including rayguns) – is popular with steampunk artists and costume designers.

Screampunk: Steampunk horror.

The Steam Age: The period from 1789 to 1914, also sometimes known as the "Long 19th Century."

Power Supplies and Storage

The Industrial Revolution was brought about largely by the availability of power on a scale undreamed of by the workshops and cottage industries of previous ages. New industries exploited traditional power sources such as animals and water mills on a larger scale than ever before, but they also took enthusiastically to new sources – notably, of course, steam.

Detailed treatments of historical power systems can be found in the original ***GURPS Steampunk,*** pp. 69-72, and in ***GURPS High-Tech,*** pp. 13-16. The following is a brief run-through of various types of power system.

Sources of Power

The basic source of energy for most of human history was *muscle power* – either from humans or domestic animals. A human being can provide a small fraction of a kilowatt over extended periods, or a bit less than a kilowatt in short bursts of a minute or two – enough to wind up a clockwork gadget or a light medieval siege engine, or propel a bicycle or keep a well-made desk-sized machine running steadily at a uniform cost in FP. A horse or ox can pull a carriage or cart or run a small mill. The Steam Age really got underway when alternative sources of power far surpassed this.

Older alternatives, only useful for large machines, were *water and wind power,* which have the virtue of being free (though not always reliable) once the machinery to exploit them is built. Sail-powered ships traversed the globe, and wind or water mills kept civilization fed. A traditional cottage-sized mill can generate a couple of kilowatts – enough to run some household gadgets, a workshop, or a modest TL(5+1) mechanical computing device. Cinematic treatments may play fast and loose with the power levels generated, but often emphasize the cumbersome unreliability of millwork. If they're important to the plot, you just *know* that somebody is going to have to dodge big clanking mechanisms while trying to keep them running.

The defining technology of steampunk is *steam* – water heated to boiling, creating pressure that drives a system of pistons (or, in later periods, turbines). The boiler may be physically separate from the engine (or multiple engines), though the two units should be close enough to minimize loss of heat and pressure in the linking pipes. Early TL5 "beam engines" were towering, inefficient contraptions, only useful for tasks such as pumping water out of mines. By the end of the 18th century, the technology had advanced to the point where many different factories used them. A quarter-ton engine, the size of a piece of furniture, could produce as much power as a watermill, while a ton of engine could produce 15 kW or so – enough to move a small boat around at respectable speeds, or to run one of Charles Babbage's hypothetical mechanical computers.

This made steam-powered vehicles a distinct possibility, although it took the development of railways in the 1820s for steam to be really competitive; old-fashioned roads were just too bumpy for steam carriages and their passengers. (See ***GURPS Vehicles: Steampunk Conveyances*** for some examples.)

More efficient "forced draft" engines powered the mid-century "Second Industrial Revolution." These had around 75% of the weight of earlier engines with the same power output, and required only two-thirds of the fuel and water consumption. By the end of the century, ships and factories were using expensive but even more efficient multi-cylinder "compound" engines. These, though, involved increasing complexity.

In the 20th century, they were replaced by steam turbines, at least in applications such as maritime propulsion and electricity generation. Steam turbines require TL6 materials and engineering precision, but repay this with power; a one-ton turbine could produce around 60 kW while consuming a quarter as much fuel as a mid-century engine with the same output. However, steampunk worlds are rarely afraid of mechanical complexity, and may feature intricate sextuple-expansion compound engines in places of turbines.

Prices

Costs given in this book are often suggestions or best guesses. After all, many of these items are imaginary or hypothetical, or are based on underdocumented historical products, while any historical prices that *are* known have to be converted to ***GURPS*** dollars (below). Anything using superscience can by definition cost whatever the GM thinks is appropriate.

The GURPS Dollar

In any event, all costs are given in "***GURPS*** $," an arbitrary unit of value. To convert these, at least for the years 1850-1915, divide the ***GURPS*** $ price by 22 to get historical U.S. dollar prices, or multiply dollar prices from historical sources by 22 to get ***GURPS*** $ values. For historical U.K. pound sterling values, divide or multiply by 110 instead. (See ***GURPS Steampunk,*** pp. 48-49, for information on U.K. currency; briefly, a pound is equal to 20 shillings, and a shilling is 12 pennies.) So, for example, something listed here as costing $500 would probably have cost about $22.70 or £4 10s historically.

Cost Factor (CF)

In some places where variations may modify the cost of items in this supplement, the cost factor rules are used. Each such modification has an associated "CF" value; multiply the normal cost of the item by (1 plus the sum of all applicable CF values) to get the modified cost. For example, an item with base cost $20, with added decorations that give CF +2 and technical improvements that give CF +0.5, costs $20 × (1+2+0.5) = $70.

By 1900 or so, *internal combustion* (in which rapid burning of liquid fuels drives pistons directly) was well on the way to surpassing steam. Being more compact and efficient at small sizes, it initially dominated in smaller machines such as automobiles and aircraft, which benefited from high power-to-weight ratios, but ultimately replaced steam in most applications. An early internal combustion engine weighing 350-700 lbs. could produce 100 kW or more – enough to propel a WWI fighter through the air at over 100 mph, or to haul 30 tons of early tank around a battlefield at a fast walking pace.

Lastly, *electricity* is really a method of power transmission rather than a power source, but once it started to prove useful, 19th-century writers such as Jules Verne fell in love with it. They assumed that future technological evolution would create cheap, compact batteries of apparently limitless capacity, which would hardly ever need charging or renewing. The Disney movie version of Verne's Captain Nemo created a highly anachronistic atomic power plant, which might actually be more plausible.

Fuel

All steam engines need fuel and substantial water supplies. They can run on wood, which is convenient for farm machines and colonial operations; adventurers riding riverboats into the heart of Africa can top up their fuel supplies by stepping ashore with an axe. But wood is relatively inefficient; coal is a much more compact source of power and hence became another defining element of the Industrial Revolution. However, even coal is *quite* bulky; larger steam locomotives towed substantial tenders, which also held reserves of water. Some later steam engines used liquid fuel (which is also required for internal combustion). The major wars of the 20th century would increasingly involve, and sometimes be *about,* contests for access to oilfields. Indeed, steam power would occasionally enjoy minor resurgences in nations temporarily cut off from oil supplies.

This age was made possible by power on a scale undreamed of by the workshops and cottage industries of previous ages.

Power Storage and Transmission

Mechanical energy can be stored in springs, which can then drive mechanisms such as clocks. Hence, *clockwork* is a form of power storage as well as a style of engineering. Realistically, springs can only hold a little energy, enough to power domestic clocks for hours or clever toys for seconds; an imaginary backpack-sized spring mechanism weighing 10 lbs. might provide a kilowatt of energy for half a minute, powering, say, some exotic clockpunk weapon for a dozen shots. (Flywheels, another alternative, are even more limited.) However, fantasy clockwork is often *wildly* powerful; a few turns of a giant key by a single human being can grant a human-sized mechanical doll the ability to dance for hours. (Realistically, winding up such a machine, or spinning up flywheels, would of course mean generating as much power as is to be stored, plus some for inefficiencies.) A harsh GM may note that a bursting spring or runaway flywheel releases all its stored energy at once.

Power can also be supplied, in electrical form, by *batteries* – a technology that has advanced dramatically over the years, though not as far as imagined by Verne. Electricity can also be transmitted efficiently over long distances, by wire, whereas mechanical power transmission is expensive, bulky, and largely useless over distances greater than a few hundred yards. Of course, this means that the coming of electricity ultimately creates a world of big centralized power stations (after a brief period when big houses sometimes have their own private generators), whereas steampunks may rather like the idea of everyone having their own steam engines.

However, the first Steam Age batteries were not rechargeable "power cells," but "primary" batteries, using irreversible chemical reactions, which had to be replaced or remanufactured when they ran down; lead-acid batteries, which *can* be recharged, are heavy and bulky. An outsize 100-lb. primary battery might supply a kilowatt of power for a couple of hours (or twice as much for half as long, and so on); a lead-acid battery of the same weight would have less than half the capacity. Even given alternate-technology developments and wildly cinematic assumptions, a Steam Age battery-powered electrical vehicle should really consist largely of batteries. Note that even modern electric cars, using TL8 power systems and construction, carry a lot of weight in power cells and still lack the full performance and range of internal combustion vehicles.

Stylish and Ruggedized Equipment

Steampunks love individualized equipment, often hand-embellished and personalized. It is also a point of pride among steampunk-style handcrafters to build gear that can stand up to prolonged, heavy use. This can be reflected in games – at a cost, of course.

Any device can have a more *stylish* appearance thanks to inlaid jewels, hand-tooled leather, embroidery, brocade, silver or gold plate, etc. This is common for presentation weapons. Styling grants a bonus to reaction rolls from collectors and potential buyers (unless they *only* care about usefulness), and to Merchant skill rolls made as Influence rolls (p. B359) on such people: CF +1 provides +1 to rolls, CF +4 grants +2, and CF +9 gives +3.

A *ruggedized* device is built to withstand abuse and bad weather. It has a tough and/or waterproof casing, rust-proof plating, heavy-duty power cables, armored glass lenses, and so on, all giving +2 to HT and double normal DR. The enhancements may also grant an occasional +1 to reactions from the kind of people who recognize and *really* admire robustness. Ruggedized adds CF +1, and weight is multiplied by ×1.2. This option isn't available for clothing, weapons, or armor.

Calculating Machines, Mechanical Mentalities, and Information Storage

Computational devices are mechanisms which store and process data in some way. The obvious example is the modern electronic computer, but all sorts of gadgets and technological systems, from TL1 on, can be considered to prefigure that. These rules provide a generalized, abstract system for handling such things at low to middling tech levels, borrowing from the treatments of computers and software on p. B472 and in the original ***GURPS Steampunk,*** pp. 85-87, ***GURPS High-Tech,*** pp. 19-22, ***GURPS Ultra-Tech,*** pp. 21-26, and the article "Thinking Machines," by Thomas Weigel, in *Pyramid #3/37: Tech and Toys II*. This chapter provides a general, *abstract* way of defining a variety of devices in many different sorts of games; real-world devices will inevitably vary in cost, weight, and capability from what this system suggests. More detailed systems would pay more attention to the specific technologies employed, but technologies in steampunk and raygun Gothic settings are generally more concerned with style than with technological realism.

Because these rules *are* specifically intended for use in steampunk and similar games, they involve moderately generous treatment of some of the possibilities. They cover tech levels, and equivalent tech levels on alternate technological paths, from TL1 to TL8, with allowance for period superscience and downright fantasy tech. For higher tech levels, see the supplements and article mentioned above.

Prices are *especially* variable for superscience devices. Unique gadgets that should logically be worth a king's ransom may in some settings be cobbled together in some backstreet workshop and then employed for trivial purposes.

> *Computers do the calculating to allow people to transform the world.*
>
> *– Conrad Wolfram*

Hardware

A computational device may be a standalone box with input and output mechanisms built in (such as a modern-day computer), or it may be installed into some larger device that it controls or enhances (such as the brain in a robot or a fire-control mechanism in an artillery piece). Where appropriate, some kind of "operating system" or "task manager" is assumed to be built into or supplied with the hardware.

Device Attributes: The key feature of any computing device is its *Complexity,* an abstract measure of its data processing power, as explained on p. B472. In addition, general-purpose computers (multipurpose computing devices which are not dedicated to a specific function) and some other devices have a *data storage capacity* (also defined on p. B472). Any device also has a *price,* if only for game accounting purposes. Lastly, devices need some kind of *power supply* – power cells or external power lines for modern electronics, or other options from a hand crank to a gigantic steam engine for other devices. These are discussed on a case-by-case basis.

Complexity and Capabilities

It is useful to know the sort of capabilities associated with each Complexity levels. Use the following as guidelines.

Complexity -2: Perform a simple arithmetical operation (such as addition). Carry out a fixed sequence of actions (such as a simple clock or music box).

Complexity -1: Perform four-function arithmetic. Carry out a fixed sequence of coordinated actions (such as an orrery, Jacquard loom, complex chronometer or scientific clock). Maintain a steady state in reaction to perturbations (such as a thermostat or steam-engine governor).

Complexity 0: Maintain motion on a well-defined path despite perturbations (such as autopilot). Provide real-time support for Artillery skill on land, eliminating up to -3 in penalties due to range or height differences. (This sort of mechanical assistance may be assumed as built into artillery at TL6+, and already factored into weapon details.) Run a simple one-player game.

Complexity 1: Execute a program written in machine code. Provide real-time support for Artillery skill in any environment, eliminating up to -5 in penalties due to range, height differences, wind, differential movement, etc. (This sort of mechanical assistance may be assumed as built into artillery at TL7+, and already factored into weapon details.) Perform complex numerical data analysis.

Complexity 2: Interpret a programming language and execute the program. Monitor the functions of a medium-sized business, providing management information on demand. Provide spreadsheet, word-processing, or publishing functions that speed up many jobs.

Complexity 3: Skill-support functions *required* by many skills at higher TLs. (This can include, for example, advanced mathematical analysis of engineering, scientific or financial data, or advanced word-processing or publishing tasks.) Versatile manipulation of sounds or graphics.

Complexity 4: Good skill support, giving +1 to Easy skills. Simple targeting software, enabling the system to use one Easy combat skill at DX, although it cannot make Deceptive Attacks, take the All-Out Attack maneuver, or target specific body parts. (Some Complexity 4 general-purpose machines end up devoting more processing power to user interactions than to their nominal purpose. Treat them as having Per 6 when processing sensory inputs.)

Complexity 5: Good skill support giving +1 to Average or harder skills. Reliable weather prediction an hour ahead. "Non-volitional" AI with IQ 6 (see *Synthetic Sapience,* pp. 11-12).

Complexity 6: Fine skill support giving +2 to Easy skills (but still only +1 to Average or harder skills). "Volitional" AI with IQ 6 (see *Synthetic Sapience,* pp. 11-12).

Complexity 7: Fine skill support giving +2 to Average or harder skills. Reliable weather prediction a day or two ahead. Non-volitional AI with IQ 10. Volitional AI akin to an IQ 8 human adult.

Complexity 8: Reliable *global* weather prediction a day or two ahead. "Decision support" functions equal to an IQ 12 advisor with perfect memory and no ulterior motives, giving a would-be mastermind +2 to many skills. Volitional AI akin to a typical IQ 10 human adult.

Control Interfaces

General-purpose machines need some way for users to manage what software is running and to store, copy, and delete files – and something simpler than spending hours with a machine interface (p. 11) is nice. The following options are included in the cost of any such machine, so long as it has a primitive, standard, or miniature terminal (see p. 11). These interfaces are systems of commands and controls, operated through the terminal.

A system of complexity 1 or higher may have a very simple "command line" interface to its operating system, allowing users to control it by typed commands or similar, so users with familiarity with the system can load different applications in seconds rather than minutes or hours.

Complexity 2 machines may include a fully featured text-based interface. Someone with Computer Operation skill can use this to manage files and other aspects of the system with a few seconds of typing.

Complexity 3 allows the machine to incorporate a full-featured graphical interface, making many tasks more intuitive (if not necessarily faster), with no skill roll required. However, this requires a standard terminal (p. 11) or a miniature terminal (p. 11) of TL8+ or the equivalent.

Complexity 4 or higher machines with standard or miniature terminals that include microphones and loudspeakers may feature voice control, although a text-based or graphical interface may still be used for complex tasks or to provide better security. Also, if an AI is installed, is running in a program space, and has access to sensory inputs, it can act as a control interface, loading and unloading programs and managing data according to verbal commands or its own volition.

Of course, steampunk computers are often very strange by the standards of our world. Their interfaces may be comparable in sophistication and flexibility, but completely different in form.

Data Storage Capacity

The Complexity of a device also determines roughly what its internal data storage capacity is likely to be. Note that these values can *easily* vary by a factor of 10 or more either way, depending on prevailing technology and the purpose of the device. This data is mostly stored in an internal subsystem such as a magnetic disk; the processing systems only hold a small fraction of this total for truly instant access. Dedicated devices (see p. 9) often have very limited internal storage, but can read external data sources.

Complexity -2: Holds up to a few dozen bytes of data directly related to its function; for example, it can add together two numbers of up to six digits each, or keep track of the current date and time.

Complexity -1: Holds a few hundred bytes of data directly related to its function; for example, several numbers to have arithmetic performed on them. May have the ability to read data from an external source, such as punch cards, and process it as it goes along.

Complexity 0: May hold up to a few MB of data, depending on function.

Complexity 1: Holds 1 GB.

Complexity 2: Holds 10 GB.

Complexity 3: Holds 100 GB.

Complexity 4: Holds 1 TB.

Complexity 5: Holds 10 TB.

Complexity 6: Holds 100 TB.

Complexity 7: Holds 1,000 TB.

Complexity 8: Holds around 10,000 TB, or simply more data than anyone ever needs, particularly if it's all plain text.

The option may be available to add extra data storage to a machine. If so, spending 10% of the base cost of the machine increases the basic capacity by as much again (e.g. spending 20% extra triples the basic capacity). In other cases, extra data storage may require cumbersome external media; reels of paper tape, caseloads of punch cards, gigantic magnetic drums, etc. See *External Storage,* p. 11.

> *[The machines] were full of cams and cogs, ratchet wheels and rods. Notched bars jutted out at odd angles.*
>
> *– Michael Flynn,*
> ***In the Country of the Blind***

Device Sizes

Computational devices come in a wide range of sizes, defined here by their weight in pounds. Each also has a base Complexity rating and price, which are equal to the attributes of a typical general-purpose computer of this size at mid-TL7 – that is, historically, in the early days of widespread general-purpose electronic computing. (In fact, some of the bigger types didn't exist at TL7, and probably could not be built with real TL7 technology – but they can be imagined as existing at a comparable level on an alternate technology path.) These can then be modified extensively. If modifiers reduce the device's Complexity *below -2,* it can't do anything useful.

Tiny: A device that can fit on a wristwatch strap or in a chunky ring, be built into a small toy, or even be implanted inside a living creature, given sufficiently sophisticated medical skills. Typically powered by miniaturized clockwork, a minuscule power cell, or tiny amounts of energy drawn from its surroundings. Complexity -1, $50, 0.1 lb.

Small: A device to carry in your hand or attach to the side of another piece of portable machinery. Powered by a battery/power cell or simple clockwork. Complexity 0, $100, 1 lb.

Personal: A desktop system, something just about portable, or the brain for a human-sized automaton or a small vehicle. May run for hours on a battery or power cell or for minutes on clockwork, be powered by a hand crank or treadle, or be plugged into a domestic power supply. Complexity 1, $1,000, 10 lbs.

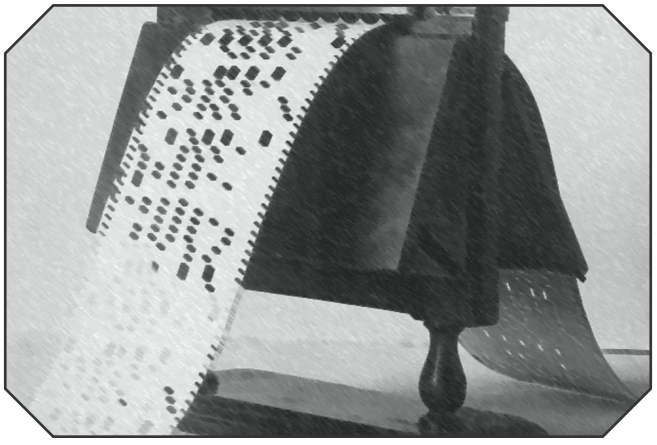
Cabinet: A "microframe" or something treated as furniture – a crucial resource for a small organization, or a key component in a large vehicle. Needs a heavy domestic or light industrial power source of some kind. Complexity 2, $10,000, 100 lbs.

Mainframe: The sort of substantial hardware that only large organizations or the very rich need or can afford. Power can come from a mains supply or, say, a small steam engine. Complexity 3, $100,000, 1,000 lbs.

Gigantic: If budgets permit and the need exists, computational machines can end up weighing several tons. Something on this scale either needs a reliable mains supply or a respectable engine or generator (which may also supply the rest of the building as a side benefit). Complexity 4, $1,000,000, 5 tons.

Titanic: When you need all the computing power you can get, try a machine that fills a building, with its own power plant attached. There are *many* problems with creating something this large, whatever the basic technology, but some technological paths may permit it, especially if superscience is involved. Complexity 5, $10,000,000, 50 tons.

Cyclopean: Someone with an unlimited budget, runaway data-processing requirements, and probably radical superscience could build a device the size of a substantial building, with one or more power plants included somewhere in the structure and making it even bigger. Whatever technology this uses, the technical issues involved in building it are going to be *interesting.* Complexity 6, $100,000,000, 500 tons.



Modifiers

The above attributes can be and often are modified extensively. Choose from the following table, noting that some options require others or are mutually incompatible (see *Option Descriptions,* below). Any option can only be taken once. Which modifiers may be applied to which sizes of device is entirely a matter for the setting design; the GM can veto anything that doesn't fit the world concept.

Each modifier applies a multiplier to the various attributes of the device, except for the Complexity, which gets an addition or subtraction. All modifiers compound together.

Example: A TL5 compact dedicated mechanical personal device has weight 3 × 1/2 × 1/2 × 3 × 10 = 22.5 lbs., cost 10 × 2 × 1/5 × 1/2 × $1,000 = $2,000, and Complexity 1 -2 = -1. This could describe an early mechanical four-function calculator, a big laboratory chronometer with a mahogany case, or a fancy coin-operated barroom music box that can play an assortment of tunes from perforated disks.

This is one situation where the cost factor rules (p. 5) do not apply. However, once a weight and cost for the device have been established using these modifiers, the rules for *Stylish and Ruggedized Equipment* (p. 6) can be applied to *them.*

Modifier	*Weight*	*Cost*	*Complexity*	*Page*
TL Modifiers*				
Built at TL1	×6	×30	-4	–
Built at TL2	×4	×25	-3	–
Built at TL3	×4	×20	-3	–
Built at TL4	×3	×15	-3	–
Built at TL5	×3	×10	-2	–
Built at TL6	×2	×10	-1	–
Built at TL7	×1	×1	–	–
Built at TL8	×1	×1/2	+2	–
Other Options				
Compact	×1/2	×2	–	below
Dedicated	×1/2	×1/5	–	below
Electromechanical	×4	×2/3	–	below
Fantastic AI	×1	†	†	10
Genius	×1	×500	+2	10
High-Capacity	×1	×1.5	–	10
Low-Power	×1	×1/20	-1	10
Mechanical	×6	×1/2	–	10
Miniature	×1/5	×10	–	10
Semi-Dedicated	×2/3	×1/3	–	10
Smart	×1	×20	+1	10
Tube-Tech	×2	×0.8	–	10

* May represent the effective TL on an alternate tech path.
† See description, p. 10.

Option Descriptions

Compact, Miniature: The device is built with small (and hence expensive) components. Skill rolls to modify or repair it are at -2 for Compact or -5 for Miniature. Some machines *have* to be constructed as Compact designs because making them larger would be prohibitively expensive in materials, too power-hungry, or prone to overheating. Miniature machines may feature actual superscience, cramming more into the space than most engineers would believe possible at the TL. These two options cannot be combined with each other.

Dedicated: The device can only run a single program, which is built into its mechanisms. Cannot be combined with Semi-Dedicated.

Electromechanical: The device uses a combination of electrical and mechanical technology – electrical circuits using physical switches to perform logical operations, gears regulated by electronic timing systems, etc. It is inevitably slower to use and noisier than a fully electronic machine with the same capabilities. Cannot be combined with Mechanical or Tube-Tech.

Fantastic AI: The device *must* also be Dedicated (p. 9), and its built-in function is always artificial intelligence of some kind (see *Synthetic Sapience,* pp. 11-12) – but its capabilities are logically far beyond the capabilities of computational devices in this setting. For every Complexity-level increase required to allow the device to run this AI, multiply the cost by 20 if calculating a cost for a one-off or prototype device from an organized workshop or laboratory, or by 5 if it is the handiwork of a solitary genius *or* if the device is being produced and sold in numbers. For example, if the device would otherwise be Complexity 4 but is intended to run a Complexity 7 non-volitional AI (IQ 10), the cost is multiplied by 8,000 for a workshop experiment, or by 125 for a one-craftsman or production-line model. This option always requires some kind of superscience or fantastical explanation, though that may sometimes be as simple as "It's a living doll in a fairytale world" or "What's goofy pulp SF without clanking robots?" – or something like "A resonant silver mesh interacts with the higher realms from which consciousness emanates" or "High-energy particles create spontaneously self-organizing pseudo-neurological pathways in an osmium-tungsten matrix."

Genius, Smart: The device is at the very least built with the best available components and design features, and may incorporate cutting-edge technology. In some cases, Genius machines may require superscience, taking them beyond what should rationally be possible at the TL; in others, they are merely masterpieces of precision craftsmanship. These two options cannot be combined with each other or with Low-Power.

High-Capacity: The device can run 50% more programs simultaneously (e.g., three programs of its own complexity).

Low-Power: The machine uses inexpensive components or is an older design – or it may be so experimental or cutting-edge that it doesn't realize the potential of the technology very well. Cannot be combined with Smart or Genius.

Computing Devices and the Law

Individual computational devices may be legally controlled, depending on what they are built to do. Once *general-purpose* devices become widespread, they especially may be subject to control, because some of their potential functions are dangerous, unlawful, unethical, or inconvenient to governments.

Any general-purpose machine is usually treated as LC4. Anything potentially capable of independent thought is typically LC3 (or lower, if society fears "inhuman minds"). Something potentially capable of superhuman intelligence, running a revolution by itself, or destroying the economy is likely LC2 or lower. Dictatorships may control or repress anything that enables widespread unofficial communications, such as printing presses or the Internet. *Software* capable of breaking military codes, breaking into the banking system, or creating weapons of mass destruction is often LC1 or 2. Remember, the mere *existence* of devices capable of breaking certain codes was one of the best-kept secrets in the world for many years!

Mechanical: The device uses purely mechanical, non-electrical engineering – cogs, gears, levers, etc. It is probably quite noisy in use, and functions much slower than an electronic machine with the same capabilities. Cannot be combined with Electromechanical or Tube-Tech.

Semi-Dedicated: The device is strictly speaking a general-purpose computer, but is heavily optimized for a single category of tasks, such as "entertainment" or "military operations." Creating programs to run on it requires another, compatible, fully general-purpose machine of the same Complexity or higher. If the Semi-Dedicated machine is used for purposes outside of its task category, skill rolls made to operate it or when using it to support other activities are at -2, and operations take twice as long to perform as with a general-purpose device. Cannot be combined with Dedicated.

Tube-Tech: The device uses electronic vacuum tubes (also known as "valves") or related technology from before the invention of the transistor – or superscience electronics clearly derived from those roots. This may be required for electronic devices in timelines where semiconductor technology never appeared. Historical complex Tube-Tech devices often required near-continuous maintenance, as vacuum tubes were notoriously fragile and failure-prone, although higher-reliability tubes were developed in TL7. Cannot be combined with Mechanical or Electromechanical.

Options and Tech Levels

Historically, clever mechanical devices become possible with the invention of metalworking, and such gadgets were known in Greek and Roman times. But, Charles Babbage's late TL5 experiments aside, they were only used for Dedicated functions, and were increasingly superseded by electrical systems from mid-TL6 on, outside of some specialized applications.

Electrical computational devices only become *conceivable* at TL5, when useful basic research into electrical forces begins. Late TL5 knowledge permits the creation of Electromechanical devices, and this option is widespread through TL6, but it is little used except for specialized Dedicated devices after the end of that TL, as miniaturized electronics are simply better.

Electronic systems (the default at TL7 on) only become *possible* with the invention of vacuum tubes (and hence the Tube-Tech option) at TL6, at the very end of the Steam Age. These enable the invention of the general-purpose electronic computer, but are bulky, fragile, and require continual maintenance; TL6 Miniature or Ruggedized Tube-Tech devices might require superscience, although high-reliability tubes were developed at TL7. (One way to make Tube-Tech devices more reliable is to not require that they have to be turned off and on so often; many failures happen at power-up.) The invention of the transistor at TL7, and the ensuing development of integrated circuits, enables the development of TL7 and TL8 devices; an alternate tech path would require the development of something comparable to achieve similar results. Before transistors became widespread, with vacuum tubes being so fragile, fire-control systems for early 1950s artillery and warships were often Mechanical.

Also, the *concept* of the general-purpose computer only appears, historically, with Babbage at mid-TL5, and his work was abortive; the idea then reappeared at late TL6.

Babbage's hypothetical machine aside, historical devices should always take the Dedicated option before TL7. A campaign with slightly alternate technology at those lower TLs might add an extra Complexity penalty to non-Dedicated devices at TL1-6, reflecting their experimental nature and lack of theoretical support. Another option is to limit all devices built at TL4 or below to a Complexity of (TL-3).

External Storage

Historically, external data storage could get quite bulky before the age of microelectronics. A reel of paper tape holding 12 KB weighed about 1.5 lbs., while a stack of 100 early punched cards holding 64 KB weighed 3 lbs. Either cost a couple of dollars. At TL7 or equivalent, the technology improves; a 1,000 KB archive can be fitted onto cards costing $20 and weighing 4 lbs. Such things have to be fed through mechanical readers, taking appreciable amounts of time, and are vulnerable to tearing or fire. More advanced (TL6+ or equivalent) systems use magnetic media, but a few megabytes of fast-access storage still weigh several *tons* and consume significant amounts of electrical power. Steampunk data processing isn't fast or transparent to end-users!

Input/Output Devices

Input/output (I/O) devices enable users to interact with computational devices. They range from minimal and difficult to fantastically sophisticated; Dedicated and Semi-Dedicated devices may have interfaces that are physically much larger than the computational device itself, whether that means a big display screen, a robotic musical instrument, or a decorative clock face. When the I/O device is that complicated, the GM may determine a price for it separate from that of the computational device itself.

Dictatorships may control or repress anything that enables widespread unofficial communications.

Machine Interface: This is the absolute minimum interface, technically available on all devices, although very hard to use on advanced systems with high levels of miniaturization. "Commands" are input by directly manipulating the machine's internal levers or switches, adding and removing whole components, adjusting electrical voltages, and so on. Results are shown on dials or other numeric displays or indicated by blinking lights or simple sounds. Performing any but the simplest functions this way requires the use of an appropriate Mechanic or Electronics Repair skill; Computer Operation is rarely applicable.

Primitive Terminal: The standard style of I/O system for early computing devices includes a mechanical keyboard, some kind of paper-tape or punch-card reader or similar, and a slow, noisy printing mechanism that outputs inelegant text. This is usually incorporated in any Personal (p. 9) or larger device with general-purpose computing capabilities. A scaled-down version may be incorporated into a Small (p. 8) device, but trying to work quickly or for more than a few minutes at a time on a Small primitive keyboard and display gives -2 or worse to skill. Extra terminals weigh 500 lbs. and cost $5,000, or have the same weight as and half the cost of the computing device itself, whichever makes the weight less; adding a big, fast printer or a graphical plotter adds 100 lbs. and $1,000. A new task may take an hour or so simply to set up on a primitive terminal, and deciphering the results takes several minutes of sifting through the output.

Standard Terminal: Historically, this means a keyboard and either a monitor (monochrome until TL8) or a good, fast printer. An intricate physically animated visual display might substitute for the latter in a steampunk world with no electronics. Again, this sort of thing tends to be built into computing devices of an appropriate TL, and Small or larger computers have enough room to include it. Adding an extra standard terminal to a system adds $500 and 50 lbs., or the same weight and half the cost of the computing device itself – whichever makes the weight less.

Miniature Terminal: If a Small (p. 8) device is advanced enough to allow complex I/O capability, it can be equipped with a miniature keyboard and a small display – the latter being just a line or two of characters on devices before TL8 or the equivalent. A Tiny (p. 8) device might be connected to a similar interface, but this will *at least* double the weight of the whole system and increase the cost by 50%. For simple tasks (e.g., simple arithmetic, or a one-line question with a yes/no answer), there is no penalty when using a miniature terminal on a Small device. For something more complex but essentially repetitive or routine (e.g., entering a table of information to a database, or writing a short letter), the skill involved is at -1 or -2. Increasingly complex tasks give worse penalties – writing a full-scale program would give -5 to -10. (Taking *Extra Time,* p. B346, may partially compensate, of course.) These penalties are doubled on a Tiny device. Most such devices are limited to simple tasks with minimal interface requirements before TL8, though.

As technology advances, more secondary devices (mice, loudspeakers, microphones, etc.) are incorporated into standard or miniature terminals, and weights may fall, especially when microelectronics develop; some of these can permit voice control (p. 8). *Mechanical* add-ons may appear on steampunk technological development paths. For example, a mechanical speech synthesizer is technically feasible by late TL5, although a useful one would be expensive and bulky – around $7,000 and 30 lbs.; higher-TL versions would be smaller, and miniature designs might be possible at *considerably* greater cost.

Synthetic Sapience

"Artificial intelligence" (abbreviated as "AI") is a modern expression, but it describes something seen in some steampunk and related fiction – "calculating machines" so advanced that they possess actual sapient intelligence, or at least fake it convincingly. For game purposes, this comes in two forms.

Non-volitional AIs can understand and possibly use speech and learn some skills, but totally lack motivation or emotional complexity. A non-volitional AI with high IQ may be quite disturbing to talk to, as it is as intelligent as an ordinary human in some ways but totally lacks motivations or empathy. However, people may get used to this. The Complexity of a non-volitional AI program is (IQ/2)+2, rounded up.

Volitional AI is fully equivalent to a human being in its ability to make decisions, pursue goals, and comprehend emotions. It usually displays emotions of its own, though these aren't necessarily very human-like. Some volitional AIs have their motivations "designed in" by their creators; others develop them as they go along. A volitional AI with IQ 6 has as much motivation and grasp of emotions as a chimpanzee or a five-year-old child, but probably much better self-control; AIs with higher IQs can match adult humans. The Complexity of a volitional AI program is (IQ/2)+ 3, rounded up.

Some settings may feature only non-volitional AI, with true sapience being beyond any human creator's skills – or only volitional AI, if stories set there involve "thinking machines" but the GM doesn't want overcomplicated but compliant mechanical toys. (Perhaps it's impossible to create versatility and language skills without emotions and self-motivation.) Most AIs of either type are at least IQ 6, as less would mean that they were more like a clever animal, with no comprehension of language, which would limit their usefulness both in real life and for story purposes.

AI Learning

The ability to learn, including mastering skills and languages and *maybe* gaining some mental advantages by experience, requires true AI. Non-volitional AIs in stories usually have few skills, though they may be very good at one or two activities. Thus, the equivalent of the Cannot Learn disadvantage may be standard.

If AIs can learn, it *may* be feasible for them to train up their IQ (and possibly their DX) to above what is determined by their Complexity. (To calculate basic DX, see p. 15.) A *single* occurrence is a scenario plot point. However, the GM may ban this (adding the feature "Complexity-Limited IQ and DX" to all AIs), as it makes trained AIs potentially very powerful and likely incredibly valuable and socially controversial.

If AIs can learn, every point spent on learned abilities during or immediately after construction adds $100 to the price. Multiply this by 10 for points spent on IQ, DX, or Talents, if that is permitted at all.

Software

See *Complexity and Capabilities,* pp. 7-8, for an overview of what programs (and hence machines) of a given Complexity can accomplish. See p. B472 for information about the relationship between computer Complexity and software Complexity.

In settings where general-purpose computers are widely available, programs may be offered for purchase. Use the following rules as a *guideline* for prices, which can vary significantly if programming skills and tools are common or rare, standard software has fallen out of copyright or been released for free, or specific algorithms (say for cryptography or volitional AI) are legally restricted.

The base price for software, at TL6-7, is as follows:

Complexity	*Price*	*Complexity*	*Price*
0	$300	5	$100,000
1	$1,000	6	$300,000
2	$3,000	7	$1,000,000
3	$10,000	8	$3,000,000
4	$30,000	9	$10,000,000

Divide prices by 10 at TL8; multiply them by 3 at TL5, 10 at TL2-4, or 100 at TL1. Note that, even if general-purpose computers are available in a setting, high-Complexity software may simply be impossible to create or run on any available hardware!

Software Development

People may decide to write their own software, when appropriate equipment is obtainable, using *New Inventions* (pp. B473-474). Use Computer Programming as the invention skill for software meant for general-purpose and Semi-Dedicated (pp. 9-10) systems, and treat Complexity values of less than 1 as 1 for all purposes. The internal logical processes of a Dedicated (p. 9) device are created as part of the mechanical or electronic design stage, using the relevant Engineer specialty. The nominal Complexity of the device can provide a guideline for the complexity of that invention; in that case, treat Complexity -2 to 0 as Simple, 1-2 as Average, 3-4 as Complex, and 5+ as Amazing. In addition, if the device has the Fantastic AI option (pp. 9-10), *each level* of Complexity provided by that option gives a further -2 to Concept rolls and -1 to Prototype rolls. Likewise, if no devices are available with Complexity *greater than* 1, or computers are too new for programming languages to have been developed, software development *must* be conducted in machine code, which gives an extra -2 to Prototype rolls.

Software design for devices using machine interfaces or primitive or miniature terminals is often slow and tricky, and may involve "batch programming," writing the software *on paper,* submitting it to the machine's operators, and then awaiting the results. This *doubles* the time required for Prototype rolls. Alternatively, it may be possible to develop the software on another, larger, more convenient machine, then transfer it over when it's complete and debugged; this is the usual process for Semi-Dedicated systems. This merely adds 10% to the time required for Prototype rolls.

Example Devices

The following are examples of the sorts of calculating devices that can appear in games. See pp. 7-11 for explanations of hardware descriptors. For other genre-appropriate analytical engines and special-purpose instruments, see pp. 63-66 and 69-70 of ***GURPS Steam-Tech.***

Historical Devices

The Antikythera Mechanism: Modern investigations into the remains of an object, dating to around 200-100 B.C. and recovered from an ancient shipwreck off the Greek island of Antikythera, have revealed that it was in fact an extraordinary *device:* a mechanical model of the movements of the solar system, superior to anything produced in Europe for the next 1,500 years, able to predict eclipses and plot astrological calendars. As the Greeks made little use of complex machinery, it was probably created as an intellectual demonstration piece. Unfortunately, due to limitations in Greek astronomical theory and mechanics, it wouldn't have been terribly accurate. A fully functional version might be represented as a TL2 Dedicated Genius Mechanical Miniature Personal device, 24 lbs. in weight and Complexity -1.

This gives a nominal cost of $10.25 million, reflecting the unique skills and craftsmanship involved, though the actual cost for the original was probably much less. It would have been seen as a curiosity of limited usefulness, especially given its limited accuracy. Someone with Astronomy/TL2 who is familiar with the device could use it to reduce the time taken to predict the state of the heavens at a given date by 80%. Demonstrating the device would gain +3 to reactions from anyone with Astronomy, Mathematics, or Mechanics skills who hadn't seen it before.

Great Clocks: In 1094, as China tentatively entered a version of TL4, the mandarin Su Song created a 40'-tall astronomical clock tower, combining an escapement mechanism with a mechanical drive to provide unprecedentedly accurate timekeeping. Similarly, a few centuries later, cathedral and town-hall towers in Renaissance Europe had complex and ingenious clocks installed. Su Song's clock featured a giant armillary sphere and was powered by an integral waterwheel. European clocks featured clock faces and were typically powered by weights wound up daily by hard-working building staff. The heart of such a machine is a TL4 Dedicated Mechanical Cabinet mechanism: 2.25 tons, $3,000, and Complexity -1. Much more of the cost and weight of such devices went into the power supplies and the display interfaces; both the Chinese clock and many European cathedral clocks had complex systems of bells to sound the hours, and incorporated animated mannequins which emerged through doors to mark specific times of day with action shows. Having a reasonable clock available is part of basic equipment for some uses of Administration, Astronomy, and other skills at TL4 or higher, and a large clock can provide this service for a whole town.

Mechanical Calculators: The first mechanical four-function calculator, the "step reckoner," was invented by German mathematician Gottfried Wilhelm Leibniz between 1672 and 1694 (that is, late TL4) – but it didn't work very well, due to engineering problems and a design flaw. The core principle was good, though, and continued in use for centuries. Hence, working mechanical calculators are at least theoretically available at TL5, and a handheld device, the "Curta," was invented at the start of TL7 and used until the emergence of cheap electronic calculators in the 1970s. A fully functional TL5 step reckoner might be a Dedicated Mechanical Personal device, weighing 90 lbs., costing $1,000, and Complexity -1. A TL7 Curta is a Dedicated Low-Power Mechanical Miniature Ruggedized Small device, also Complexity -1, which suggests a weight of 0.72 lbs. and a cost of $10. In actuality, these devices weighed 0.5 lbs. and cost $125-$175 at 1960s prices; the cost can be assumed to cover especially clever mechanical engineering and high reliability – Curtas were considered to be much more robust than early electronic calculators. Some kind of calculator is part of the basic equipment for almost any numerical task from TL6 on; at TL5, a calculator might reduce the time taken by such tasks by 50% *and* give +1 to the skill involved.

Mechanical Fire-Control Computer: This is a hand-operated system installed on a 1930s warship to direct the main guns, adjusting for range, target speed, wind speed, etc. in combat. It is placed deep in the hull, as losing it would seriously reduce the ship's combat effectiveness; the operators communicate with the ship's spotting stations and turrets by electrical intercom. The tough, proven technology survived into the early 1950s and in some cases even longer, despite the development of electronics. It is a TL6 Dedicated Low-Power Mechanical Ruggedized Mainframe: 3.6 tons, $10,000, and Complexity 1. (That weight and cost may be underestimates, however; this is, after all, specially constructed and extra-rugged military equipment.) Early TL7 fire-control computers, introduced during WWII, used electromechanical or electronic technology, giving them Complexity 2 capabilities. These devices could be linked to guns, giving them direct control over engagements with enemy vessels and even aircraft.

ENIAC: The first general-purpose computer in history was built for the U.S. Army at the University of Pennsylvania in 1946, and employed for tasks including compiling artillery tables and designing nuclear weapons.

Timepieces

Simple clocks and watches can in principle be treated as computational devices performing Complexity -2 tasks – tracking and displaying the time adequately well over moderate periods. Intricate cathedral clocks, sophisticated maritime chronometers, and most TL8+ timepieces are Complexity -1, as they control complex displays (which may well be larger than the timekeeping mechanism), or compensate for environmental fluctuations while displaying relatively accurate times with minimal attention. In any case, *any* accurate timekeeping requires a mechanism that keeps time consistently and reliably. Historically, this is a TL4 development (with inaccurate prototypes appearing at late TL3). Mechanisms capable of keeping accurate time on a moving ship are a crucial early TL5 invention.

However, these rules give slightly high prices and weights for timepieces, especially pocket devices. A plain TL6 watch would be a Dedicated Mechanical Tiny device with Complexity -2, giving it a price of $50 and a weight of 0.6 lb.; ***GURPS High Tech*** suggests $25 and negligible weight, although some superior watches do cost a *lot* more, so $50 is at least the right order of magnitude. (Smart, giving Complexity -1 and so allowing high precision or a lot of extra features, would raise the price to $1,000; Compact, halving the weight, would double the price.) A TL5 pocket maritime chronometer, however, is noted as $500 and 0.5 lb. on p. 37 (and in ***High-Tech***); the nearest thing these rules would permit with the requisite complexity at that TL would be a Dedicated Genius Mechanical Tiny device, weighing 0.9 lb. but costing $25,000. Clock making must simply be treated as better than other computational device construction at some points in history.

It should also be noted that Complexity 2+ general-purpose devices include an accurate clock for free, to regulate their other functions.

Although its construction date was within early TL7, and general-purpose computers are a defining feature of that tech level, it used vacuum-tube technology rather than the transistors usually associated with TL7 computers. It employed punch cards for input and output, but a lot of its functions were controlled through a machine interface (p. 11). Treat it as a TL6 Low-Power Tube-Tech Gigantic machine: 20 tons (actually about 30 tons, with various peripherals), with a nominal cost of $400,000 (much increased in practice by the fact that this is a unique prototype), and Complexity 2.

The Analytical Engine weaves algebraic patterns just as the Jacquard-loom weaves flowers and leaves.

– Ada Lovelace

Babbage Machines

The eccentric 19th-century British scientist and inventor Charles Babbage conceived a series of quintessential steampunk mechanical computers. Unfortunately, none of them were ever completed in his lifetime; they tested the limits of TL5 mechanical engineering, and Babbage was not always an easy man to get on with.

The Difference Engine: This was a machine designed to calculate and tabulate useful mathematical functions called polynomials. Babbage's first design was started, but ultimately abandoned due to squabbles within the project and loss of government funding. His second, which he never tried to construct, has been recreated and built in recent years, and proved to work. Specifically, it is a TL5 Dedicated Mechanical Mainframe, making it 4.5 tons (five tons in reality), $100,000, and Complexity 1.

The Analytical Engine: While working on the Difference Engine, Babbage had an extraordinary idea – the concept of the first true general-purpose computer. Although this never came anywhere near being built, it was a powerful thought experiment. A fully developed Analytical Engine can be imagined as a TL(5+1) Mechanical Mainframe: 6 tons and $500,000 (plus the weight and cost of the small steam engine that is needed to run it), and Complexity 2.

The Ultimate Engine: Babbage had some eccentric and sometimes worrying ideas about the organization of society, and in a steampunk timeline, with grants from an all-too-sympathetic government, he might have built a machine to facilitate carrying them through: a TL(5+1) Mechanical Smart Gigantic device, weighing 60 tons and costing $100 million, Complexity 4, powered by a great external steam engine and able to maintain a database of the entire population of a large city and support attempts to manage society in detail. That might mean it would need a vast capacity for data; every extra terabyte after the first would cost $100,000.

Fantastic Creations

The Alexandrian Machine: As the Antikythera Mechanism (pp. 12-13) shows, the ancient Greeks could be remarkably ingenious, although some of their philosophers seem to have been actively hostile to the idea of applying their knowledge to anything *useful.* This imaginary device suggests what they *might* have created if the idea had caught someone's attention for long enough. It is a big wooden box full of wheels and gears, with lots of levers on the front and a crank handle worked by a slave. A TL2 Dedicated Mechanical Smart Personal device, weighing 120 lbs., costing $50,000, and with Complexity -1, it is in fact a working four-function calculator. If some practical-minded Roman engineer got hold of it, it could lead to initially small but ultimately crucial developments in engineering; the GM can decide what it makes possible. See ***Steam-Tech,*** p. 63, for a few more background details.

The Whispering Iron City: In an alternate universe where an Iron Age civilization endured for tens of thousands of years under the thumbs of some highly interventionist gods, the God of Craftsmen forged his own chief temple complex into a machine. Today, with the gods faded, it is maintained by the last remnants of his priesthood, who keep the wind and water mills running to drive the billions of cogwheels, and seek to obey the strange mutters that echo through the walls of the surrounding city. The whole complex is a TL2 Genius High-Capacity Mechanical Cyclopean device, with Complexity 5. About 12,000 tons of stone, iron, and bronze went into its construction, and one philosopher went insane after calculating the theoretical cost of the project as little short of $1 trillion. The temple-machine runs and is run by an IQ 6 non-volitional AI – a "mind" that now consists of little but an ancient list of incomplete imperatives. However, it also still has access to a huge collection of decision-support programs and databases, giving it a reputation as a powerful if eccentric oracle.

Songbird's Cage: Medieval craftsmen occasionally created ingenious devices as amusements for wealthy clients, and this one, though imaginary, is probably not too unlike some of these real-world creations: a music-box mechanism concealed in the base of a birdcage with a dummy bird inside. It appears to sing on command while flapping its wings. The mechanism is a TL3 Compact Dedicated Mechanical Smart Small device: 6 lbs., $8,000, Complexity -2. Making it *stylish* (p. 6) would be an appropriate way to reflect the artistry that went into the bird and the gilded cage, and the reaction bonuses that grants would reflect much of the point of such creations.

Das Vademekum: An early 20th-century world of runaway inventiveness is plunging toward war – and the wonders of *Electricity!* are being worrisomely exploited by Prussian militarism. Every senior officer in the Kaiser's army and navy has one of these devices that can calculate artillery trajectories in an instant, manage logistics issues with infallible precision, and provide a simple but adequate battlefield encryption system – all run off a neat little battery worn on the belt. It is admitted that all the internal switches cause it to vibrate and feel a little warm in the hands when it is turned on, and reading the glowing filament text display is hard on the eyes – but those are hardly problems to the disciplined staff officer to whom victory is assured! This is a TL6^ Electromechanical Semi-Dedicated Smart Small device weighing 5.3 lbs. and Complexity 0. Each unit should cost around $4,450, but the brilliance of German craftsmanship in secret government workshops somehow keeps the price down. A Vademekum counts as fine-quality equipment for any military task that can benefit from rapid, accurate calculations.

Mycroft-IVa: The product of a timeline where a successful career for Charles Babbage led to accelerated developments in computing, with downright cinematic results in artificial intelligence, the Mycroft-IVa is a specialized electromechanical engine sold to large police departments to facilitate criminal investigations. Its operating system is an IQ 6 non-volitional AI, which takes input through speech or keyboard entry, and responds vocally or with printouts; it can also interact electronically with a Holmes-1 automaton (pp. 16-17). It has been designed to speak in the voice of a condescending civil-service expert. It is trained in Criminology-14; it can also access large databases of regional knowledge and criminal records, and run skill-support programs to give +1 to various investigatory skills. This all gives it an unjustified aura of infallibility. It is a TL(5+2)^ Electromechanical Semi-Dedicated Smart Gigantic machine: 13.3 tons, $4.45 million, Complexity 5. For details on an older version, see ***Steam-Tech,*** pp. 64-65.

Raygun Gothic Electronic Brain: This is the kind of static "calculating machine" sometimes found in raygun Gothic stories – a TL(6+1)^ Tube-Tech Gigantic device, with Complexity 4, weighing 10 tons and costing $800,000. One of its program slots is usually employed to run a natural language-interpretation program. The other typically assists with some great engineering project or plots trajectories for spaceships. The operators spend much of their time replacing miniature vacuum tubes, but thanks to superscience, that doesn't prevent it from being useful.

We find your Olympia quite uncanny, and prefer to have nothing to do with her. She seems to act like a living being, and yet has some strange peculiarity of her own.

– E.T.A. Hoffmann, "The Sandman"

Automatons and Mechanical Men

Inventors and craftsmen have for centuries tinkered with the idea of "automatons" that could mimic life, but for the most part, they built only simple animated mannequins – Complexity -2 devices, if that. However, fairy tales and the like sometimes featured miraculously versatile and capable automatons, and with the development of increasingly sophisticated computational devices, the idea of building them into what would eventually be called "robots" became widespread. This usually means using AI-level devices (see pp. 11-12); automatons with less powerful controlling systems would be severely limited in usefulness. Note, incidentally, that steampunk "automatons" don't necessarily have the Automaton meta-trait (p. B263); that's appropriate for non-volitional minds (see p. 11), but not for volitional AIs.

Fictional automatons often seem to be the smartest machines in their settings; pulp-era science-fiction stories often featured humanoid robots with near-human capabilities alongside severely limited, room-sized static computers. This is represented by the Fantastic AI option (pp. 9-10). It may also be appropriate to assume that an automaton's inventor had one or two levels of High TL (p. B23), which also explains why these things aren't produced in bulk – society just doesn't have the technological facilities to do so.

Because most automatons in steampunk and period fiction do seem to be lucky flukes of craftsmanship rather than production-line commercial items, trying to attach prices to them is futile. Their sophisticated mechanical brains alone should logically be worth vast amounts of money, but this doesn't come up in many stories, unless a king rewards an artificer with a big bag of gold. Nonetheless, this supplement offers nominal prices.

Automaton Attributes and Learning

Being Unliving, automatons tend to have HP around twice what would be normal for living things of similar weight. However, Steam Age technology doesn't tend to support giving machines similarly greater ST than living things of similar weight. Hence, these examples have significantly different ST and HP values. In settings where automatons are supposed to be frighteningly powerful, raise their ST values to the same as their HP.

Also, along with an IQ determined by the rules on pp. 11-12, an automaton built using a calculating device as its brain usually has a DX of (Complexity/2)+8, rounded down. This rule *might* be relaxed for artificial intelligences that can somehow *learn* to increase their DX by 1 or 2 (see p. 12); equally, poor or experimental designs might be slow and clumsy, with reduced DX.

If automatons are produced and sold in significant numbers, whether or not their controlling AIs can learn would make a significant difference to their salability. A mechanical butler that could be customized with secondary skills such as Cooking, Sewing, or Teamster would have obvious benefits – and the models might also be acquired by dubious individuals, who would then train them in Stealth and missile weapon skills.

Automatons in Play

Automatons may be fully detailed as game characters when necessary, but a few features may be relevant even when they are being treated purely as objects. They always have the Machine [25] meta-trait, and often physical disadvantages such as Bad Grip [-5/level], Disturbing Voice *or* Mute [-10 or -25], Colorblindness [-10], Fragile (Brittle and/or Combustible) [-15 and/or -5], Ham-Fisted [-5 or -10], Increased Consumption [-10/level], or Numb [-20]. They may have a few levels of Lifting ST, being able to apply impressive amounts of force if they take their time over it. If they are *supposed* to pass in human society, they may not be terribly good at it, with disadvantages such as Clueless [-10] or Odious Personal Habits (Ignores social cues) [-5 to -15]. Cannot Learn [-30] and the Feature "Complexity-Limited IQ and DX" may be common or standard; see p. 12. Non-volitional AIs also have Indomitable [15] and the Automaton [-85] meta-trait.

Steampunk AIs *don't* necessarily have the AI meta-trait, because steampunk mechanical minds don't necessarily have all the advantages associated with modern computer brains, such as Digital Mind or Intuitive Mathematician.

They may be allowed a variant version of Digital Mind which leaves them vulnerable to some telepathic powers and magic in exchange for effective immunity to computer viruses – which don't exist – and limited vulnerability to Computer Hacking or Computer Programming – because even if those skills exist, people can only get at their brains after a lot of work with wrenches and screwdrivers.

Example Automatons

The following are some possible automaton designs. Use these examples and the above information to update the other mechanical creations on pp. 70-72 and 75-76 of ***Steam-Tech.***

Dancing Doll

The creation of a fairytale clockmaker, this is an impossibly slender, fragile mannequin (though heavier than its build suggests), which is powered by clockwork and largely made of wood. A giant key fits into its back to wind it up, which is needed after it has danced for 15 minutes. Even without the key, it is clearly nonliving to any sort of close inspection. However, it somehow passes as human; people think of it as a wonderful, odd-looking dancer who is amazingly shy except when on stage. Fancy dresses serve to obscure its physique, and its maker has a lot of practice at whisking it away after every performance. Several romantic young men have fallen in love with "her" after seeing it on stage from a distance.

It is a TL(5+1)^ creation in a TL5 society. Its creator has High TL 1 and probably an Unusual Background giving him access to period superscience. The doll's control system alone, a TL(5+1)^ Dedicated Fantastic AI Mechanical Small device running a non-volitional AI, should by rights be worth $1,562,500 as the product of a solitary genius, doubled to $3,125,000 for being one TL ahead of the setting, but the creator seems to have burned out all of his inspiration in building the doll, and all *it* wants to do is dance. He *might* accept, say, £500 (around $55,000) for it, if he was desperate, but he generally treats it with a slightly disturbing paternal possessiveness.

ST: 9	**HP:** 18	**Speed:** 5.00
DX: 10	**Will:** 6	**Move:** 5
IQ: 6	**Per:** 6	**Weight:** 90 lbs.
HT: 10	**FP:** N/A	**SM:** 0
Dodge: 8	**Parry:** 8	**DR:** 1

Traits: Appearance (Beautiful); Automaton; Bad Grip 1; Cannot Learn; Doesn't Breathe; Doesn't Sleep; Fragile (Brittle, Combustible); Increased Consumption 5 (Rewind every 15 minutes); Indomitable; Machine; Mute; No Sense of Smell/Taste; Odious Personal Habits (Ignores all social cues; -2 reactions); Secret (Passing for human).
Skills: Dancing-15.

Steam Worker

This contraption has an impressive mechanical brain – a TL(5+1)^ Dedicated Fantastic AI Mechanical Personal system (Complexity 5, 60 lbs.) – but nonetheless totally lacks free will or initiative. It stands 7' tall and is broader in proportion than a human being. It appears to have been assembled from boilerplate with minimal thought given to aesthetics; it is slow and clumsy, but strong. A chimney projecting upward from its back makes its dependence on steam power clear; it needs refueling with good coal three times a day in regular use.

In fact, it is an eccentric inventor's idea of the next great step in industrialization: a tireless worker which never complains about its role, freeing humans up to realize their true potential (or destroying the bargaining power of organized labor – not all eccentric inventors are idealists). It is an unworldly academic's idea of an ideal manual worker – strong and docile rather than skilled. The inventor doesn't recognize the potential of that brain, which would have cost hundreds of millions for a corporate lab to create, if they could do so at all, and which is worth $3,125,000 even as a mass-producible item. He prices the robot at $50,000.

Alternatively, an even more fantastical version of this automaton's brain could give it full volition, removing the Automaton meta-trait and raising DX to 11 – but that brain would then nominally be worth even more, and it would still be IQ 6. That might even cause more problems than it prevents. It's also possible, for story purposes, that the inventor *intended* to create a non-volitional AI, but the result "awoke" to become volitional, leading to interesting problems. If the automaton is to have a continuing role in the game, delete Fragile.

ST: 18	**HP:** 36	**Speed:** 5.25
DX: 10	**Will:** 6	**Move:** 4
IQ: 6	**Per:** 6	**Weight:** 730 lbs.
HT: 11	**FP:** N/A	**SM:** +1
Dodge: 8	**Parry:** 8	**DR:** 10

Grapple (10): No damage, but on further turns can squeeze (*Choke or Strangle,* p. B370). Reach C, 1.
Punch (10): 1d+1 crushing. Reach C, 1.

Traits: Automaton; Cannot Float; Colorblindness; Disturbing Voice; Doesn't Breathe (Oxygen Combustion); Doesn't Sleep; Fragile (Brittle); Ham-Fisted 2; High Pain Threshold; Immunity to Telepathic Powers; Indomitable; Lifting ST 5; Machine; No Sense of Smell/Taste; Noisy 4; Numb; Photographic Memory; Reprogrammable; Social Stigma (Valuable Property).

Holmes-1

From the same timeline as the Mycroft-IVa police engine (p. 15), the Holmes-1 is a lumbering, 7' humanoid figure, incongruously clad in a deerstalker and Inverness cape, apparently smoking a pipe (actually a suction device to pick up small particles for analysis). It is in fact a mobile automated evidence-gathering machine, sold to police organizations. It is controlled by a TL(5+2)^ Compact Dedicated Electromechanical Fantastic AI Cabinet-sized electronic brain (Complexity 5, 100 lbs.) which runs a non-volitional AI trained in Forensics skill. This, its evocative appearance, and its programmed habit of saying "Elementary" a lot create the unthinking, unfortunate assumption in some operators that it is a mechanical great detective. In fact, it is simply very good at collecting every speck of evidence (mud, fibers, footprint casts, blood, photographs, etc.) from a crime scene, and storing and cataloging it perfectly, with only occasional cross-contamination. It has a built-in cable jack, which enables it to transfer information directly to a Mycroft-IVa, or human "partners" can use it as fine-quality equipment for their own Forensics skills.

This is *not* a combat machine, and its array of delicate systems and mechanisms makes it terribly prone to breakdowns after any sort of careless handling. However, if it is caught up in a fight, it can be ordered to try and restrain or run over opponents.

The Holmes-1 runs on lead-acid batteries with a three-hour duration, or can be plugged into a mains electricity supply when convenient. Police departments pay $814,000 for one of these; a unique prototype, before the model goes into production, would have a book value of $23 million, thanks to its unique brain, the creation of an unworldly genius in the manufacturer's design office.

See ***Steam-Tech,*** pp. 73-74, for an earlier variation on this automaton.

ST: 15	**HP:** 30	**Speed:** 4.00
DX: 10	**Will:** 6	**Move:** 4
IQ: 6	**Per:** 6	**Weight:** 445 lbs.
HT: 7	**FP:** N/A	**SM:** +1
Dodge: 7	**Parry:** 8	**DR:** 4

Grapple (10): No damage, but on further turns can squeeze (*Choke or Strangle,* p. B370). Reach C, 1.

Slam (10): Collision damage and possible knockdown (p. B371).

Trample (10): 1d+1 crushing vs. prone opponents. Automatic hit for 1d-3 crushing after a slam and knockdown.

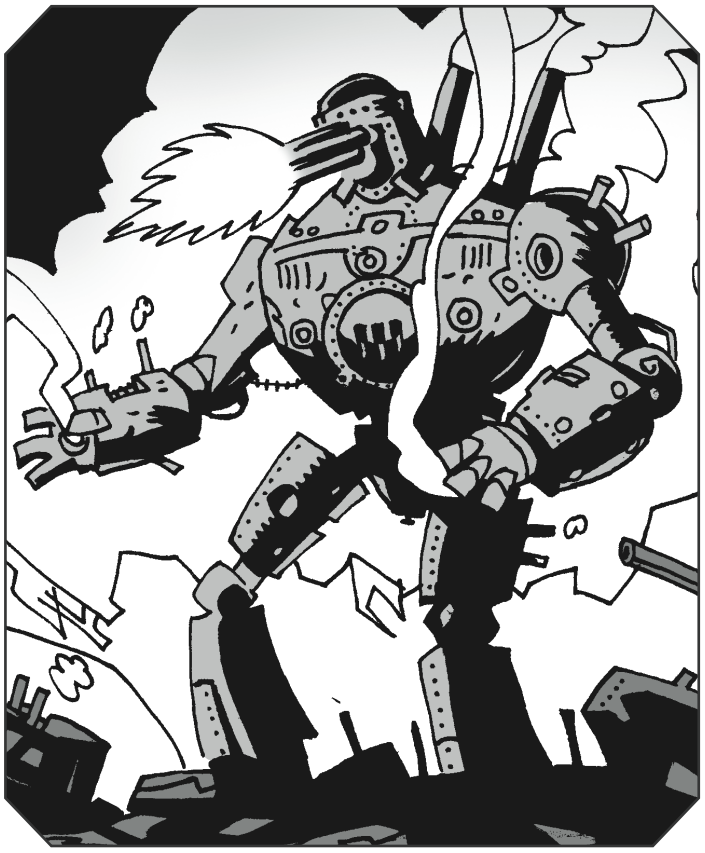
Traits: Absolute Timing; Automaton; Cannot Float; Disturbing Voice; Doesn't Breathe; Doesn't Sleep; High Pain Threshold; Increased Consumption 1 (3-hour endurance); Honesty (6); Immunity to Telepathic Powers; Indomitable; Lightning Calculator; Machine; Microscopic Vision 1; No Sense of Smell/Taste; Noisy 2; Photographic Memory; Quirk (Saying "Elementary" a lot); Reprogrammable; Social Stigma (Valuable Property).

Skills: Forensics/TL5-13.

Eisensoldat

In a late steampunk world of unrelenting mechanized warfare, the *Eisensoldat* is the latest TL(5+2) super-weapon. This 18' mechanical man has an anti-tank rifle (p. 31) with 10 rounds in each arm and a helmet gun (p. 32) with an oversized magazine holding 200 rounds in its head-turret. It strides across the battlefield (Move 3 off-road), ripping barbed wire away with its huge hands and terrorizing enemy infantry. It has a TL(5+2) Electromechanical Semi-Dedicated Smart Mainframe brain (Complexity 4, 1.33 tons), running a sub-AI control system that can accept voice commands from authorized sources. It can also distinguish friend from foe if given some kind of marker; typically, troops serving alongside these machines wear embellished helmets designed to be distinctive in the infrared, with the details carefully kept secret from the enemy. However, an *Eisensoldat* works best if supervised by an officer who understands its capabilities and limitations, and supported by specially trained human infantry.

Aside from that control system, it can run one Complexity 4 program at a time that lets it punch with its fists or fire its integral weapons at DX. It may have some other software in its memory banks (for basic navigation and damage assessment); switching programs takes one second.



By default, unless ordered otherwise, once it is told it is in battle, it shoots at anyone who shoots at it, then at anyone with enemy insignia (or perhaps just lacking *friendly* markers), nearest first, starting with its helmet gun, switching to an anti-tank rifle if two hits from the former don't stop the target from moving or shooting back. (Opponents playing dead easily deceive it.) It always takes one turn to aim its guns, unless ordered otherwise. It does not dodge in combat, but must rely on its armor (and on supporting troops to take out heavy enemy guns). Its infrared-only vision is useful for spotting enemy guns (+2 to find heat sources; see p. B60). Its sextuple-expansion steam engine can run for 12 hours on one load of coal. It costs $957,000.

ST: 42	**HP:** 84	**Speed:** 5.00
DX: 10	**Will:** N/A	**Move:** 4
IQ: N/A	**Per:** 8	**Weight:** 4.6 tons
HT: 10	**FP:** N/A	**SM:** +3
Dodge: N/A	**Parry:** N/A	**DR:** 30

Guns (10): As weapon.

Punch (10): 4d+2 crushing. Reach C-2.

Traits: Cannot Float; Disturbing Voice; Doesn't Breathe (Oxygen Combustion); Doesn't Sleep; Ham-Fisted 2; High Pain Threshold; Infravision (No Normal Vision); Machine; Mindless*; No Sense of Smell/Taste; Noisy 6; Numb; Reprogrammable; Social Stigma (Monster; Valuable Property).

Skills: Brawling-10; Guns/TL5 (as required)-10 (see description).

* This machine has no mental traits at all; all its skills come from specific programs, as described above.

Raygun Gothic Robot

A classic TL(6+2)^ "pulp-style" robot, this machine actually operates in a TL(6+1)^ society; the laboratories which created it are working at the leading edge of scientific bafflegab, even by raygun Gothic standards. (They're still using vacuum tubes, but *very small and glittery* ones.) It is a humanoid but obviously non-human machine with a transparent dome for a head (exposing some of those vacuum tubes to view), a polished metal body, and multi-jointed limbs. It is designed as a multi-purpose assistant that can work in environments that are too risky even for the brave human citizens of the future. Hence, it is the kind of thing often assigned to exploratory spaceships. It's not very bright, but it can hold a conversation, and its perfect memory can contain every standard repair manual it needs.

It has a TL(6+2)^ Dedicated Fantastic AI Tube-Tech Small brain (Complexity 7; 5 lbs.), which allows it to run a volitional AI personality. (Some users, especially evil masterminds, may prefer a non-volitional version with IQ 10, producing competent but dependably obedient – and unimaginative – soldiers.) Such robots are mostly designed to be fairly peaceful, though, grappling and restraining problematic humans rather than pummeling them.

As a commercial product manufactured in moderate numbers, the robot costs $100,000. However, if such robots were still experimental in the setting, this one's brain alone would be worth $12.8 million (or twice that if allowing for the fact that it's a TL ahead of its surroundings), making it a valuable prototype that PCs might be asked to recover in one piece if it goes rogue.

ST: 13	**HP:** 26	**Speed:** 6.00
DX: 11	**Will:** 8	**Move:** 5
IQ: 8	**Per:** 8	**Weight:** 250 lbs.
HT: 12	**FP:** N/A	**SM:** 0
Dodge: 9	**Parry:** 8	**DR:** 15

Grapple (11): No damage, but on further turns can squeeze (*Choke or Strangle,* p. B370). Reach C.
Weapon: By weapon type; see description.

Traits: AI; Cannot Float; Doesn't Breathe; Doesn't Sleep; Double-Jointed; Hidebound; High Pain Threshold; Incurious (15); Lifting ST 3; Low Empathy; Machine; No Sense of Humor; Noisy 1; Pressure Support 1; Reduced Consumption 3 (Recharge once per week); Sealed; Social Stigma (Valuable Property); Vacuum Support.
Skills: This robot comes with 10 points in trained skills appropriate to its assignment, usually including one type of Crewman and various repair skills. For example, a typical exploration or space patrol ship's robot has Beam Weapons/TL(6+1)^ (Pistol)-12, Electronics Repair/TL(6+1)^ (Comm)-8, Electronics Repair/TL(6+1)^ (Sensors)-8, Mechanic/TL(6+1)^ (Spaceship)-8, and Spacer/TL(6+1)^-9.

Dialogue Over Distances

Although long-range signaling goes back to ancient times, the Steam Age applied scientific and technological ideas to the business, increasing speed and efficiency considerably. To begin with, this was mostly just old approaches done bigger and better, but these were soon superseded by technologies previously undreamed of.

For additional genre-appropriate communications apparatus, see ***Steam-Tech,*** pp. 49-51.

Visual Telegraphy

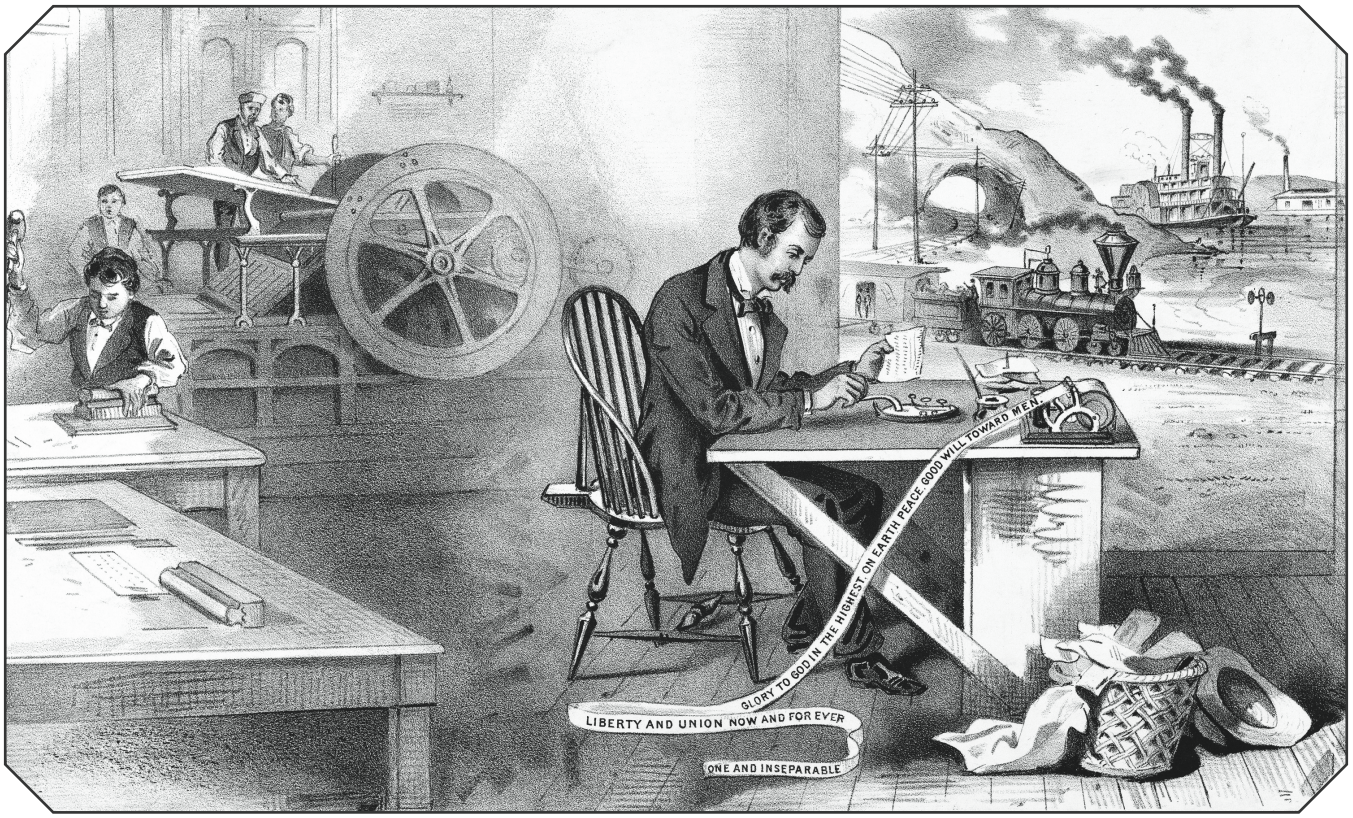
Before the development of practical electrical engineering, long-distance signaling depended on visual signals. Smoke signals, flags, etc. could send the equivalent of a few bytes of information over many miles – on a clear day, given no obstructions. Still, with the right prearranged signals, that could be crucial. Ships continued to use flag signals and blinking lights well into the 20th century; they were cheap, reliable over short distances, and not prone to interception.

Telegraph Towers

A rather clockpunk-looking approach to pre-electrical telegraphy emerged, historically, as a useful technology at mid-TL5. A system using chains of "semaphore towers" was developed in France in 1792, and quickly copied, with all sorts of changes and improvements, by other powers. Each tower was placed to have a clear view of those on either side of it in the chain, and consisted of a building (or less permanent wooden hut) with a mast supporting some arrangement of pivoting paddles, panels, or shutters; the positions of this array had defined meanings, and operators in each tower could pass signals up and down the line. It was claimed that a short message could travel 300 miles in six minutes.

This sort of telegraphy was mostly but not solely used by the military. Only they felt that they had sufficiently pressing need for rapid communication to justify the cost of setting up whole chains of towers across the country, although once they were built, they could carry other messages, too. The French Emperor Napoleon carried a portable telegraph system with his headquarters when on campaign, for short-range tactical signaling.

The skill to operate such a system is Professional Skill (Tower Telegrapher); someone with that skill can send or receive messages at one word per minute (wpm) per level of skill on an early system, rising to 2 wpm by the end of TL5, when the system is abandoned in favor of electric telegraphy. Historically, many telegraph messages used codes; a specific number or keyword told recipients that a certain anticipated event had occurred, rather than anyone sending lengthy texts. The systems used by different tower designs were completely different, and somebody trained purely on one would be totally unable to read or work with another; the skill is specialized by system. However, the early French system, involving a pair of pivoting paddles, relied on a scheme that was also used with handheld flags, so somebody trained on that might have a cross-default with Professional Skill (Flag Telegrapher).



The Heliograph

Another refinement of visual telegraphy, the *heliograph,* is generally available after 1850 (late TL5). It consists of a mirror-and-shutter apparatus atop a tripod, with a trigger that lets the user direct flashes of reflected sunlight in a set direction, where hopefully someone is watching. Anyone in the same general direction might see the signals, but messages can be encoded or enciphered. In sunny conditions, a signal can flash across 30 miles; the U.S. Cavalry occasionally transmitted from mountaintop to mountaintop over 150+ miles. Steampunk airships, flying above the clouds, might accomplish similar results, if they know roughly where another airship is.

Heliographs are $100 and 50 lbs. A TL(5+1) "airship heliograph" with gyrostabilization and a high-power telescope, allowing air-to-air communication, doubles weight and cost.

Setting up or operating a heliograph uses Professional Skill (Heliographer); send or receive speeds are two words per minute per level of skill. A heliograph uses Morse code, like an electric telegraph, so operators trained on either technology can *read* transmissions using the other with a skill roll at -1.

Electrical Communications

The Steam Age begins replacing mechanical telegraphs with electrical telegraphy in the 1830s, moving on to the telephone (1876), wireless telegraphy (1896), and radio telephony in the 1900s. Empires whose couriers had once spent weeks in transit switched to methods that took bare seconds. Telegraphy also provides explorers with new reasons for venturing into the wilderness: surveying telegraph routes.

The Telegraph

The range of a telegraph depends directly on the power available. With early models, one large battery was needed per 10-20 miles of wire, and long distances required relays, but the technology advanced with time. By 1860, the major cities of the eastern U.S. were connected to each other. In 1861, California was linked to the Atlantic coast. In July 1866, over 1,700 miles of cable connected Newfoundland to Ireland.

Roll against Electronics Operation (Communications) skill to send or receive a telegraph message. Success means the message is sent or read correctly. Failure means it isn't understood. On a critical failure, something goes *subtly and dangerously* wrong; perhaps a crucial word is missed or mangled.

With basic equipment, a telegrapher can tap a line to intercept a message or send a false one. At TL5, a tap is impossible to detect and requires only an uncontested Electronics Operation (Communications) roll. At TL6, the snooper must win a Quick Contest of skill with the intended recipient to avoid alerting him that somebody is listening in.

Every telegrapher has a distinct way of sending, called a *fist*. A successful skill roll lets one operator recognize another by his fist. To fake a fist, the impostor must win a Quick Contest of Electronics Operation (Communications) with the recipient, and the faker rolls at -6.

Prices and Equipment

At TL5, telegraph rates are mostly around $10 per word. Transatlantic rates are $50 per character! At TL6-7, telegrams are $0.50 per word, or $2.50 per word internationally.

Telegraph Set (TL5): Used to create or receive a signal; at TL6, a portable set comes with a dry battery, good for an hour of operation. $150, 3 lbs.

Register Telegraph (TL5): Prints messages on paper tape for decoding later. $5,000, 30 lbs.

Automatic Telegraph (TL5): Uses punched paper tape to send pre-prepared messages at 300-400 words per minute. With perforator, transmitter, and receiver: $7,500, 100 lbs.

Stock Ticker (TL6): A receiver that prints out business stock prices. Historically, New York City had so many stock tickers that "ticker tape" was used for confetti during parades. $3,000, 25 lbs.; renting a stock ticker line costs $200/month.

Calculating Engines and Telegraphy

If steampunk can encompass computing engines *and* electrical communication, what are the chances of plugging one into the other? Could one have a Babbage Machine Internet?

The answer probably would be "sort of," with the devil, as ever, residing in the details. Telegraphy and computing developed as distinct technologies in the 19th century; rendering the coding schemes compatible would be a challenge in itself. Getting a telegraph signal to control the big, heavy gears of a mechanical computer would be a significant engineering task, especially before electromechanical computing technologies were developed. Later, both computational machines and high-speed telegraphy used paper tape, so they could have merged then. Of course, realistically, both early computing and telegraphy were relatively slow and primitive; a true "Victorian Internet" would take some time to evolve.

For game purposes, a steampunk Internet would perforce be much more *mechanical* than the modern version. Bronze keys and relays would clatter and hum, and connections would be made literally mechanically. Neat little LEDs would be replaced by big filament bulbs or mechanical indicators. In place of web pages, there would be literal printed pages, many of them involving masses of cryptic text, akin to the sort of thing seen on the Internet in the 1980s.

The Telephone

In 1876, Alexander Graham Bell invented the telephone. The first commercial switchboard was implemented less than two years later. By 1890, every major U.S. city had a phone system (some had two or more competing systems), and there were almost 1.5 million phones in the United States by 1900. Long-distance lines tied together local networks, but only between major cities at first. The first transcontinental telephone line dates to 1915, but even then, calls were prohibitively expensive: New York to Havana in 1921 costs $130 for three minutes!

At early TL6, setting up a call involves one or more operators; misunderstandings are common. The GM may demand IQ rolls at penalties of up to -4 to interpret hasty messages. In small towns, the local operator will know an inordinate amount about everybody else's business, and might make a useful game Contact, with a skill such as Current Affairs (Regional) at a high effective level. In larger cities, the operator's intimate knowledge may be less encompassing, but there's always the *chance* that a call was noted or listened to. A Contact at the city telephone company with Electronics Operation (Communications) skill is the easiest way to bug a call, and cultivating the company's staff as a Contact Group provides all sorts of options. For example, the log of calls is an actual log-book, and snoopers might persuade someone to give them a chance to sneak a peek.

By mid-TL6, automated switchboards use relays and vacuum tubes. Phone numbers appear, along with rotary dials. But telephone engineers can still be very useful Contacts, if they're prepared to break a few rules.

Telephone Equipment

Telephone (TL6): $25, 3 lbs.

Military Telephone (TL6): Sound-powered – a hand crank rings a connected phone, and a loud voice generates the power to carry the message. $50, 5 lbs.

Telephone Switchboard (TL6): A portable 10-line switchboard. Female operators worked these behind the lines during WWI. $1,000, 50 lbs.

Teletype (TL6): Sends and prints text via phone line to one other phone number or to every line in a directory. From the 1920s, a TL7 model capable of printing photos is available for ×2 cost – or ×4 cost if it can handle *color* photos. (This is after the end of the Steam Age, historically, but a steampunk world could feature an early, bulky, brass-and-rivets version.) $7,500, 200 lbs.; renting the line costs $500/month.

Early Radio

Radio communication is a Steam Age invention, but a late one, and few steampunk games are likely to feature it, although it has a place in raygun Gothic science fiction. Even if it does appear, it can be limited by reflecting technological fact: early radios were big (static or able to be installed on ocean-going ships, but not *portable*) and required skilled operation. If a raygun Gothic spaceship can call home, that perhaps means it has a "telegraphy cabin" with a humming vacuum-tube-based "hyper-radio" that still uses Morse code. See ***GURPS High-Tech,*** pp. 37-39, for details of historical TL6 radios.

Telegraphs are machines for conveying information over extensive lines with great rapidity.

– Charles Babbage

Chapter Two

The Well-Dressed Protagonist

*"What do you think, Millicent? Adequately **à la mode**?"*

Lady Hollman examined her reflection in the mirror, and patted a loose strand of russet hair back into place in her complex arrangement. Her lady's maid, who had spent 20 minutes on that arrangement, repressed any reaction.

"Entirely appropriate, madam. Not that the Prussian ambassador has any eye for fashion, I fear."

"No, but his secretary does, I do believe. And the Colonel sometimes has the sense to take advice from that sharp young man."

"Ah, yes. A problem, this evening, perhaps?"

*"Only if I fail to keep the Colonel distracted from good advice." Lady Hollman smiled thoughtfully. "Which reminds me – are **you** prepared?"*

"Fully, madam," said Millicent, in a tone which managed respectfully to convey a hint of offense taken. She opened a drawer in the dressing table, and extracted a plain black bonnet, a pair of tinted goggles, a set of four green glass capsules, and a small pistol. Then she donned the bonnet, and a long black coat from the back of the door. The goggles, capsules, and pistol disappeared into its capacious pockets.

"We could send Peter, you know," Lady Hollman said with a touch of concern as she secreted a pistol of her own in a concealed compartment in her bustle.

*"The embassy is well protected against **burglary,**" Millicent replied. "Much better simply to walk in the front door. Have no fear, madam; the fog bombs will serve very well. We will have the airship plans by midnight."*

Mundane Garb

As ***Steampunk 1,*** pp. 43-46, describes, Steam Age costume is a complex topic and evolved considerably through the period, while many steampunk games involve costumes that owe more to modern steampunk fashion than to genuine Victorian styles. However, some general guidelines are possible.

Basic Outfits

The GM who wants to keep things simple can always use the rules for clothes on p. B266, with the generic outfits described there representing whatever is the norm in their setting. However, it's possible to add a little more detail to taste.

One option is to add a new category of outfit: *medium weight*. This is clothing appropriate for wear outside on cool days in temperate regions, and indoors in unheated houses; it uses thick fabrics and features a jacket or lightweight coat. When making HT rolls to resist cold (p. B430), where light clothing would give -5 to the roll and winter clothing would give +0, this outfit gives -3. A medium-weight outfit costs 25% of cost of living and has a base weight of 3 lbs. When buying a complete wardrobe, medium-weight outfits can replace one or two of the included ordinary sets of clothes.

> *A stranger came marching toward Mallory across the lobby floor: a British soldier, an Artillery subaltern, in elegant dress gear.*
>
> *– William Gibson and Bruce Sterling,* ***The Difference Engine***

Secondly, historical TL5-6 clothing tended to be fairly complex and bulky. It kept wearers adequately warm and dry, but the lack of modern synthetic materials made it cumbersome. Hence, all outfit weights should be *doubled* at those TLs. So an ordinary or formal outfit would weigh 4 lbs., a medium-weight outfit 6 lbs., and a winter outfit 8 lbs. (Steampunk worlds on divergent tech paths might or might not have lightweight fabrics that avoid this problem) Lighter clothes may be available for summer or tropical wear, but are seen as a mark of poverty (or of a non-Western "uncivilized" background, or both).

Garment Modifications

The garments discussed so far are still just basic outfits, providing adequate warmth and what is seen as minimum decency in a Victorian-style culture, but prioritizing convenience and freedom of action over either style or full respectability. "Respectable" folk will frequently react to people dressed so simply at penalties, and simple dressers are noticed as if they have Distinctive Features (p. B165) and probably barred from some establishments. This effect is most pronounced in the Victorian era; Georgian clothes could be lighter and simpler, with some daring dresses weighing just a pound or so – although even then, clothes could make Status *very* clear and be priced accordingly.

The following modifiers can be used to define more historically acceptable outfits. The effects of cost factor (CF) modifiers are explained on p. 5; also, DR granted by these outfits never protects the face or hands, and may not protect the skull unless there's a really spectacular hat in the ensemble. A "settled" person (see *Starting Wealth,* p. B26) can assume that the clothes purchased with the 80% of their wealth assigned to such things have whatever modifiers are considered "normal" in the setting for individuals of their sex and Status at no extra cost; Victorians applied a lot of desperate ingenuity to keeping their wardrobes "respectable" on limited budgets. People with Status less than 0 can afford only very plain clothes, though, which helps flag their low Status. Also, *undercover* outfits (p. 23) always have to be purchased specially.

All garment modifiers are cumulative. Weight effects multiply together; for example, the weight of a floor-length, lightly structured, moderately embellished outfit is multiplied by 1.2×1.2×1.2=1.728. Cost modifiers are additive, as explained on p. 5; for example, a heavily structured, heavily embellished outfit that gives +2 to Holdout rolls is multiplied by 1+1+0.5+19=21.5. See *Period Clothing and Game Rules* (p. 24) for more on the game effects of "enhanced" outfits.

Physical Searches: Attempting a "pat-down" search in a Victorian setting is always considered highly intrusive – and downright obscene by some people.

Embellished

The outfit features lots of ruffles, trimming, bows, and other gratuitous features. This isn't the same as styling (p. 23); the embellishments may be cheap materials and way out of fashion. Embellishment *may* serve primarily to look attractive, but may also be intended to disguise the human body shape at times when standards of respectability are especially extreme. A costume with less embellishment than is currently socially required gives -1 or worse reactions from people who will consider it insufficiently respectable or fashionable (GM's judgment).

Moderate embellishment multiplies weight by 1.2, and gives +1 to Disguise skill when the GM agrees that changing or concealing apparent body shape is helpful. *Heavy* embellishment multiplies weight by 1.5 and gives CF +0.5, and provides up to +2 on Disguise rolls at the GM's option.

Floor Length

The outfit includes a full-bodied skirt or robe that reaches beyond the wearer's ankles at minimum, and may literally brush the floor. The rest of the outfit matches in general style. This is common for respectable Western female outfits throughout the Steam Age, though not universal; muddy streets and sheer inconvenience discourage it. In other cultures, wealthy *men* may wear floor-sweeping robes. This feature may be required for higher Status levels (Status 2+ people often need to show that they don't have to worry about inconvenience), or for simple respectability in the absence of structuring or embellishment (see below).

Someone in a floor-length garment can only ride a horse sidesaddle, can only ride a bicycle if it has a lady's frame and suffers a -3 to Bicycling skill rolls even then, and should suffer other penalties to athletic activities at the GM's whim – and the hem or train *will* get dirty. Also, such garments are good for concealment, offsetting up to -2 in penalties to hide long items such as swords or rifles.

Multiply outfit weight by 1.2; cost is unaffected.

Layered

The outfit uses more layers of fabric than might seem strictly necessary, even by Steam Age standards – multiple layers of underwear, corsets, petticoats, undershirts, shirts, vests, coats, and so on. This has little effect on price; although layered garments use more fabric, only the topmost layer needs to be at all stylish or pretty. (Respectable Victorians considered fancy underwear to be morally dubious.) Layering may also give penalties to rolls to endure high temperatures, for example, but gives no benefits against cold; it isn't designed to keep everything warm! It *can* make it easier to hide objects on one's person, giving a bonus to Holdout skill, but extracting those objects then takes a minute or two, and involves indecent-looking rummaging!

Light layering simply multiplies outfit weight by 1.2; *moderate* layering multiplies it by 1.5, and gives -1 to rolls to deal with high temperatures, DR 1 vs. crushing damage, and +1 to Holdout; *heavy* layering multiplies weight by 2, gives -2 to rolls to resist heat, +2 to Holdout, and DR 1 vs. damage other than impaling, and adds +0.5 CF.

Structured

The outfit incorporates significant rigid or semi-rigid elements, giving it an outline independent of the wearer's body shape. Structural components can include corsets, crinolines, oversized hats, and bustles. The amount of structuring isn't directly related to the visible *volume* of the clothes when worn; a lightweight crinoline may be broad enough to make it hard for the wearer to get through doorways, while actually being lighter than a "slim" outfit with a tight corset, heavy bustle, and fancy hat. Structured outfits may provide some DR if attacks land on the rigid structural elements – the GM decides which hit locations are protected, or determines randomly (see levels, below). The garments can also provide space for *Concealed Devices* (pp. 42-46) if these are incorporated when the garments are made or added with special work later.

Light structuring (maybe a lightweight corset and a nice hat) gives ×1.2 weight and +1 DR on the torso *or* any two other hit locations *or* on a roll of 1 on 1d, and permits up to two concealed-device spaces for hidden devices.

Moderate structuring (perhaps a substantial corset, small bustle, and fancy hat) gives ×1.5 weight, CF +0.5, +1 DR on the torso and groin *or* three or four other hit locations *or* on a roll of 1 or 2 on 1d, and four concealed-device spaces.

Heavy structuring (lots of corseting, a downright inconvenient bustle or rigid crinoline, and a *really* fancy hat, say) gives ×2 weight, CF +1, +1 DR on about 50% of the body (typically the skull, torso, groin, vitals, and half of leg hits, or 1-3 on 1d), and six concealed-device spaces.

All concealment spaces are in addition to any provided by hats or footwear worn with the outfit; those may well hold more devices (see p. 43).

Stylish

The rules for styling under *Stylish and Ruggedized Equipment* (p. 6) can be applied to clothing to represent "high fashion" garb. In this case, the reaction bonus comes from devotees of fashion, who must at minimum have either the Fashion Sense advantage or Current Affairs (High Culture), or Current Affairs (Popular Culture) for fashionable but low-Status garb. Styling for +2 reactions requires garments for at least Status 2+, and +3 reaction styling requires that the outfit be for Status 3+; very fancy decoration and fine design on low-Status garb just looks flashy and pretentious. It is entirely possible for very high-fashion garments to have CF modifiers much greater than +9; the later Steam Age was an era of phenomenally expensive prestige designs. Current fashion at any date may necessitate that a garment has several other features as detailed here, often but not only embellishments, for it to qualify as stylish.

Undercover

This is not a matter of appearance or bulk, and is less common historically, but may be of interest to adventurers. An outfit with hidden pockets, a special cut, etc. can give an equipment bonus to Holdout skill for items concealed on the wearer's person. (This sort of work requires a skilled tailor or dressmaker, with Sewing-15+ and Holdout-12+, who you can trust to be discreet; unless you're a member of an intelligence organization or established smuggling gang, you'll need Streetwise skill to find such.) This has no effect on outfit weight, but increases cost: +1 to Holdout gives +4 CF, while +2 to skill gives +19 CF.

Reduced Weight

Steampunk 1, p. 43, offers the possibility of using the Fashion Sense advantage plus either Sewing skill or 50% extra expense to create outfits that match current trends while halving weight and penalties to actions. If the GM permits this option, the following special rules can be added.

1. In TL5 or TL6 settings where standard clothing weight is doubled, no outfit weight can be reduced below 3 lbs. If the weight-doubling rule is not in effect, no outfit can be reduced below 1.5 lbs.

2. Again assuming the "doubled weight" rule for TL5 or TL6 is in effect, if an outfit's weight is reduced below 6 lbs., it counts as an ordinary outfit for purposes of resisting cold. If it is based on a medium-weight or "winter" basic pattern, and weight is reduced to more than 6 lbs. but less than 8 lbs., it counts as medium weight. Heat insulation needs fabric! If the "doubled weight" rule isn't in force, halve all these numbers.

3. At the end of a week's ordinary wear or after any kind of violent action scene, the garment requires 1d×20 minutes and a Sewing skill roll for maintenance, or it will start showing rips or wear. It will also go out of fashion after 1d+1 months.

Note that the weight of any concealed devices is always added to that of the garments themselves, and cannot be reduced by skilled tailoring. However, garments with such devices incorporated may often have their weight reduced in various ways, to keep the overall weight of the whole assembly down to something manageable.

Historical Examples

Different historical outfits use different combinations of modifiers, reflecting various Steam Age disputes and trends.

Example 1: Early crinolines used multiple layers of voluminous petticoats to bulk up the skirt, and these would be combined with some kind of corseting; TL5, floor length, heavy layering, and light structure (or more), results in ×2×1.2×2×1.2 = ×5.76 weight, so even an "ordinary" outfit would weigh 11-12 lbs., with ×1.5 cost. Amelia Bloomer sought to replace this with a shorter skirt with "bloomers" underneath, but still used a lot of fabric and some structural features, for respectability (textile manufacturers were all in favor); TL5 with moderate layering and light structure, results in ×2×1.5×1.2 = ×3.6 weight (just over 7 lbs. for an ordinary outfit). Then someone invented the semi-rigid crinoline frame, producing a dress which was "simply" TL5 with moderate structuring, for ×2×1.5 = ×3 weight (6 lbs. for an ordinary outfit), which Amelia Bloomer preferred to her own idea, despite any difficulty in getting through doorways.

Period Clothing and Game Effects

The following optional rules may be appropriate in a game with Steam Age-style clothing. With some of them in force, Fashion Sense might almost seem like a liability. However, it can be used when constructing costumes that are socially acceptable without being quite so cumbersome or inconvenient; see *Fashion Sense* (***Steampunk 1,*** p. 43).

Corseting: Corsets are commonly worn as part of *layered* or *structured* outfits (see pp. 22-23). While worn, a historically accurate tight corset moves the wearer one or two steps down the fitness scale defined by Very Fit, Fit, average, Unfit, and Very Unfit, thus penalizing HT rolls and limiting FP. The tightest corsets might inflict *three* shifts! If this takes the wearer past Very Unfit, the GM may require periodic HT rolls to avoid *permanent* loss of levels of fitness or HT. Tight corsets may be mandated by some combination of fashion and a Compulsive Behavior or other disadvantages

Cumbersome Garb: Crinolines and other bulky garb inflict from -1 to -5 (occasionally worse!) on any DX or DX-based skill rolls requiring rapid or precise leg movement, including all uses of Acrobatics skill. If clothing weights are increased as discussed on pp. 22-23, encumbrance (p. B17) can also sting; a moderately built lady with ST 8, wearing 37 lbs. of clothing, as may sometimes be considered respectable, may well be operating at Medium encumbrance.

Goggles (see p. 25): These provide Nictitating Membrane 1, but if their DR is penetrated, this may mean serious trouble from glass in the eyes, at the GM's option. Goggles may be *tinted*, at no extra cost, providing from +1 to +5 to HT rolls to resist dazzling effects, flash bombs, etc., but for every such +1, they also give -1 to all Vision rolls. Pushing goggles up onto your forehead or pulling them back over your eyes requires a free hand, a Ready maneuver, and a roll against DX+2; a critical failure either drops the goggles altogether or leaves the person effectively blind until he makes a successful attempt.

Goggle Accessories: Steampunks sometimes like accessorizing their goggles. There's little historical precedent for this, but it looks cool. If the GM permits it, goggles can have attachments such as fold-down tinted panels (giving the effects of tinted lenses, as above) for $10, or a monocular (p. 38) or a miniature microscope (p. 45) for the cost of the item plus $10. Bringing any of these into action or folding them back requires a free hand, a Ready maneuver, and a roll against DX+3; if a person tries to use vision for normal purposes with a telescope or microscope in place for use, he effectively has One Eye (p. B147).

Hobble Skirts: Anyone wearing a hobble skirt, as was briefly fashionable early in the 20th century, has -3 to Dodge. Multiply Move (*after* encumbrance) by 0.4, rounding down; e.g., Move 6 becomes Move 2.

Veils: A veil may give -1 to Vision rolls to resolve fine detail, at the GM's option, but rolls to identify, depict, or describe the face of someone who was seen wearing a veil are at -2 or worse.

Vehicles and Eye Protection

Someone driving or riding in a fast-moving open vehicle with no functional windscreen should wear eye protection such as goggles, or suffer a penalty. Divide the vehicle's speed in mph by 10, drop all fractions, find the equivalent measurement in yards on the *Size and Speed/Range Table* (p. B550), and apply the corresponding Speed/Range penalty to Vision rolls. So, for example, traveling at 150 mph gives -5. A veil provides partial protection, negating up to -2 in Vision penalties. For example, someone riding at 70 mph with unprotected eyes would normally suffer -3 to Vision rolls; a veil reduces that to -1."

(All of these weights are minima; actually, most outfits had more structuring and some embellishment, increasing the weight differences significantly.) Later "bloomers" were intended more as athletic outfits with an acceptable degree of respectability; represent them simply by light or moderate layering but with the removal of the necessity for a respectable garment to be floor length.

Example 2: Late in the 19th century, the Rational Dress Society campaigned for the weight of a fashionable woman's costume to be reduced from 37 lbs. to 7 lbs. In game terms, the full fashionable outfit might be medium weight and TL6, with heavy layering, heavy structuring, and heavy embellishment, weighing 36 lbs. (with cost multiplied by three even before any increases for stylishness). The sort of costumes which the radical progressives of the Society favored would be either simple TL6 medium-weight outfits weighing 6 lbs., or quasi-medieval "artistic" gowns – TL6 ordinary outfits, but floor length and with light layering, weighing about the same. (The floor-length feature averts many reaction penalties for the lack of other stuff.) Add 1 lb. for lightweight shoes and the numbers are correct.

It is, of course, notable that most of these issues and examples involve female costumes. Male garb was rarely so extreme, but was still subject to shifts in fashion and stern rules of etiquette about what should be worn when and where. A gentleman might have to wear a frock coat when out and about, even in summer, making his regular garb medium weight, and might conceivably be wearing a discrete corset under that as well as a substantial top hat on his head, adding up to light structuring.

Additional Clothing Items

A few pieces of clothing may be worn in addition to standard outfits.

Long Coats

Most winter outfits incorporate some kind of coat, but this is something more extensive – a classic "duster" or long overcoat that falls to at least the knees and possibly the ankles. It is warm (worn with boots and ordinary clothes, it's as good as winter clothes) and versatile.

It is popular in wilder regions such as the American West, but may be considered excessive in polite urban society. It does give +4 to Holdout for items carried on the body, but may attract careful searches simply because it is so obviously useful that way; apply the *undercover* modifier (p. 23) to increase the bonus. Cost $50, weight 5 lbs.; a leather version has DR 1, double weight, and +4 CF.

Headgear

Hats were always an important part of Steam Age costuming, and modern steampunks frequently follow this with enthusiasm. Any standard complete outfit can be assumed to include a lightweight hat in appropriate style, whether it's a workman's cloth cap, a porter's bowler, a cowboy hat, a gentleman's topper, a respectable lady's bonnet, or a fancy little item to go with a ball gown. More substantial or specialized headgear may be purchased separately. A "basic" hat of some type might be purchased for 5% of the cost of a full outfit of the same Status and weight, and weigh 5% of the corresponding outfit weight. Double weight and cost for something ostentatiously fancy (which may also have enough bulk to conceal little items, giving +1 or +2 to Holdout when an item is small enough to fit). High-fashion hats for high-Status ladies may generate reaction penalties from observers who care about endangered bird life. A substantial hat for a lady may incorporate a veil; see p. 24 for game effects.

Protective headgear is detailed on below. Armored head protection might be seen as inappropriate in civilian company. Even so, a leather helmet (below) and goggles (below) may be the mark of a bold vehicle operator in a steampunk world, and a pith helmet (below) is likewise the mark of the explorer or white hunter.

> *I never saw so many shocking bad hats in my life.*
>
> *– The Duke of Wellington*

Protective Wear

The Steam Age is not, generally, noted for the use of personal armor, simply because offence, in the form of firearms, surpasses the materials available for comfortably wearable defense. In civilized parts of the world, clunking around in serious armor is likely to look pointless as well as gauche. However, *protective* gear more generally is something of a steampunk staple, with some basis in historical fact.

Goggles: Stereotypically, the most important option of all is eye protection. Glass-and-leather goggles appear around TL6, cost $20, and have negligible weight; some may be tinted at no extra cost. See p. 24 for game effects. More exotic features – such as polarizing lenses or toughened non-fragmenting glass (which increases DR to 2 and eliminates the risk of glass in the eyes) – may be available for increased cost (*at least* double prices) in some settings.

Workshop Protection: Steampunks with a fondness for handcrafting may wear leather or heavy fabrics to protect against minor crafting accidents and that stand up to the rigors of that environment. Any item of DR 1 armor, and DR 1 or 2 gloves or footwear, from pp. B283-284 can be purchased and explained on this basis. Wearing such items in polite society would be considered bizarre or low-class (-1 to -3 reactions, or just treat the individual as Status 0 or less), but most people will at least consider work clothes as mundanely practical rather than as sinister combat gear.

Historical Armor

Despite the low frequency of appearance of armor in the Steam Age, there are some exceptions and oddities. Most types of TL5 or lower armor listed in ***GURPS*** books can still be found *somewhere,* if only in the display galleries in some aristocrat's ancestral castle. In addition, at the start of the period, a few remnants of such past times remained in use. By the end, a few new options were becoming available. Game details are on the *Historical Armor Table,* p. 26.

Steel Corselet (TL5): At the start of the Steam Age, most European armies still had a regiment or two of *cuirassiers* – big men on big horses, trained to charge home with the sword. They were increasingly obviously out of date, but were kept around for much of the era because they looked good. Their armor was highly polished for show (and often used as a mirror!), but had a cloth cover for field duty.

Steel Vest (TL5): The generic 19th-century attempt at a concealable bulletproof vest – a military-style vest with pockets in the front for a pair of steel plates. This was not actually rated highly by most soldiers who looked at it, but was nonetheless allegedly worn by certain gunfighters. It could just about pass as or be worn under normal clothes.

Silk Vest (TL6): A thickly padded silk vest of a type often worn by affluent gentlemen. Most observers who notice it are unlikely to assume that it's armor. This specific design comes from the late Steam Age, and so is rated as TL6. However, fabric body protections have existed for centuries, and the optional steel inserts aren't especially advanced technology, so something similar could have appeared earlier.

Cavalry Helmet (TL6): A stainless-steel or nickel-plated dress helmet, worn with the steel corselet (above), and similarly highly polished under a cloth field cover.

Pith Helmet (TL5): This domed helmet, associated with white hunters, explorers, and some European troops on tropical postings, is rigid enough to provide some DR, but mostly serves to protect against the sun and tropical downpours.

Leather Helmet (TL6): The famous "Snoopy"-style skullcap worn by aviators and tankers – and by steampunks with a fondness for vehicles. It has earflaps and thick padding.

Heavy Helmet (TL6): The kind of hefty infantry helmet associated with, for example, German troops in WWI, and with steampunk heavies who borrow their visual style. A strap-on heavy-steel-plate brow reinforcement is sometimes issued to machine gunners and trench sentries; this protects the skull from the front (+15 DR, +$10, +5 lbs.):

Anti-Garrote Collar (TL5): During the 1850s and 1860s, British cities suffered a minor spate of "garrotings" – muggings in which one of the attackers disabled the victim by choking him from behind with a wire or rope, or just an arm around his neck. This triggered a crime-wave panic, which some people in turn took as a commercial opportunity. Various sorts of anti-garrote collars and cravats were invented, and some were patented, although it's not clear if any ever reached the market. The simplest option is a stiff leather collar, similar to something often worn by soldiers, as listed on the table; that can be hidden under a scarf or high coat collar, though not under indoor clothes. A more substantial version provides the same protection, but is also embellished with short metal spikes; price becomes $38. The spikes do cutting damage to any limb or hands used to attack the neck equal to thr-2 damage for the ST used in the attack. That version cannot be concealed except by a hugely bulky scarf (though attackers may not notice it on a darkened street), and looks somewhat ridiculous. A subtler version provides the same DR, but has a sharp concealed blade mounted vertically below the chin. The blade is concealable, makes the price $50, and does thr-1 cutting damage for the ST used in the attack to any hand, limb, *or weapon* that crosses the wearer's throat (GM's decision) potentially severing strangling cords.

Corset Armor

As ***Steampunk 1,*** p. 44, notes, most women (and some men) in Victorian-style settings would wear corsets, and modern steampunk fashion has latched onto this. The rules on pp. 22-23 discuss corsets as a matter of style, but what about corsets as *armor*? After all, even a realistic historical corset was made of stiff fabric with rigid reinforcements.

Corsets can vary considerably in size, from broad belts to extensive assemblages of stays and fabric, but for game purposes, a typical generic corset can be considered to protect hit location 11 (p. B552), which for these purposes should be called the "abdomen" rather than the "groin." A typical historical corset may be enough to provide some DR, and has significant weight, but this is all treated as part of the rules for layered and structured clothing (pp. 22-23). More significantly, a leather "steampunk adventuring corset" provides DR 3, weighs 5.5 lbs., and costs $80, and an armored steel corset provides DR 8, weighs 5.5 lbs., and costs $275. The latter two will not be available in all settings, and are unlikely to be treated as suitable for polite society, giving -2 or worse reactions from respectable folk, if they are noticed. Fortunately, they'll fit under clothing, though real steampunk fashion victims may disdain that option.

Incidentally, although an armored corset only protects the one hit location, it can serve as an excellent dramatic excuse when invoking the *Flesh Wounds* and *TV Action Violence* cinematic combat rules (p. B417). Any time that a potentially lethal hit fails to kill the wearer, explain that "it just bounced off my corset."

Armored corsets should be carefully selected to fit the wearer, as a bad choice will be very uncomfortable at best, downright dangerous at worst. If using the rules under *Period Clothing and Game Rules* (p. 24), an armored corset that wasn't chosen carefully will either give two or three fitness level reductions, or be uncomfortably loose (-1 to DX for actions involving full-body movement) and obviously unsuited (-1 to reactions from people who care about style, or more from serious fashion victims). If the corset was personally fitted for comfort, ignore those penalties entirely – though it will still count for encumbrance, won't be "slimming," and may not be considered sufficiently fashionable.

Historical Armor Table

Terms and notation are as defined on p. B282. All of these items are LC4.

TL	*Armor*	*Location*	*DR*	*Cost*	*Weight*	*Notes*
5	Anti-Garrote Collar	neck	2	$10	0.5	[1]
5	Pith Helmet	skull	1	$10	1	
5	Steel Corselet	torso	10/4	$600	12	[2]
5	Steel Vest	torso	5F	$150	7	[1]
6	Cavalry Helmet	skull	4	$100	3	
6	Heavy Helmet	skull	6	$100	5	
6	Leather Helmet	skull	2	$20	1	[1]
6	Silk Vest	torso	4/2*	$800	6	[1, 3]
	+ *Steel Plate*	torso	+5F	+$400	+6	

Notes

[1] Concealable *as* or *under* clothing.

[2] Higher DR is for the front; lower DR is for the back.

[3] Split DR: use the first, higher DR against *piercing* and *cutting* attacks; use the second, lower DR against *all other damage types*.

Improvised Armor

Despite the decline of armor in the Steam Age, the period actually created the opportunity for some effective improvisation in personal protection. When the poorest backwoods farmer had an iron plow, and any small workshop might have an old boiler lying around, anyone could lay hands on iron plate of a quality that would have been considered wonderful a mere couple of centuries earlier.

Probably the most famous attempt to exploit this took place in 1880, when the Australian outlaws the Kelly Gang scavenged or stole iron plow moldboards and induced local blacksmiths to create them four sets of body armor. Although crude, these apparently reliably resisted close-range fire from the local police force's Martini-Henry .45 rifles (5d pi+ in ***GURPS***). Accounts from the time, and the one surviving suit, suggest that they protected the wearer's torso, and featured crude barrel helms that protected the face and skull but were open at the top (so if someone could somehow get above the wearer, they would be vulnerable to head shots) and necessarily had eye slits; the suits also left the wearer's arms and legs unprotected.

They weighed around 97 lbs. each, which suggests a DR of around 22 – and indeed, the gang was only brought down by leg hits and lucky rifle shots (critical hits or high damage rolls, in ***GURPS*** terms). But some members of the gang thought that the whole idea was disastrous; the weight was crippling, and they needed extra horses to carry the armor between shoot-outs. It would also have taken a minute or so to don, and given the wearer No Peripheral Vision and -2 to all Hearing, Vision, and Smell rolls.

A fictional instance is seen in the Western movie *A Fistful of Dollars,* in which the protagonist, knowing that his opponent, an excellent marksman, *always* goes for heart shots, hides a slab of steel plate under his clothes, protecting that location. This would weigh a few pounds and again provide DR in the 20s (good enough against TL5 guns, a little low against TL6 weapons), but the best reason for using this trick would be as a dramatic explanation when using the *Flesh Wounds* cinematic combat rule, as with an armored corset (p. 26); "the bullet bounced off my hidden armor."

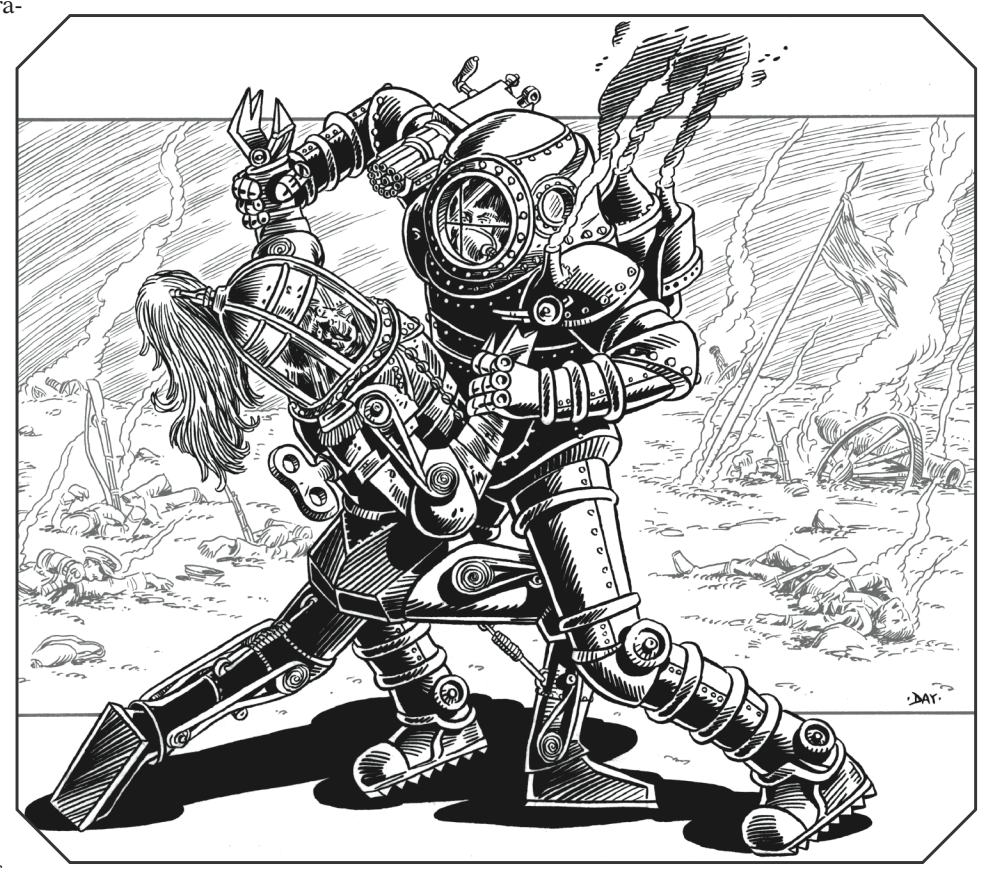
Steampunk Power Armor

Steampunk frequently features the ideas of modern science fiction, transplanted to the Steam Age and given a brass-and-rivets veneer – and there's no reason not to apply this principle to the science-fiction idea of power armor, if the setting can stand it. A couple of possibilities follow; in both cases, the wearers cannot use any melee combat or athletic skill at a higher level than their Battlesuit skill.

Clockwork Armor (TL(4+2)^): The creation of a Renaissance genius or an eccentric Victorian inventor with an obsession with clockwork, this clanking and cumbersome-looking suit provides DR 10 on the head and torso, and DR 5 on the limbs and eyes (thanks to an armored glass eye slit, the product of advanced chemistry or exotic alchemy). It also has built-in motors, powered by springs of amazing power capacity (hence the superscience rating) that allow the wearer to lift and carry as though ST 14, to strike as though ST 20, and to run tirelessly at Move 4 on level ground or 3 cross-country. Unfortunately, the wearer also suffers from Bad Grip 1 and Ham-Fisted 2. The springs only hold enough power for three hours of operation, then require 10 man-hours of winding (a full day's work for one person, or proportionately less for larger crews using special winding mechanisms). The suit weighs 1,000 lbs. and costs $70,000.

Steam Battlesuit (TL(5+2)): Advanced infantry equipment in some war-torn steampunk timelines, this suit isn't really bulletproof, but does protect against shrapnel and similar threats – the bigger problem on many battlefields – and enables the wearer to carry heavier weapons. It is powered by a compact steam engine, but fortunately also features air conditioning for the wearer, who therefore doesn't roast. It provides DR 10 on the head and torso and DR 5 on the arms, legs, and eyes (thanks to an armored-glass eye-slit). It allows the wearer to lift and carry as though ST 14, to strike as though ST 20, and to run tirelessly at Move 5 on and off road. It also gives Bad Grip 1. It has a shoulder-mounted helmet gun (p. 32). A load of coal is good for 7.5 hours of operation. It weighs 685 lbs. and costs $61,000.

Defensive Battlesuit: This heavier version of the steam battlesuit has twice the DR and gives Move 4 on roads and 3 cross-country. It weighs 1,035 lbs. and costs $64,250.



Specialized Protection

In addition to armor that protects against combat damage, many steampunks will need protection against various sorts of environmental and job-related hazards. Light protective work clothes, leather helmets, and goggles – the basic protective wear of many a dedicated steampunk – are discussed on pp. 25-26; the following are more specialized examples.

Airship Rigger's Suit (TL6): Work garb developed for the explosively hazardous interior of a zeppelin hull; a set of soft cloth overalls and padded felt shoes, all with absolutely no metal fittings that could strike sparks. The suit also has deep pockets for tools. $65, 4 lbs.

Hard-Hat Diving Suit (TL5): The "closed" diving dress was perfected in the 1830s. It includes a brass helmet with portholes for vision and controlled intake and outlet valves for air. The helmet is sealed to a waterproof rubberized canvas suit, which has lead-soled shoes. The "hard-hat" diver is tied to the surface by a 200' airline. Hard-hat diving requires a trained (and *trusted*) crew of handlers on the surface, including two or more pumpers until motor-driven pumps are developed, and at least one line-tender to keep the hose and ropes from fouling. When performing a *risky* activity underwater, roll against Diving Suit (p. B192); failure might mean problems such as a leaking hose or suit, a fouled line, or a broken helmet. A suit costs $2,500 and weighs 175 lbs. in total; the brass helmet has DR 6, while the suit has DR 2. The wearer effectively has Tunnel Vision (p. B151): In addition, a hand-powered compressor is $1,000 and 300 lbs., while 200' of hose on a reel is $500 and 25 lbs.

Steampunk Diving Suit (TL(5+1)): Historically, usable diving equipment with air tanks, independent of lines to the surface, was an early TL7 development, dependent on reliable and complex regulator valves and high-pressure tanks. Still, some of those components *might* plausibly have been invented earlier. This version is a not-too-implausible development, resembling the hard-hat suit above, but with better materials and an air tank instead of air lines; it has the same DR values and Tunnel Vision effect, costs $3,500, and weighs 180 lbs. in total. In a gritty, quasi-realistic game, the air tank is good for 15 minutes; increase that to 120 minutes in more cinematic games. Tanks can be changed over underwater, but this needs a (trusted) friend to work on your backpack; the job takes 30 seconds (in which time the diver must hold his breath). An assistant can reduce this to 10 seconds with a successful Diving Suit roll, but in that case, a critical failure means that the task takes 60 seconds and wastes 1d minutes' worth of air. Replacement, refilled tanks weigh 25 lbs. and cost $600. A dive-support ship may well have recharging pumps as a standard feature; if so, refilling a tank takes 20 minutes.

Gas Mask (TL5): Someone wearing a gas mask draws the air he breathes in through a chemical filter, which eliminates smoke, dust, and most respiratory agents known at the mask's TL, but may be vulnerable to more advanced chemical weapons. TL5 masks are heavy leather hoods with glass lenses over the eyes, giving Tunnel Vision. TL6 versions are less cumbersome, only give No Peripheral Vision, and have a separate filter, worn on the chest or belt and linked to the mask by a hose. However, that hose is then vulnerable to cutting attacks (-2 to hit). Both types give DR 2 to the eyes and face, and block the wearer's sense of smell. Higher-TL designs may be lighter and incorporate additional features, but will then cost more. $100, 8 lbs. at TL5 (4 lbs. at TL6).

Pneumatic Suit (TL(5+1)): A multi-purpose steampunk protective suit, mostly made of rubberized canvas, which is inflated when in use (taking one minute with a small electric air pump). This makes it cumbersome, giving -2 to all DX-based rolls for movement actions including melee combat. The integral helmet with faceplate provides No Peripheral Vision. However, the suit ensures that the wearer floats in water (+3 to Swimming rolls except for speed), acts as full winter clothing to resist cold, has the equivalent of a built-in gas mask (above), is treated to resist most common acids, and is fully electrically insulated. It also provides DR 4, but if any damage except from a crushing attack does the wearer more than 1 point of damage, the suit deflates until repaired. When it is deflated, it doesn't float, doesn't resist cold, and provides only DR 1, but it also gives no penalty to DX-based actions. $200, 10 lbs.

Steampunk Spacesuit (TL(5+2)): In a world with steampunk space travel, one must expect the presence of suitably imposing if slightly cumbersome, rivet-laden vacuum suits, which somehow work out cheaper and simpler than the technically hugely complex and hence expensive suits developed for real-world space exploration. (Feel free to assume the presence of some borderline superscience here.) This possible example is derived from the hard-hat diving suit (above), with more advanced sealing and the addition of a backpack air tank and an internal pressure-management system. The steampunk spacesuit is laden with tool fitments and analogue dials. (Its climate-control systems are remarkably effective over a moderate range of conditions, but need some human handling.) The helmet gives the wearer No Peripheral Vision, and is DR 7; the suit is DR 3. The air tank is good for 90 minutes. Replacement, refilled tanks weigh 35 lbs. and cost $600. Spaceships may have tank-recharging pumps as a standard feature; if so, refilling a tank takes 20 minutes. Use Vacc Suit skill to manage the suit in emergencies or to remain safe while performing complex extended tasks. $5,000, 160 lbs.

GURPS Third Edition Clothing and Armor

The ***GURPS Basic Set*** has a general treatment of clothing and armor, expanded here for more genre-appropriate detail; this volume also contains new-edition versions of a few specific items from older-edition steampunk-related books. Hence, it should rarely be necessary to refer to ***GURPS*** *Third Edition* material for this sort of thing. In any case, weight and DR values are measured on the same scales in both editions, so little conversion work is ever needed. Costs given in the original ***GURPS Steampunk*** and ***GURPS Steam-Tech*** are based on period dollar values (see p. 5), so to convert them to the generic "***GURPS*** $" used in Fourth Edition books, multiply by 22.

A few other statistics appear for some items. "PD" values are not used in Fourth Edition. Items listed in older books with a "Holdout" value can plausibly be concealed under ordinary clothing; the numeric value is simply the relevant penalty to the skill of the same name. Also, Legality Class (LC) ratings given in Third Edition books should be reduced by 1 for Fourth Edition use.

Lastly, note that Fourth Edition tidies up various diving suit and similar skills; for example, "Open-Dress Diving" skill becomes simply Diving Suit/TL5 (p. B192; see also ***GURPS Update***). Other versions of Environment Suit skill might be relied on to enable safe, efficient use of other protective suits and the like from whatever sources.

Chapter Three

Instruments of Conflict and Carnage

The clockwork monstrosity advanced with insensate malevolence, its iron claws held high, its metal feet clicking on the floor tiles. Purves already had his Webley-Fosbery pistol in hand, and he fired six times as the automaton advanced. All six bullets found their mark, but each was deflected by iron scales. Purves cast the gun aside before its hammer could fall on an empty chamber, and in a single motion, drew the sword that was concealed within his walking-cane and raised it to deflect the automaton's first cut. The monster threw a second attack at him from his other side, but Purves still had the reinforced cane itself in his left hand, and he brought that too up in a parry, the iron claws scraping bamboo veneer away from steel reinforcement. Purves retreated, looking for some path of escape, and the automaton advanced inexorably.

"Stand aside, sir!"

Sergeant Noakes had entered the room while Purves was distracted by the threat, and Purves obeyed his words instinctively, stepping to his left while Noakes advanced to his right. Noakes had his Bohemian-made clockwork carbine in hand, and now it roared tersely. Its bullets had a little more power than those from the Webley-Fosbery, and the automaton staggered as two of them made dents in its carapace, but then it recovered and returned to the fray.

"Thank you, gentlemen. My turn, I believe."

Lieutenant Trace had followed Noakes into the room, and had evidently been taking careful aim with his LeMat pistol. The report when he fired demonstrated that he was using the shotgun barrel, and his shot took the automaton square in the torso. An even louder explosion followed the gunshot noise by a fraction of a second, and the monster's mechanical body was blown apart. Cogs and springs fell in every corner of the room.

"You know," said the lieutenant, "I owe Miss Singleton an apology. I doubted her claims about the effectiveness of that shell."

Steampunk adventurers are rarely outright pacifists, and technological advances, historical or otherwise, usually include ways of applying large amounts of force to problems in a short span of time. However, the gratuitous intricacy and strangeness of steampunk technology can be seen every bit as much in weaponry as elsewhere; this chapter provides some examples. See ***GURPS High-Tech*** and ***GURPS High-Tech: Adventure Guns*** for many more historical weapons, some of them exotic enough to fit into a steampunk campaign (with the original manufacturer-specific name changed if necessary).

Melee Weapons

The Steam Age is an era of guns more than hand-to-hand weapons, but melee weaponry has its place in steampunk games. Anything listed for earlier TLs can still be found somewhere, if only in those dusty collections in aristocrats' castles, ready to be grabbed and wielded by desperate adventurers. Meanwhile, native peoples may find themselves confronting colonial powers at a distinct tech-level disadvantage. See p. B274 for rules for weapon quality and price at TL7+ (or equivalent). The following are a few period-relevant options; see the *Melee Weapons Table,* p. 30, for game details where necessary. Most purpose-made melee weapons are LC4, as usual, in the Steam Age, but something made as a jungle knife will usually be legal in a jungle area.

Bowie Knife: A heavy style of blade, made famous by legendary Western knife fighter Jim Bowie and wielded by an American hero in Bram Stoker's *Dracula*. Weapons labeled as Bowie knives vary considerably, but usually feature a cross hilt and a "clipped" point, making them effective for stabbing as well as cutting; they are never thrown. Most Victorian Bowie knives would rate as large knives (p. B272), though some, especially later versions, could rate as long knives (see table, p. 30) or even shortswords (p. B273). Another, related, Western fighting knife, the "Arkansas toothpick," had a long, straight, two-edged blade, and is often classed as a long knife.

Cavalry Saber: At the start of the Steam Age, cavalry were still routinely issued with swords and expected to use them on occasion, so there were plenty of these blades around for years afterward. See p. B271 for game details. For 19th-century Japanese katanas, imported to the West after the opening up of Japan, use the same statistics.

Kukri: Although originally more of a jungle knife than anything else, the famous blade of the Nepalese Gurkhas gained a deadly reputation from its wielders, making its way into *Dracula* and countless war stories. See below for game details.

Machete: A long, heavy knife, good for hacking through jungle or chopping sugarcane, and hence widely available to explorers and colonial revolutionaries in tropical regions, albeit often of cheap quality. Treat smaller machetes as kukris (above); see the table for game details for larger blades.

Naval Cutlass: Napoleonic boarding actions often involved close-quarters fighting, so a good blade had its charms for sailors. See p. B273 for game details; note that the standard bell hilt gives DR 4 for the hand.

Sword Cane: A gentleman who wants to be prepared for trouble may carry a smallsword of sorts concealed within his walking stick. Realistically, a lot of sword canes or "swordsticks" are rather small and suffer from the lack of a guard. See the table for game details. In addition, the thin construction reduces the effective quality by one level. The 1-lb. sheath can be used as a baton (p. B273). A *cinematic* sword cane, however, is a fully effective smallsword (p. B273), with quality as paid for. Also, the sheath is balanced for use as a short staff (p. B273), and a fighter who is familiar with the design can draw the blade and end up with a ready weapon in each hand. When the sword is in its sheath, the assembly can be used as a light club (p. B271). Which type is the norm in a setting is up to the GM to decide. Either way, a sword cane costs $600 and is often treated as LC3.

A gentleman who wants to be prepared for trouble may carry a smallsword of sorts concealed within his walking stick.

Melee Weapons Table

Terms and notation are as defined on pp. B268-271.

TL	Weapon	Damage	Reach	Parry	Cost	Weight	ST
KNIFE (DX-4, Force Sword-3, Main-Gauche-3, or Shortsword-3)							
2	Kukri	sw-1 cut	C, 1	0	$50	1.5	7
	or	thr-1 imp	C	0	–	–	7
2	Long Knife	sw-1 cut	C, 1	0	$120	1.5	7
	or	thr imp	C, 1	0	–	–	7
SHORTSWORD (DX-4, Force Sword-3, Main-Gauche-3, or Shortsword-3)							
2	Large Machete	sw+1 cut	1	0	$400	3	10
	or	thr-2 imp	1	0	–	–	10
2	Long Knife	sw-1 cut	1	0	$120	1.5	7
	or	thr imp	C, 1	0	–	–	7
SMALLSWORD (DX-5, Main-Gauche-3, Rapier-3, Saber-3, or Shortsword-4)							
5	Sword Cane, Realistic	thr imp	C	-2F	$600	1.5	5

Projectile Weapons

If steampunk heroes get into life-or-death fights, they will most likely rely on guns, but possibly quite *unusual* guns. In all cases, except where otherwise indicated in the notes, a full reload of ammunition costs $20 times the ammunition weight in pounds (see p. B279).

Historical Firearms

In many games, heroes will carry either real historical firearms, or something similar enough that details can be taken straight from the ***GURPS Basic Set.*** Looking at pp. B278-279, the TL5 rifle-musket is an appropriate weapon for elite Napoleonic-period soldiers, while the TL5 derringer, revolver, cartridge rifle, lever-action carbine, and double shotgun could adequately equip most mid-19th century adventuring parties (or groups drawing their general style from that period). The TL6 revolvers and bolt-action rifle are appropriate as later Steam Age weapons. For more ideas, see ***GURPS High-Tech, GURPS High-Tech: Adventure Guns,*** or the ***GURPS High-Tech: Pulp Guns*** supplements. The following are a few especially steampunk-game-appropriate weapons drawn from those.

Brown Bess Musket

A classic Napoleonic line infantry weapon, in service in Britain and elsewhere from 1744 to the 1840s, despite being far from the best weapon of its type. Fitting the 1.1 lb. socket bayonet (included in the price) takes four Ready maneuvers and turns it into a spear with Reach 1, 2*, only usable two-handed, but also gives -1 to Guns skill when firing the musket. The bayonet lacks a grip and so can't be used as a knife on its own.

Flintlock Pistol

One-shot pistols were relatively handy sidearms for Napoleonic-period officers. These guns also saw frequent use in crowded naval boarding actions. This is a well-made duelist's weapon from the late 18th century, and hence would be sold as one of a pair in a fancy wooden case. Taking double time for careful loading gives +1 Acc.

Pepperbox Pistol

The predecessor of the revolver was the "pepperbox," a weapon with a rather steampunk appearance. Instead of having several chambers feeding a single barrel, pepperboxes have multiple barrels in a revolving arrangement. They were popular from the 1830s to the 1850s and still seen occasionally for years after that. This is a smoothbore caplock weapon, often carried as a pocket gun by civilians.

Tranter Man-Stopper

A real-world example of steampunk-style excess, this break-open double-action-only revolver was chambered for a huge .577 cartridge – known at the time as 24-bore – to *guarantee* man-stopping in close combat. It had only a 4" barrel, but the voluminous cylinder made it rather bulky. Only a few hundred were made.

In order to reload, the shooter had to remove the cylinder and take off the recoil shield before punching out each case individually. Removing and reassembling the cylinder takes 15 seconds.

Automatic Revolver

The term "automatic revolver" is normally considered meaningless; pistols can be automatics *or* revolvers. This is the one weapon that managed to be both. The Webley-Fosbery Automatic was a revolver that used the recoil of a shot to cock its hammer and revolve the cylinder for the next shot. This reduced the felt recoil, but the precision-engineered mechanism caused some problems. Steampunks are unlikely to be deterred by that.

LeMat Revolver

Another weapon to appeal to gadget-loving steampunks, the LeMat is an outsize revolver in which the cylinder revolves around a 5", 18-gauge shotgun barrel. Switching the hammer between pistol and shotgun modes is a free action unless the user is not yet familiar with the weapon (see p. B169); in that case, it requires a Ready maneuver. The details here are for a later variant using pinfire cartridges, rather than the early muzzle-loader version. However, the shotgun barrel is still loaded the old way and is fired using Guns (Shotgun) skill; firing shot, it has Dmg 1d(0.5) pi-, Acc 1, Range 30/600, RoF 1×11, Shots 1(20), and Rcl 1. It might in principle be loaded with a lead slug, giving it Dmg 4d pi++ and RoF 1, or other interesting loads.

Cane Rifle

Historically, a number of gunsmiths concealed various sorts of long arms inside walking sticks, as a gentleman's protection against stray dogs and ruffians. This is an early TL6 volume-produced type. It has a cork muzzle plug that can simply be blown out when it is fired. The plug then needs replacing before the disguise is complete or the cane can really be used as such again; it's better if the user removes it before firing.

Anti-Tank Rifle

Faced with the sudden appearance of armored fighting vehicles, TL6 armies would surely hasten to produce infantry weapons capable of punching through them – such as this, the Mauser Tank-Gewehr 18, created by the Germans when faced with WWI British tanks. It thus comes from 1918, just outside the Steam Age, but it's not hard to imagine gunsmiths coming up with something similar a little earlier if necessary. It is a huge, single-shot, bolt-action rifle that would also give good results against "lost world" creatures: 5.5' long, loaded with armor-piercing bullets, and fired prone from its integral bipod. Its recoil is *horrendous;* critical failures, especially by users with less than the minimum ST, could have results up to and including shattered collarbones, and many users reported headaches and nausea after taking a few shots. But when nothing else will do the job . . .

Drillings

A "drilling" is a type of hunting gun, usually made in Central Europe at TL6. The name means "triplet" in German, and a drilling is a gun with three barrels – usually two shotgun barrels for small game, and a single rifle barrel in case the hunter encounters something more formidable. However, all sorts of combinations are possible. Steampunk gunsmiths might come up with *really* odd triplets.

For a plausible drilling, take a standard double-barreled shotgun, then assume a third barrel that is a single-shot version – Shots 1(3i) – of a rifle of the same TL; add one-third of the weight and half the price of the rifle to that of the shotgun, and set the Bulk to whichever is worse of the two guns. Switching barrels is a free action unless the user is not yet familiar with the drilling (see p. B169). In this case, it requires a Ready maneuver.

Fictional Steampunk Firearms

Strictly speaking, some of these aren't *fire*arms, as they use alternative forms of propulsion. Some of them appeared originally on pp. 14-16 of ***Steam-Tech.***

To create more steampunk-style firearms, see the notes on *Quick and Dirty Steam-Tech* in ***Steampunk 1,*** pp. 27-29, and particularly the section on weapons on pp. 28-29. Applying those rules to a selection of modern firearms would provide a broad array of weapons.

Very Heavy Revolver

If a steampunk enthusiasm for big, powerful handguns progressed to the extreme (and seized upon the newfangled smokeless powder), this six-shot double-action revolver could be the result. It is ridiculously heavy, has serious stopping power, and requires frequent maintenance. Low production numbers set the price disproportionately high.

Peroxide Pistol

Appropriate for settings such as a metal-poor dying Mars in a raygun Gothic game, this non-metallic weapon uses a catalyzed chemical reaction to propel a glass dart, which may be poisoned. Martian "red reaver" neurotoxin is a follow-up blood agent with a five-second delay; one dose inflicts 2d toxic damage, with no resistance roll (see pp. B437-439). Darts cost just $0.01 each, but add $10 per dart for that poison, which also changes the LC of the weapon to 2. A loading of liquid peroxide propellant, enough for 100 shots, costs $5 and takes three minutes to fill.

Assassin's Air Rifle

This unlikely but technically *almost* feasible custom-built weapon is based on one that famously appears in the Sherlock Holmes story "The Adventure of the Empty House." Holmes notes that it is an "admirable and unique weapon, noiseless and of tremendous power." When not in use, it seems to a casual glance to be a walking stick, with part of the mechanism carried separately in the user's pocket. It takes just 30 seconds to assemble into a functional if odd-looking gun. It is then "charged" by pulling against a heavy spring mechanism, and the single shot is loaded at the breech; it fires soft-nosed revolver bullets.

Its wielder in that story is an expert marksman who aims for the head, to ensure an instant kill. The rifle configuration permits shots at significant range, confusing investigators who believe that they are dealing with a close-quarters pistol attack.

See the Steyr-Girandoni M.1780 on p. 88 of ***GURPS High-Tech*** for a real-world example of a TL5 air rifle that actually saw military service.

"Sticherin" Pistol

Also known as the "Seamstress," this weapon from a timeline where electrical engineering progressed faster than in our history, is in fact what ***GURPS Ultra-Tech*** calls a Gauss pistol, using electromagnetic forces to project a 2mm steel needle at very high velocity. A full magazine of needles costs $0.10. The pistol is powered by a 0.75-lb. non-rechargeable battery in the grip, which is good for 50 shots; replacement batteries cost $16.50. This may be considered marginally superscience, at least for TL(6+1); a more "realistic" version might need a separate 2-lb. battery pack with the same capacity and cost, worn at the waist and connected to the gun by a cable.

Clockwork Carbine

Mechanical ingenuity might allow the creation of a functional submachine gun in a steampunk setting, using springs and clockwork to power a miniature Gatling-style mechanism. This design has *two* 10-round tubular magazines, each of which takes three Ready maneuvers to replace. The clockwork must be rewound with a crank handle (stored in the stock) after every 100 shots, taking 30 seconds. It can *only* fire full six-round bursts; field modifications to reduce its RoF and conserve ammunition are possible, but are bad for the gun.

The clockwork carbine has a Malf number (p. B279) of 15. It can also be fitted with a gravity-feed hopper in place of the twin magazines at an added cost of $40, changing weight to 13/4, Shots to 50(3), Bulk to -5, and Malf to 13.

Steampunk Rifle

Another imaginary example of steampunk excess in firearms, this is infernally heavy with an appalling kick, and its double-action eight-shot revolver mechanism can be slow to reload – but its half-inch caliber bullets have some heft.

Helmet Gun

This short-barreled 0.60" recoilless semi-automatic weapon is designed to be fitted to convenient points on systems such as steampunk power armor. Anyone within two yards in a 60° cone behind the gun when it fires suffers 1d+1 burning damage from backblast. (Note that recoilless weapons, which reduce felt recoil by ejecting gas out the back, are historically a TL7 development, but they wouldn't be too implausible at TL(5+1).)

Carbide Rifle

This pump-action repeating rifle uses acetylene (produced by a chemical reaction) rather than solid propellants, to avoid some of the maintenance problems with conventional firearms. Each bullet costs $0.10; recharging with enough water and calcium carbide for 42 shots takes two minutes and costs $5.

Early Repeating Firearms

It seems that, not long after useful personal firearms were invented, gunsmiths started trying to make them capable of rapid repeated fire. In practice, this didn't prove very feasible at the time, although various systems were tried, often using revolver-style mechanisms; powder and bullets might have to be loaded separately. The idea only really became viable at mid-TL5. (However, see the Puckle Gun in ***GURPS Low-Tech,*** pp. 92-93, and *Pyramid #3/52: Low-Tech II,* pp. 20-22 – though that saw little or no service.) Before then, experimental repeating firearms were generally cumbersome, unreliable, fragile, possibly dangerous to use, and very expensive.

Nonetheless, a brilliant artificer in a clockpunk or Georgian-period campaign might come up with something usable for wealthy adventurers. To represent this, take any single-shot black powder firearm, reduce Acc by 1 to a minimum of 1, increase Weight by 1 lb., change Shots to 6(60i), apply an extra -1 to Bulk, and add $1,000 to the cost. For brutal realism, the gun might also have -2 to Malf (p. B279), with any malfunction having a chance of making the gun explode in the user's hand, possibly while firing all of its remaining shots at once; also, just maintaining the gun may require a specialist workshop.

RoF is unlikely ever to be better than 1, given the limitations of early firing mechanisms. Some designs might allow faster loading at the cost of slower chambering, with a couple of Ready maneuvers required between shots; change Shots to 6(20i) and *reduce* RoF to 1/3.

Projectile Weapons Table

Terms and notation are as defined on pp. B268-271. See the weapon descriptions for more information about their features.

TL	Weapon	Damage	Acc	Range	Weight	RoF	Shots	ST	Bulk	Rcl	Cost	LC	Notes
CROSSBOW (DX-4)													
6+1	Powered Crossbow	2d imp	4	50/200	10/2.6	3	15+1(2i)	8†	-4	3	$2,000	4	
GUNS (GRENADE LAUNCHER) (DX-4, or most other Guns at -4)													
5+2	Bomb Gun *+ follow-up*	5d+1 pi++ 4d cr ex	2	315/2,600	15.9/1.11	1	1(3i)	13B†	-6	6	$450	1	
GUNS (LAW) (DX-4, or most other Guns at -4)													
5+1	Helmet Gun	6d-1 pi++	4	230/2,000	24/10	1	22(20)	10	-6	1	$1,155	1	
GUNS (MUSKET) (DX-4, or most other Guns at -2)													
5	Brown Bess	4d+2 pi++	2	100/1,100	10.2/0.09	1	1(40)	11†	-6	4	$100	3	[1]
GUNS (PISTOL) (DX-4, or most other Guns at -2)													
5	Flintlock Pistol	1d+2 pi+	1	70/800	2.75/0.023	1	1(20)	9	-3	2	$300	3	[1]
5	Pepperbox Pistol	1d+1 pi-	1	30/330	1.8/0.04	3	6(30i)	8	-1	2	$150	3	[1]
5	Tranter Man-Stopper	2d+2 pi++	1	130/1,400	3.4/0.48	3	5(4i)	11	-3	4	$750	3	
5+1	Very Heavy Revolver	3d+2 pi+	2	210/2,300	3.8/0.27	3	6(3i)	12	-4	4	$540	3	
6	Automatic Revolver	2d-1 pi+	2	120/1,300	3/0.3	3	6(2i)	9	-2	2	$850	3	
6	LeMat Revolver	1d+2 pi+	2	100/1,100	3.7/0.3	1	9(3i)	10	-3	2	$250	3	
5+2	Peroxide Pistol	1d imp	1	66/720	0.85/0.02	3	10(3i)	6	-1	2	$1,000	3	[2, 3]
6+1	"Sticherin" Pistol	2d(2) pi-	3	320/2,500	2.25/0.125	3	25(3)	7	-3	2	$360	3	[4]
GUNS (RIFLE) (DX-4, or most other Guns at -2)													
6	Assassin's Air Rifle	2d(0.5) pi+	4	200/1,800	5.5/0.01	1	1(7)	8†	-4	2	$1,500	2	
6	Cane Rifle	2d-1 pi-	1	110/1,200	1.5/0.03	1	1(10)	8†	-4	2	$180	3	
6	Anti-Tank Rifle	5d×2(2) pi	5	2,100/8,800	40/0.26	1	1(3i)	16B†	-8	6	$10,000	1	
5+1	Steampunk Rifle	6d+1 pi+	3	750/4,700	11.6/1.2	3	8(3i)	11†	-5	5	$630	3	
5+1	Carbide Rifle	7d-1 pi+	5	650/4,400	13/0.67	3	14(3i)	11†	-5	3	$2,500	3	[5]
5+1	Vulcan Gun	2d(0.5) cr	3	22/190	13/0.7	3	12(4)	9†	-5	2	$900	3	[1]
GUNS (SMG) (DX-4, or most other Guns at -2)													
5+1	Clockwork Carbine	3d-2 pi	3	300/2,200	10/1	6!	20+1(6)	11	-4	3	$1,300	2	[6]

Notes

[1] Unreliable; malfunctions on 16+ (see p. B407).
[2] Recharge liquid peroxide every 100 shots.
[3] Darts may be poisoned.
[4] Replace battery every 50 shots.
[5] Recharge chemical propellants every 42 shots.
[6] Fires fully automatic fire (6-round bursts) *only*; rewind clockwork every 100 shots. Very unreliable; malfunctions on 15+ (see p. B407).

The first thing necessary for a soldier is a trusty rifle. It should be easily and conveniently charged, and its fire should be certain and effective.

– ***Scientific American,*** *May 11, 1861*

Vulcan Gun

A steampunk riot-control weapon, firing vulcanized rubber bullets from a drum magazine. It is advertised, optimistically, as nonlethal. A full 12-shot drum magazine costs $1.50.

Bomb Gun

If motorized vehicles arrive on the battlefield ahead of schedule, some kind of response is likely. This "steampunk grenade launcher" is designed to tackle lightly armored opposition. It's a bulky, stubby shoulder arm with a wooden stock, a flimsy barrel, a primitive-but-functional muzzle brake, and an integral bipod.

The values given on the table are for anti-vehicle ammunition, hard-cased rounds designed to penetrate armor before exploding. One alternative load is a high-explosive fragmentation shell; add a (0.5) armor multiplier to the initial kinetic damage, and replace the follow-up explosion with a linked 3d+2 crushing explosion and [2d+2] fragmentation.

Powered Crossbow

This highly cinematic high-tech crossbow is of course, strictly speaking, not a "firearm" – but it fits in the same niche in any world where it exists. It uses an insanely complex system of built-in electric motors, pulleys, ratchets, and cams that might need superscience to work reliably. A 4-lb., $10 battery (usually worn on a belt) powers it. The battery needs replacing every 30 shots.

A Gadgeteer probably built it; even so, its mechanical complexity gives it a Malf number (p. B279) of 16. One advantage of the crossbow configuration is that it can fire wooden bolts that may count as stakes when hunting vampires, if that's helpful. (If the rules require a wooden *point,* that gives a bolt -1 damage and armor divisor (0.5).) A *highly* cinematic purely clockwork TL(4+2^) version of the weapon might have Weight 20/2.6, ST 13†, Bulk -9, and Cost $4,000, but not require a battery, instead just needing five minutes of rewinding every 15 shots.

Rays and Beams

When steampunk engineering merges with weird science, the resulting instruments of destruction may not bother with mere bullets. Naturally, raygun Gothic settings likely feature a lot of rayguns, but other avenues can bring such things into play.

These weapons often have the "sur" modifier on their listed damage. This means that they have the equivalent of the Surge enhancement (p. B105).

Etheric Technology and the Spirit World

"The ether" started out as a fairly precise scientific term for the medium in which light waves vibrated, but by the end of the Steam Age, the term had found broader uses, with some suspicion that spirits were "etheric" or "ethereal" creatures. If *both* ideas are taken seriously, this produces some dramatic story possibilities.

Not only could a game world feature "etheric" technology that interacts with spirits (such as the "electric pentacles" seen in William Hope Hodgson's stories of "Carnacki the Ghost-Finder"), but etheric weapons also might actually threaten spirits. For example, etheric shock weapons (below) might do their full damage to spirits as crushing damage, ignoring their insubstantiality. For extra complications, in games with more traditional occult elements, magic or folk-charms that ward against "spiritual influences" might also block or disrupt etheric technology.

Etheric Shock Weapons

The original ***GURPS Steampunk,*** p. 97, offers one possible rationalization for steampunk energy weapons – the theory, abandoned in real life early in TL6, of the luminiferous ether, the medium in which electromagnetic waves such as light vibrate. Etheric shock weapons work by creating faster-than-light shock waves in the ether, which has the effect of inducing massive pulses of electrical energy in any matter in their path. Transforming the theory of the ether into a practical, portable technology requires a couple of TLs of advance as well as being period superscience.

The *etheric shock rifle* is a product of such advances. A bulky, complex device, it can only fire every other turn, as its capacitors have to recharge between shots (with much ominous humming). The listed number of shots and ammunition weight is for a relatively compact, replaceable battery pack, which costs $50. The GM who wants to add a plausible-looking weird-science constraint to this weapon can replace that requirement with a 15-lb. backpack full of batteries, which is good for 50 shots but then has to be plugged into a static power supply to recharge for an hour or two.

Classic Rayguns

The sort of raygun favored by steampunk costume-makers isn't always explained in much detail, but some common features suggest a possible technical conception. These are probably charged particle beam weapons, accelerating a "packet" of particles through their barrels. At the same time, ring-like structures mounted around the barrels generate a self-sustaining magnetic containment field that travels with the particles and prevents the packet from tearing itself apart due to internal repulsion. The containment field tends to deform and then wrap itself around whatever solid object the beam hits. Sometimes, when the beam does enough damage to destroy the target immediately, the field envelops the whole object for a split-second as it energetically disintegrates, producing a visual effect as if the target becomes a glowing silhouette of itself and then vanishes.

Ray and Beam Weapons Table

Terms and notation are as defined on pp. B268-271. See the weapon descriptions for more information about their features.

TL	*Weapon*	*Damage*	*Acc*	*Range*	*Weight*	*RoF*	*Shots*	*ST*	*Bulk*	*Rcl*	*Cost*	*LC*	*Notes*
BEAM WEAPONS (PISTOL) (DX-4, other Beam Weapons-4, or Guns (Pistol)-4)													
6+1^	Pistol Raygun	2d burn sur	2	200/2,000	2.5/0.5	3	20	7	-3	1	$500	3	
BEAM WEAPONS (RIFLE) (DX-4, other Beam Weapons-4, or Guns (Rifle)-4)													
5+2^	Etheric Shock Rifle	6d×4(2) burn sur	6	150/190	11.3/2	1/2	10	10†	-5	1	$2,750	2	[1]
6+1^	Rifle Raygun	5d burn sur	5	1,000/5,000	8/1	6	40	8†	-4	1	$1,500	2	

Notes

[1] Unreliable; malfunctions on 16+ (see p. B407).

Many rayguns have a reflective concave dish near the muzzle. This is primarily a simple safety feature, preventing energetic splash-back from making things hot for the firer's hand, but it can also help by deflecting secondary energies toward the target, and may be involved in forming the containment field.

The table (above) has two rayguns: a simple pistol and a larger rifle-configuration weapon. Both can fire single-shot pulses or rapid-fire streams that have the appearance of a continuous beam. Both are powered by replaceable high-capacity energy cells, giving the listed number of shots and ammunition weight; the pistol's cell costs $4, while the rifle version is $8.

GURPS Third Edition Weapons

Most steampunk-relevant weapons that appeared in ***GURPS*** *Third Edition* books have had their statistics converted to Fourth Edition form; a selection appear here, and others can be found in the ***Basic Set,*** the current edition of ***GURPS High-Tech,*** or ***GURPS High-Tech: Adventure Guns,*** along with plenty of new material. However, if you need anything else that hasn't been updated yet, it's rarely hard to do the job for yourself.

Many standard weapons stats carry over directly from the old to the new edition. TL may change due to alterations in reference start dates and in the treatment of variant technologies and superscience; assess this based on specific data for the weapon. Damage becomes piercing for most projectile weapons; pistols smaller than .32/8mm caliber are pi-, intermediate calibers are pi, and anything greater than .40/10mm is pi+, while for rifles, less than .22/5mm is pi- and larger than .60/15mm is pi+. Exotic ray or beam weapons usually do burning damage, of course. Acc 1 stays at 1 and Acc 2 or 3 become 2; otherwise, *halve* the Acc value and round down.

Bulk can best be estimated – try to find something with similar weight and configuration. Change Rcl to a positive value and add 1, except for anything truly recoilless (such as most beam weapons), where Rcl is always 1. As noted on p. 28, costs given in the original ***GURPS Steampunk*** and ***GURPS Steam-Tech*** are based on period currency values; to convert them to the generic "***GURPS*** $" used in Fourth Edition books, multiply by 22. Lastly, and again as on p. 28, Legality Class (LC) ratings given in Third Edition books should be reduced by 1 for Fourth Edition use.

Chapter Four

A Miscellany of Convenient Paraphernalia

"Is he really such a threat?" whispered Fortescue as he squinted through his opera glasses. "He looks such a skinny little runt."

"You saw the aetherigraphs," Dr. Garamond replied. "That temple draws power from the Dark Streams of Lemuria. Its servants are no longer human."

"If you say so," said Fortescue uncertainly.

"I do." The Doctor turned to the other two members of their party. "Vosper, Mordheim – are you prepared?"

The pair responded with broad, grim smiles and brisk nods. Then, the burly Vosper folded aside the silver hand at the end of his artificial left arm, and tightened a spring. Meanwhile, the dapper Mordheim unscrewed the grip of his walking-cane and took a long draft from the flask concealed within.

They shared one last moment of silence. Then Vosper triggered a firing mechanism, and a grappling hook leapt from his arm to lodge in the stonework of the temple's roof. At the same moment, Mordheim gave vent to the blood-curdling cry that marked his transformation from man to monster.

"Let us stand back," Dr. Garamond suggested, only to see that Fortescue was already retreating into the deeper jungle. The Doctor followed, glancing back briefly to see that Vosper was now scampering up the temple walls, seeking the advantage of height. More dramatically, however, Mordheim was charging into battle with the "skinny" guard, whose hands and eyes were glowing with the dark lightning of Lemuria as he met the onrush of the monster.

"Beautiful," muttered the Doctor, extracting his pocket watch as he made briskly for cover. "Let us see how long they need on this occasion."

In addition to clothes and weapons, the well-equipped steampunk hero is likely to carry all sorts of interesting *stuff*, some of it concealed or cunningly disguised.

Routine Personal Equipment

To begin with, adventurers in an increasingly technological society are likely to acquire a range of sophisticated tools, in even the most realistic games.

Maps and Navigating Instruments

From TL4 onwards, basic equipment for most routine Navigation tasks (that is, finding the way from one known point to another) is simply a good map of the area. Inaccurate maps give from -1 to -5 to skill, as improvised equipment; having *no* map, when one is really required, gives -10. Prices for maps range from "free" to "exorbitant," depending on circumstances.

However, professional navigators always like to have a good set of additional tools, and improvements in navigation equipment and precision cartography are a significant feature of TL5 and TL6. For some tasks, such as determining location precisely when out of sight of landmarks (at sea and miles from the coast, say, or flying above the clouds), a set of navigating instruments counts as basic equipment, and a map may do little good. Bonuses from such equipment cannot usually be combined with the +3 from Absolute Direction or 3D Spatial Sense. Details of the instruments involved vary by skill specialization and TL.

Maritime Navigation

A full set of maritime navigating instruments at TL5 or TL6 consists of chart books, compass, sextant (or at very early TL5, cross-staff and astrolabe), dividers, lead line, log, and sandglass (if no chronometer, p. 37, is available), all carried in a robust case. This gives +2 to Navigation (Sea) at TL5, +3 at TL6+. Because this includes the benefits of a compass, someone who also has Absolute Direction or 3D Spatial Sense only gets an additional +2 rather than the usual +3 from those advantages. Any large, properly equipped ship is likely to have all of this gear on the bridge as standard. $3,000, 30 lbs. LC4.

Aerial and Space Navigation

Early attempts at Navigation (Air) typically use similar principles to the Sea specialty, and so might use some of the same equipment at TL5. However, most maritime tools are useless in the air; if an aerial navigator has a set of nautical instruments as above, it gives +1 to skill at best, which cannot be combined with the bonus from Absolute Direction or 3D Spatial Sense. By TL6 or the equivalent, aerial navigators have their own specialized gear, but this is mostly integrated into a craft's bridge or cockpit systems. The equipment provided in any TL6 aerial craft's navigation room or station, if one is present, reliably gives +2 to the skill; the gear includes a gyrocompass, making a magnetic compass superfluous. Absolute Direction or 3D Spatial Sense only gives a navigator an additional +1 in this case, because their benefits overlap with those from a gyrocompass.

Additional developments further helped with aerial navigation. *Optical drift indicators* permit highly accurate dead reckoning, giving +3 to Navigation (Air) if combined with a compass (or Absolute Direction or 3D Spatial Sense) and chronometer (or Absolute Timing or Chronolocation). However, the indicators require a clear view of the surface below, powerful searchlights to illuminate that surface at night, and constant attention by at least one crewman with Airshipman skill. Later, when networks of radio beacons have been set up, *radio direction finding* gives +1 to the skill per beacon in range, up to a maximum of +4.

Steampunk space travelers (and astral navigators) should doubtless employ similar amounts of gear, but its nature would depend on the setting's superscience; brass telescopes and intricate evolutions of the sextant often seem appropriate. Again, a typical navigation station usually provides +2 to Navigation (Space).

Historically developed in the 1920s, the *aerial sextant* (TL6) is a refinement of the maritime sextant, lightweight, streamlined for use in exposed observation positions on airships or early aircraft, and with features to compensate for hazy or cloudy conditions. Combined with a set of astronomical reference books ($50, 2 lbs.), this gives +1 to Navigation (Air) if a full navigation station is unavailable, or rates as basic equipment for tasks for which a map is useless. However, it cannot be combined with dead reckoning methods. Determining position when flying above the clouds is more or less impossible without this! Larger early TL6 aerial craft have one or two in their equipment lockers, and daring pioneer aviators carry one in the cockpit. $3,300, 2 lbs.

Land Navigation

Navigation (Land) typically leans very much on maps (p. 36) and a compass (p. 44). Using maritime (or aerial) techniques and equipment, with cross-specialty defaults, can work up to a point, but will slow a group down and can lead to comedy.

Mapmaking: If a group is venturing into literally uncharted territory, the explorers should consider generating their own maps as they go along, using Cartography skill. To do the job to *professional* levels (often the point of early expeditions), party members will need Mathematics (Surveying) as well, and the company advances at the equivalent of a walking pace at best. But when they turn for home, they hopefully have the maps they need for navigation, plus information of commercial value.

Surveying Instruments (TL5): The equipment for making a professional-grade map of a new area (compass, chains, flags, drawing instruments, etc.) is *bulky;* bring a couple of mules, a team of local porters, or a steam tractor. However, it does give +2 to Mathematics (Surveying) rolls for that part of the task, and also to Navigation (Land) when that may be needed. $1,000, 300 lbs. LC4.

O, how glorious would it be to set my heel upon the Pole and turn myself 360 degrees in a second!
– Sir Joseph Banks

Chronometers

A crucial addition to navigation equipment at TL5 is a precise and *reliable* chronometer. Routine accurate determination of longitude becomes feasible, saving countless lives. (Just to be sure, many ships carry *three* chronometers.) This also simplifies accurate global-scale map-making.

A timepiece which is not only accurate enough to use for navigation, but which remains accurate on a moving ship, is a creation of the 1760s. It gives +1 to Navigation (Sea) by itself, or +3 when combined with a full set of navigating instruments. By mid-TL6, a *good* pocket watch *might* be an adequate substitute for a chronometer, at least for a month or so after being set correctly, but disturbances or major temperature shifts can throw it dangerously off. (The GM can decide if there is a potential problem, and roll secretly against the watch's HT of 10; on a failure, the bonus becomes a -2 penalty.) In a baroque clockpunk/early steampunk world, chronometers might be replaced by some of the less feasible technologies proposed for the purpose – say, astronomical devices for observing the moons of Jupiter.

Absolute Timing or Chronolocation might be as good as a chronometer. The GM may allow anyone with those advantages to claim the same bonuses as if they had a chronometer – until something somehow throws them off.

Pocket Chronometer (TL5): A timepiece that looks like an oversized pocket watch. $500, 0.5 lb. LC4.

Ship's Chronometer (TL5): A clock mounted on gimbals to minimize problems with the motion of the ship, making it more likely to survive hostile conditions and easier to read than a pocket chronometer. It is more appropriate for the most precise tasks. $1,000, 15 lbs. LC4.

Data Collection and Recording

Tech level 5 is notable as the point at which machinery becomes available which can reliably manipulate sounds or images, and steampunk sometimes builds on that. These technologies are usually LC4.

Enhancing Vision

The telescope is a TL4 invention, but the technology achieved a degree of mass-market maturity at TL5. Throughout the 18th century, the telescope, or spyglass, was a symbol of authority for military officers – especially *naval* officers. Then, around 1825, fully useful binoculars were developed, and they rapidly came to replace the telescope in the field, except for special applications.

Both give a limited form of Telescopic Vision (p. B92), but a telescope effectively also gives Tunnel Vision, whereas binoculars merely give No Peripheral Vision (see p. B151). Scanning a scene, looking for something, takes three times as long with a telescope as with binoculars, and tracking a fast-moving object requires a DX roll with a telescope, but not with binoculars unless the GM decides that its movement is especially erratic.

Binoculars (TL5): Give Telescopic Vision 2. $100, 4 lbs. Holdout -3. At TL6, superior binoculars that weigh 3 lbs. and negate a further -1 to Vision rolls when "zooming in" on targets can be obtained for $150.

Monocular (TL5): The minimal implementation of telescope technology, small enough to keep concealed while it is in use, or to be easily concealed within other items. A $10 monocular gives Telescopic Vision 1; at TL6, a monocular that gives Telescopic Vision 2 can be obtained for $30. 0.1 lb. Holdout 0.

Opera Glasses (TL5): Pocket binoculars with low magnification and limited or no focusing ability. As the name suggests, opera glasses' main use is at the theater or opera, to give audience members a better view of the actors (or each other). Hence, they are often fashion items, with some level of styling (p. 6) – mother-of-pearl, lacquer, or gilded bodies, fine leather presentation cases, etc. – *required* at high Status levels. Their usefulness for serious observation work is limited, but they're better than nothing, and any regular theatergoer might have a pair in a purse or pocket. Gives Telescopic Vision 1 (any more would just lead to problems with lens shake and a too-narrow field of view), but with no option to "zoom in" on targets. Holdout -1. $15, 0.25 lb.

Spyglass (TL5): Gives Telescopic Vision 2. Holdout -2. $25, 2 lbs.

Pocket Spyglass (TL6): Gives Telescopic Vision 2. Holdout -1. $5, 0.25 lb.

Spotting Scope (TL6): A large telescope mounted on a small tripod, used for specialist tasks such as amateur astronomy, surveying, or precision artillery aiming. Gives Telescopic Vision 5. $300, 10 lbs.

Photography

Photography starts with a combination of mid-TL5 optics and chemistry, and progresses from there, evolving substantially through the rest of the Steam Age.

Wet-Plate Camera (TL5)

Cameras of the 1840s relied on one of several chemical processes to prepare a plate of glass ("daguerreotype" or "ambrotype") or metal ("ferrotype" or "tintype") to receive an image. The wet-plate collodion process was the most widespread by the early 1850s. In this process, the chemical-treated plate serves as the negative for printmaking. The photographer prepares the plate in a darkroom or a tent, working by the light of a lantern with a red glass or silk cover. He immerses the plate in a chemical bath to render it light-sensitive, removes it, puts it into a lightproof carrier, and attaches this to the back of the tripod-mounted camera. To take a photograph, he removes the carrier's front panel and the lens cap, exposing the plate to light for 15 seconds or more before replacing the cap. (This exposure time explains why period photographs often depict people sitting or leaning – and why action shots are impossible.) He then takes the sealed carrier back to the darkroom and makes prints on special photosensitive paper. It's all a moderately tricky process; failed Photography skill rolls, and especially critical failures, indicate blurred, unusable, or completely spoiled images.

Although TL6 chemistry permits fast "snapshot" photography with film, glass-plate technology survives for a while for high-quality images. (It was still being used for astronomical work in the 1990s.) Plates take 30 seconds to change; a successful DX-based Photography/TL6 roll reduces this to 10 seconds, but a critical failure then spoils the plate being removed.

Developing Equipment (TL5): Enough chemicals and containers for developing a few hundred wet-plate images and accompanying prints. Many of the chemicals are flammable or toxic! $300, 25 lbs.

Glass Plate (TL5): A common 6.5" × 8.5" glass plate. $5, 0.5 lb.

Wet-Plate Camera (TL5): A camera and tripod. $1,000, 50 lbs.

People were stunned when they heard that two inventors had perfected a process that could capture an image on a silver plate.

– "Nadar" (Gaspard-Félix Tournachon)

Box Camera (TL6)

In 1888, George Eastman introduced the first consumer-friendly camera with the slogan "You press the button, we do the rest." His Kodak camera created the amateur photographer, and adventurers too may appreciate its simplicity; the later Brownie (1900) was light and simple enough for a child to use. By the end of TL6, after the end of the Steam Age, camera technology had become vastly more sophisticated and complex, with all sorts of specialist gear.

A box camera uses photographic film, holding 6-12 exposures. Once the film is used up, the whole camera is sent off to a commercial lab, and returned with the prints, loaded and ready to shoot again. Alternatively, skilled users with access to darkroom equipment can develop the film and reload the camera themselves. Higher-quality equipment can develop unusual films, produce enlargements, and so on.

Box Camera (TL6): $20, 0.5 lb.

Darkroom Equipment (TL6): $500, 25 lbs.

Developing and Reloading (TL6): Takes 4-6 weeks. $3.

Film: A strip of film with 6-12 exposures, for loading in a darkroom. $1.

Print: Materials for making one print in a darkroom. $0.10.

Concealable Camera (TL(6+1))

Steampunk settings may involve rapid or quirky advances in photographic technology, creating interesting new possibilities in a Steam Age setting. For example, an imaginary refinement of the box camera (p. 38) for clandestine use might be made highly compact and somewhat more rugged, with hugely ingenious, intricate, and well-muffled clockwork mechanisms. It normally folds away into a rigid case, but one external switch extends or retracts the lens (taking five seconds), while a second switch takes a photograph and winds the film on afterward. This camera may be considered borderline superscience for its ability to take useful photographs in, seemingly, any situation. Film and developing costs are as for the box camera. $100, 0.5 lb.

Which do I consider my greatest invention? Well, my reply to that would be that I like the phonograph best.

– Thomas Edison

Sound Recording

Various Victorian inventors dabbled with mechanical sound recording, but the key breakthrough was made by Thomas Edison in 1877, and improved by Alexander Graham Bell's laboratories in the 1880s. By 1897, the technology was well enough known that it featured in Bram Stoker's *Dracula*.

Phonograph (TL6)

"Phonograph" can be used to mean anything that might nowadays be called a "record player," but the term is used here to mean one of the early types that relies on wax cylinders for recording. This has a definite steampunk look, although disc-based recording was already beginning to supersede this type by the end of the Steam Age. Cylinder machines do have the advantage that they can be used to record as well as to play back.

The phonograph is a tabletop apparatus about the size of breadbox. The user speaks into the "listening horn," which transports the sound through a metal tube to the "scribe," which etches grooves in a rotating cylinder of wax-coated cardboard. When the scribe reaches the end of the track, the cylinder is full. Each cylinder can hold two to three minutes of recording. To play back the sound, the scribe, or a lighter needle, tracks the groove as the cylinder rotates, producing mechanical vibrations that can be somewhat amplified by the horn. Some models are powered by a hand crank, others by electricity.

A wax cylinder will wear out after a few dozen plays, although later prerecorded cylinders were made of more durable materials. A cylinder-shaving machine allows one to reuse wax-covered cylinders several times by shaving them smooth, thereby erasing the recording; this has the same weight and cost as the phonograph itself.

An early or high-quality phonograph might be $3,000 and 30 lbs., but this price rapidly fell for simple (probably playback-only) home machines, which could be as little as $170. Blank cylinders are $5; recorded cylinders are $10-$20. Cylinders weigh about 0.5 lb., including protective packaging.

Craft Tools

The following is just a sampling of the sort of equipment that may be acquired by steampunk crafters and adventurers. See ***GURPS High-Tech*** for more details and many more ideas.

Pocket Tools

These are minimal but very portable options for crafters.

Multi-Function Knife (TL5)

Karl Elsener's multi-bladed folding knife was first issued to Swiss soldiers in 1891, but similar pocketknives were already common during the American Civil War. They make plausible additions to a steampunk setting. Elsener's original knife had a clip-point blade, a screwdriver, an awl, and a can opener. The officer's model quickly followed, adding a second, smaller blade and the famous corkscrew. Knives since then have included saw blades, scissors, magnifying glasses, emergency whistles, toothpicks, and tweezers. Treat the largest models as multi-tools (below).

Depending on the job, the GM may treat a multi-function knife as improvised equipment (-5 quality) for minor repairs or as basic equipment for extremely simple tasks. The longest blade *can* be used as a dagger, but serves very badly as such; -2 to both attack and parry, and if the blade is used to parry effectively, is itself parried or blocked, or hits an opponent but fails to penetrate DR, there is a 3 in 6 chance of it folding back and doing 1 HP damage to the wielder's hand. A basic version is $25 and 0.1 lb.

Multi-Tool (TL5)

The modern real-world Pocket Survival Tool was invented in 1983, but similar "multiplex" tools have been around since the 1850s. Their versatility and compactness make them popular among soldiers and emergency personnel. Many variations exist, featuring all sorts of specialist tools; steampunk worlds could offer many, many more.

Like the multi-function knife (above), the utility of a multi-tool depends on the skill being used and the job at hand. It's probably at least improvised equipment (-5 quality) for most technological tasks. For routine tasks, the GM might allow it to stand in for a mini-tool kit (p. 40). It is as effective and safe in combat as the multi-function knife. $50, 0.5 lb.

Slide Rule (TL5)

This mathematical tool – basic equipment for many TL5+ technological tasks – gives up to ×10 speed with calculations involving multiplication, division, powers, roots, etc. In some cases, attempting TL5+ mathematics or engineering with just pencil and paper gives -5 for improvised equipment (p. B345), though taking extra time (that is, carefully calculating by hand) can give bonuses (p. B346) that will partly compensate. For advanced work, though, a slide rule (or something better) may be *required*; lacking one gives the -10 penalty for *no* equipment. $50, 0.5 lb.

Tool Kits

Tool kits are essential to repair skills (see p. B190). A separate kit is required for Electrician, Machinist, and *each specialty* of Armoury, Electronics Repair, and Mechanic. You don't use an Armoury kit to repair a pistol – you use an Armoury (Small Arms) kit. However, if a task is essentially routine, a generous GM may allow use of a tool kit intended for a different but related skill – wrenches and screwdrivers are universal; a tool kit can almost always rate as at least improvised equipment (-5 quality) for a different skill. The kit's quality determines the equipment modifiers (p. B345) that apply when using the relevant skill. If the item being worked on has a different TL from the tool kit, apply *Tech-Level Modifiers* (p. B168) as well.

Tool kits contain a variety of appropriate tools and spare parts; the exact components are deliberately left vague here. They don't get cheaper, lighter, or more effective as TL increases; as gadgets get more complex, so do the tools needed to fix them!

Mechanic (Vehicle Type) and Armoury (Vehicular Armor) tool kits and workshops can only perform major repairs on vehicles up to 10 tons. Multiply tool cost and weight by (vehicle weight in tons)/10 for larger facilities. For instance, a Mechanic (Submarine) workshop with a 2,000-ton capacity has 200× cost and weight.

See *Repairs* (p. B484) and *Breakdowns* (p. B485) for further details on repairs, maintenance, and spare-parts costs.

Mini-Tool Kit: A belt-sized tool kit. It gives the wearer -2 (quality) for the specific skill and specialty for which it's designed. $200, 4 lbs.

Portable Tool Kit: The standard tool kit counts as basic equipment for the specific skill and specialty for which it's designed, and gives -2 (quality) for other specialties of the same skill. If more than one person tries to use it simultaneously for separate tasks, everyone gets -1 to the skill per person using it. $600, 20 lbs.

Workshop: A room-filling set of tools can have everything necessary for repairs or *fabrication* (welder, mill, lathe, etc.), including a range of materials and spare parts. It gives +2 (quality) to skill. Each skill requires its own shop, but the wrong type of shop is better than nothing – the quality modifier ranges from -2 for reasonably close crafts to -5 for distant ones. A typical workshop is $15,000, and the equipment included weighs around a ton. Up to three users can work in the space simultaneously, but at -1 to skill for two people or -3 for three if they're working on different tasks. All workshops require external power.

A tool is usually more simple than a machine . . .
– Charles Babbage

Portable Laboratories

A portable laboratory provides the scientific equipment necessary to conduct research in the field. It's dedicated to a particular skill – Biology, Chemistry, Geology, Metallurgy, Paleontology, etc. The included instruments fulfill that skill's equipment requirements when gathering and analyzing samples. If lab TL and skill TL don't match, apply tech-level modifiers (p. B168). Labs don't get cheaper or lighter as TL increases; they allow use of higher-TL skills and applications. Portable labs are typically LC4 if the local legal system is sophisticated enough to deal with them, but if they include a lot of toxins or volatiles, they might be more restricted.

Miniature Laboratory (TL5): A suitcase-sized kit. Takes at least 10 seconds to unpack or pack away again. It counts as basic equipment for the skill for one person. $3,000, 20 lbs.

Field Laboratory (TL5): Enough specialized equipment to give +1 (quality) to the skill for one person when properly prepared for use. Setup takes at least a minute, as does packing it again for transit. $15,000, 200 lbs.

Vehicular Laboratory (TL5): A long-occupancy vehicle may have a laboratory cabin with enough equipment installed to give +2 (quality) to the skill. Up to two people can work in the space simultaneously, though if they're doing very similar work, the GM may sometimes rule that they take longer due to contention for items of equipment. Unpacking the equipment for use, or stowing it for travel, takes at least 15 minutes. $75,000, 1 ton.

Fantastical Gear

A campaign with superscience or other exotic technology can feature all sorts of useful devices that exploit the variant laws of nature, with details depending on the specifics of the setting. The following are just some example possibilities for a range of campaign assumptions. Most are legally unrestricted, if only because the law is probably unaware of the options they offer, even if their existence is generally known.

Camera Arcana (TL6^)

This looks like a big, cumbersome, early TL6 box camera (p. 38). However, its polarizing lenses shaped from strange crystals, and the exotic emulsions used in its photographic plates, give it the ability to photograph ethereal phenomena that are invisible to normal sight. Of course, the photographer doesn't know what he's getting until the "aetherigraphs" are developed; this may lead to the occasional Fright Check. $1,000 (each plate costs $15), 10 lbs. For additional background details, see ***Steam-Tech,*** p. 36.

Electric Pentacle (TL6^)

Invented by Thomas Carnacki (p. 34) in 1907, this device consists of mercury-vapor tubes set in a pentagram shape, wired in parallel to an induction coil, powered by two lead-acid batteries. The delicate and touchy tubes require an hour and a successful Electrician/TL6 roll to set up. They emit specific wavelengths of blue light that repel spirits.

Ghosts or demons that wish to cross the light barrier must win a Quick Contest of Will vs. the barrier's DR – and a standard 40-tube pentacle, with batteries good for eight hours of continuous operation, generates a DR 30 barrier. However, some spirits may have the ability to circumvent or even overpower the barrier; Carnacki backed it up with a lot of more traditional occult protections, and was still very cautious about very powerful manifestations.

The pentacle only guards against ghosts and their abilities, but even fully materialized spirits or possessed humans cannot cross it, and the DR protects the tubes from anything they throw. However, any critical failure on a physical skill by someone inside the pentacle or close to a tube is likely to break a tube, and hence the barrier, with a misplaced foot or fist. A 40-tube electric pentacle is 10.5' in diameter (33' in circumference), and has enough room in the central, protected pentagon for one person, who sits on the battery pack. More tubes allow larger pentacles, but DR can only increase with more or more-efficient batteries, induction coils, or transformers. $2,500, 20 lbs.

Electrolabe (TL(5+1)^)

This navigation aid, all polished brass and iron and strange materials in glass capsules, uses the "etheric wind" and Earth's magnetic field to determine location. It gives +1 to Navigation skill and accurately determines latitude on a successful roll. It also doubles any bonuses given by a marine chronometer (p. 37). Combined with a chronometer, it eliminates penalties due to bad weather and unfamiliar currents, and permits Navigation skill to be used underwater without penalty. $450, 10 lbs.

Mesmeric Wand (TL(5+1)^)

Early theories suggested that hypnotism ("mesmerism") exploited a psychic force called "animal magnetism"; this equipment assumes that that's true. The mesmeric wand, a 2' rod of metal and crystal, amplifies and focuses that force. It requires Hypnotism skill to function, giving +3 to normal uses of the skill.

It can also be used to place opponents into a light trance at range. Each attempt takes 1d seconds of concentration (taking 3d seconds gives +1 to skill), and the roll takes standard range modifiers (p. B550). The victim resists with Will; victory means the target is dazed (p. B428) for a number of minutes equal to the margin of victory. During that time, the victim gets *no* roll to resist ordinary hypnotism attempts by anyone using the same wand.

The wand incorporates a 1-lb. electrical battery, which must be replaced, at the cost of $5, after every 15 minutes of use; changing batteries takes one minute. It is certain to be LC3 if publicly known to work, and may well become LC2 if incidents of criminal misuse are reported. $1,300, 2 lbs. For additional background details, see ***Steam-Tech,*** p. 18.

X-Ray Goggles (TL(6+1)^)

Through the wonders of X-rays, this large pair of goggles grants Penetrating Vision 1 with the Blockable (Lead) limitation (p. B74). A battery worn on a belt powers it. When the power is off, the lenses become completely opaque. The battery has to be replaced at a cost of $30 after every two hours of use. The goggles give DR 1 to the wearer's eyes, but have fragile components; any kind of hard impact has a 4 in 6 chance of making them useless (and opaque) until repaired. Once this technology becomes widely known, such goggles will become LC4 at the very minimum, and may become LC2 or even LC1 if a moral panic blows up over the threat to public decency. $325, 0.2 lb.; the battery weighs 1.2 lbs.

N-Rays

In 1895, the German physicist Wilhelm Conrad Röntgen discovered a mysterious new form of radiation, *X-rays;* the find earned him the first Nobel Prize in physics. In 1903, while trying to produce polarized X-rays, the French physicist René Blondlot believed that he had discovered another new and even more mysterious form, which he named *N-radiation*. N-rays were emitted spontaneously by all materials except green wood and metal treated with an anesthetic such as ether, were refracted by aluminum, and caused fluorescence in threads coated with calcium sulfide. This "discovery" was widely accepted in France, but proved hard to replicate, and was eventually shown to be the result of wishful thinking.

The significant point here for games, though, is that radiated energy was poorly understood in the Age of Steam. New rays with mysterious properties were used to justify a variety of marvels in works of fiction. They could be explained as products of new elements, with radium as a precedent, or simply hand-waved away. They are a classic instance of period superscience and potentially useful in games – and after all, the fascination with exotic rays survived well into the next era, becoming a cornerstone of raygun Gothic.

Concealed Devices

The Victorians had a great fondness for concealed gadgets and ingeniously disguised devices, which matches up nicely with the modern steampunk love of ingenious props and costume details. They hardly invented this – similar ideas go back at least to Renaissance craftsmen, if not far beyond. But in the period, the idea is particularly suited to secret agents (who continue to employ concealed devices to the present day) and gentleman-adventurers who are happy to spend a little money for the advantage of surprise in dangerous circumstances.

The following are a simplified set of general-purpose rules for defining such items in game terms. It uses the abstract concept of "spaces," each representing a few cubic inches of capacity; if a concealing object has a certain number of spaces available, ingenious crafters can squeeze in concealed devices up to that many spaces. In addition, some very small items are classified as *Tiny* (see p. 8) and can be fitted in exceptionally limited spaces. The GM should apply common sense in deciding what gadgets can be squeezed into what concealment, and may rule that some devices are unavailable, illegal, or just hard to acquire and expensive.

Defining and Acquiring Concealed Gadgets

To define a concealed gadget, choose a concealing object (see below) and apply any modifiers to make it more *stylish* or *ruggedized* (p. 6). Then select devices up to the concealing object's available spaces, apply modifiers to those if you want them to be ruggedized (there's little point in making them stylish – they're hidden! – although some observers might be impressed by finely made gadgets once they are revealed). Finally, add up the total cost. Simple switches or catches may be worked into the object's external structure to enable a gadget to be operated without special preparation.

Some simple devices (a compass concealed in cane handle, say) are available over the counter at novelty shops in any big city. Others (firearms especially) may need to be ordered by post or specially requested (taking 2d days in civilized areas). Really odd creations (a telegraph set in a lady's hat, say) may have to be crafted to order (2d+2 days – and perhaps an Area Knowledge, Streetwise, or Merchant roll – to find and commission a crafter and for the person to complete the job, plus 50% higher price for the special order). The GM decides what category any given idea falls into. Espionage agencies and well-organized criminal gangs may have some devices, including quite sinister creations, "in stock," but only release them on loan to trusted employees.

Interchangeable Devices

In general, the device or gadget becomes an integral part of the concealing object. However, some objects may incorporate general-purpose spaces that can take a selection of different devices of the user's choice, each fitted to that space. For example, a cane might actually be a hollow cylinder into which the owner could slot a glass flask, a set of lockpicks, or a slide rule. (Swapping devices around takes a couple of minutes.) Those with the Gizmo advantage (p. B57) can leave the current configuration of their concealed items undefined until they need something, and then declare that their Gizmo is something that could plausibly fit in the space or spaces available. In that case, searching the PC will never locate the concealment until the current concealed device is defined.

Such multi-purpose objects cannot incorporate external switches or catches, and the GM is the final arbiter as to what might or might not be possible. If something is permitted, add a +0.1 CF to the concealing object *and* to each of the interchangeable gadgets.

Finding Concealed Devices

In general, finding a concealed device within a competently crafted object requires a successful Search roll (p. B219) at -3. Skilled craftsmanship can improve the concealment quality; each additional -1 to the Search roll gives the concealing object a +0.2 CF. If the searcher *knows* that the device is present, a little experimentation (taking 30 seconds) and a successful IQ roll will find the concealment trick, and multiple attempts can be made without penalty.

Other Practical Concerns

Mostly, concealed gadgets are classed as LC4, being largely harmless, although suspicious law enforcers might wonder why someone would conceal *any* given item. Concealed weapons are always LC3 or worse, and may cause the owner to be treated as an assassin if discovered at the wrong moment – though high-Status individuals can get away with thin excuses. Concealed "thief equipment" such as lockpicks attracts similar suspicion if discovered.

If a concealing item (such as a cane or staff) is used as a weapon, anything within it may need to roll against its HT (usually 11) to avoid being damaged – unless it's fairly simple and robust, and the item is made with such use in mind (like a blade within a swordstick).

Example Concealing Objects

The following are just some of the possibilities!

Clothing

See pp. 22-23 for the number of concealment spaces provided by clothes with various degrees of "structuring." Concealment spaces incorporated into the clothes when they are made cost an extra $5 per space; adding spaces to preexisting structured clothes costs $10 per space. Either way, it helps to have a dressmaker who knows better than to ask why such features are required.

Where within the outfit the concealed devices are located depends on the exact nature of the structuring and the purchaser's requests. Spaces are built into padded or loose and flowing sections of the costume: Wide or puffed sleeves or fancy gloves can provide a convenient space or two on each forearm; a bustle can hold another, or even two if it's the largest type; and a crinoline may incorporate up to six spaces.

Hats can provide more spaces in addition to any within the rest of the outfit; each space adds $5 to the price. Any hat can have a compartment for a Tiny item, all but the smallest cap or bonnet has room for a one-space item, a fancy costume hat or a man's bowler or top hat allows up to two spaces, and a slightly excessive fashionable number for a lady or really extravagant gentleman's "topper" may even take a three-space item – though walking around with two pounds of gadgetry on top of one's head in addition to the bulk of a fancy hat may cause minor problems during action scenes, at the GM's whim. This could mean, say, a DX roll to avoid losing the hat after attempting a Dodge or taking damage, or -2 to Vision rolls to notice things that require turning one's head.

Footwear can offers more spaces. Ordinary shoes can have compartments in the soles for one Tiny item per foot. Boots usually have room for a one-space item per foot – in the thick reinforced soles of a workman's boot, say, or next to the shins in a more elegant high boot. Some outrageously high-heeled but substantial shoes or boots can also have one-space compartments in the heels. However, they may be considered too flashy for polite company, and moving fast in them can be difficult (e.g., the GM can impose -2 to Acrobatics and Jumping, or -1 to Move). Add $5 to the cost for each space or compartment added.

Pocket Items

Many minor accoutrements, of the types that individuals routinely carry in a large pocket or purse, can be cunningly constructed with room for a one-space device, at double normal cost – although if the device has more than negligible weight, the item will be rather bulky. Snuffboxes and cigarette cases are common choices. A brooch or cloak-fastening of a big, fancy type only normally acceptable as part of a dressy outfit can also just fit such a device. Treat all such items as having a base cost of $40 and a weight before the gadget is added of 0.2 lb. Styling may be *mandatory* to avoid the object looking clumsy and vulgar. A pocket watch (see *Timepieces,* p. 13) *might* be made bulky enough to take a one-space item, but the user may then need a good-sized pocket.

A multi-function knife (p. 39) or multi-tool (p. 39) may be made with some of the "blade" spaces given over to an appropriate one-space gadget. Simply add the weight of the gadget to that of the knife or tool; do the same for the cost if this is a standard version from the vendor, or multiply the total cost by 10 for a one-off bespoke creation. A hidden compartment in the handle for a Tiny item adds $10 to cost.

Sticks and Weapons

A typical "trick" stick or cane is made of tubular steel with some kind of decorative finish. Gloss-black "japanned" enamel is the most popular, but there are countless possibilities, including high-visibility colors, precise measuring marks, or wood veneer.

Hiking Staff: 6 spaces, $75, 3 lbs. + gadgets. Counts as a quarterstaff (p. B273) in combat. Comes with a threaded tip and interchangeable points – a rounded "crutch tip" for paved roads and a blunted metal spike for soft ground.

Lightweight Gentleman's Stick: 2 spaces, $25, 1 lb. + gadgets. Counts as a baton (p. B273) in combat. A *collapsible* stick dismantles into two sections, each with one space, for transport or storage; increase cost to $40.

Regular Gentleman's Stick: 3 spaces, $35, 1.5 lbs. + gadgets. Counts as a baton or short staff (p. B273) in combat. A *collapsible* stick dismantles into three sections, each with one space, for transport or storage; increase cost to $50.

Umbrella/Parasol: The base cost for an umbrella or parasol is $5; styling may be required if it is to be carried with a high-Status or fashionable outfit. Weight is 1 lb. Adding a hidden compartment in the handle for a Tiny item adds $10 to the cost; a big, fancy handle, cunningly constructed to take a one-space device, adds $20.

Weapon Pommel/Stock: Most standard weapons can be made with a compartment in the pommel or stock for a Tiny item; an armorer can do this on request as part of the manufacturing process, adding $20 to the weapon cost. A two-handed weapon such as a great axe, bastard sword, or rifle can have a one-space compartment added without weakening it too much; add $30.

Many minor accoutrements, of the types that individuals routinely carry in a large pocket or purse, can be cunningly constructed with room for a one-space device.

Concealable Items and Devices

The following are items that are fairly regularly concealed within other items. Other small objects may of course be possible, at the GM's discretion. Multiply the price of any standard object, or a device defined using the rules for *Calculating Machines, Mechanical Mentalities, and Information Storage* (pp. 7-18), by 1.2 for a concealable version, if it doesn't appear on the list below.

Tiny Items

Typical Tiny items include medical pills, doses of concentrated poison, and gemstones. A miniature compass or other instrument might be squeezed into the same space, but would cost at least twice as much as the one-space versions below, while being harder to use effectively (-2 to any relevant skill roll). If a device is defined using the rules for *Calculating Machines, Mechanical Mentalities, and Information Storage* (pp. 7-18), it can only count as Tiny for *this* purpose if it weighs no more than 0.075 lb., which in practice limits such devices to TL7+ or equivalent.

One-Space Items

A standard purchasable device or object, or a device defined using the rules for *Calculating Machines, Mechanical Mentalities, and Information Storage* (pp. 7-18), can fit in one space if it weighs no more than 0.25 lb.

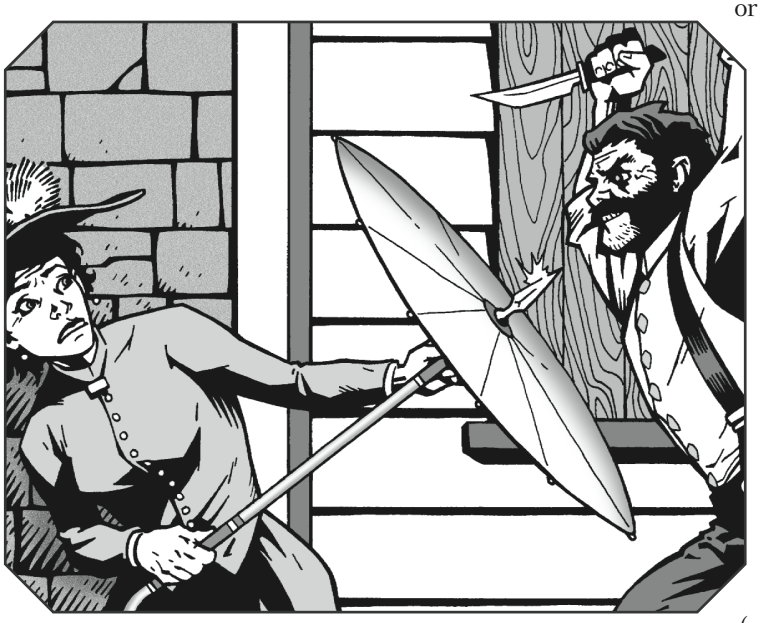
Coin Holder (TL4): A small cylinder that discreetly holds five good-sized coins, provided by the user – typically gold sovereigns or similar, worth $200, for emergencies. $10; negligible weight, but the coins add about 0.125 lb.

Dagger (TL1): As p. B272; add $5 to work the sheath into the concealing space, which must have at least 6" of available length. Drawing from a concealed sheath may take several seconds. A cinematic (TL(4+1)) *spring sheath* can release the blade for immediate use at the touch of a catch, actually giving +1 to Fast-Draw rolls; add $100 to the cost for such a mechanism. If positioned correctly, the spring sheath might even enable a familiar user to bring the weapon out as a free action with no roll required.

Drinking Cup (TL4): "Shot glass" size. May be cheap glass or metal ($2), but most gentlemen prefer a silver cup, engraved with a family crest, monogram, or initials (making it useful as an "I was here" message to friends in emergencies). $75, neg.

Fishing Tackle (TL5): A packet of hooks, sinkers, and a float, with a 30' spool of lightweight line – basic equipment for Fishing skill. If hidden in a stick, the stick will doubtless be made so it can be used as a fishing rod. $30, neg.

Lockpicks (TL3): As p. B289 (negligible weight), all in a neat case.



Magnetic Compass (TL5): Shows magnetic north, and gives +1 to Navigation (Air, Land, or Sea). However, a full set of maritime navigating instruments (p. 36) or a large aerial craft's navigation systems (p. 37) always includes a compass, and having another one gives no extra benefit. Also, this bonus cannot be combined with the +3 from Absolute Direction or 3D Spatial Sense. $25, neg.

Measuring Stick (TL5): An 18" folding ruler, made of a brass-like alloy guaranteed not to expand or contract much with temperature fluctuations. The reverse has a scale which permits distances to be read off a standard 1"-to-one-mile map, and a simple protractor to assess angles. $20, 0.2 lb.

Miniature Pistol (TL6): The smallest pistol that can do significant damage to a human being, loaded with one round of small-caliber ammunition. Late-TL5 versions existed, but were very fiddly and not very effective, being muzzleloaders or caplocks; this type uses a .22-caliber rimfire cartridge ($0.20 each). Many concealing items make the gun hard to aim effectively, giving -1 to -3 to skill at the GM's option. Dmg 1d-1 pi-, Acc 0, Range 70/800, Wt. 0.2/0.005, RoF 1, Shots 1(10), ST 5, Bulk -1, Rcl 2, Cost $40.

Mini-Torch (TL6): An early compact flashlight. Produces a five-yard beam of light for up to an hour on one battery. A couple of spare batteries take up another space if also carried concealed and cost $3. $25, 0.25 lb. If electrical technology is still new or limited in the setting, double all costs, and batteries only last half as long.

Monocular (TL5): See p. 38.

Pocket Spyglass (TL6): See p. 38; a pocket spyglass designed for this sort of concealment costs $20 and has HT 9 to resist damage from misuse. Note that it is impossible to conceal while in use, unlike a monocular (above), and will need to be concealed in something at least 6" long.

Sealed Capsule (TL5): A waterproof steel capsule with a threaded stopper and a rubber lining, good for holding small items in safety. $10, neg.

Slide Rule (TL5): See p. 39, but this version is inconveniently small, only giving a ×5 improvement in calculation times. Tasks for which a slide rule is basic or required equipment *either* take twice as long with this version, *or* suffer -1 or -2 due to reduced precision, as the GM chooses. $25, 0.125 lb.

Spare Ammunition: Secure space for up to 0.15 lb. of firearms ammunition (e.g., 5 rounds for a cane rifle, 30 rounds for a miniature pistol, or seven rounds for an emergency pistol). The contents will not suffer even if the thing they are hidden in is used as a melee weapon. $10, 0.1 lb. empty.

Whistle (TL5): Loud enough to be detected by an unmodified Hearing roll up to 128 yards away. $5, neg.

Wire Saw (TL6): 2' of serrated wire with finger rings at the ends. Realistically, does 1 point of cutting damage every four seconds, but is quickly ruined by DR 5+ materials. A cinematic, TL(5+1) version will cut through hardened-steel jail bars in 1d+1 minutes. Also functions as a wire garrote (pp. B272, B405). $10, neg.

Two-Space Items

A standard purchasable device or object, or a device defined using the rules for *Calculating Machines, Mechanical Mentalities, and Information Storage* (pp. 7-18), can fit in two spaces if it weighs no more than 0.75 lb., but the GM should apply common sense as to what will fit within a given space.

Blowpipe (TL1): As p. B275, but lighter and more compact – this version dismantles for storage (30 seconds to assemble) and comes with five darts. Drugs or poisons to go on the darts cost extra. $500.75 lb.

Camera (TL6 or TL(6+1)): The evolution of film photography permits the creation of *hidden* cameras. A slightly more compact but more rugged version of the box camera (p. 38), which can be fitted into a concealed compartment, is 0.75 lb. and $40; however, it has to be at least partly extracted for use. The somewhat cinematic concealable camera (p. 39) is a better option, if it is available. Both are two-space items and are HT 9 for purposes of surviving abuse.

Concealed Tool Kit (TL5): A neatly packed collection of small screwdrivers, wrenches, files, etc. Its usefulness depends on the skill being used and the job at hand, but it represents at least improvised equipment (-5 quality) for almost any technological task. For routine tasks involving physically *small* problems, it might stand in for a mini-tool kit (p. 40). $50, 0.75 lb.

Drink Flask (TL4): A glass-lined bottle with a stopper that doubles as a small drinking cup. Can hold up to 1/4 pint (0.25 lb.) of liquid. $20, 0.25 lb. empty.

Emergency Pistol (TL6): Somewhat more substantial than the one-space miniature pistol (p. 44), this is nonetheless intended primarily for firing signal flares, not for combat. It has to be partly dismantled for loading. It has a very short barrel and a necessarily unconventional grip, being fired by a thumb trigger on the side, which limits its hitting power and accuracy. It takes standard .38 pistol cartridges ($0.20 each), and can back up an intimidation attempt or be used in a stealthy attack to obtain a more serviceable weapon. Dmg 1d pi, Acc 0, Range 60/990, Wt. 0.75/0.021, RoF 1, Shots 1(10), ST 8, Bulk -1, Rcl 2, Cost $330. Many concealing items make the gun hard to aim effectively, giving -1 to -3 to skill at the GM's discretion. Flare cartridges ($1 each) come in multiple colors, and can be seen for a mile or so if fired into the air; the burst lasts five seconds. If fired at a target, they have half the above ranges and do 1d-2 cr *and* 1d-2 burn. They continue inflicting burning damage every second for 2d seconds if they somehow remain in contact with the target. They can also unnerve pyrophobic monsters and easily ignite flammable materials.

Fighting Knife (TL1): A large or small knife; see p. B272. Add $5 to work the sheath into the concealing space, which must have at least 9" of available length. Drawing from a concealed sheath may take several seconds. A cinematic (TL(4+1)) *spring sheath* can release the blade for immediate use at the touch of a catch, giving +1 to Fast-Draw rolls; add $100 to the cost for such a mechanism. A correctly spring positioned sheath might even enable a familiar user to bring the weapon out as a free action with no roll required.

Microscope (TL5): A 50× folding microscope. Requires a fair amount of ambient light, or something like the mini-torch (p. 44). HT 10 to resist damage. $60, 1 lb.

Periscope (TL4): A folding system of lenses and mirrors. Fully extended, it allows looking around corners from up to 1' away. $20, 0.5 lb.

Three-Space Items

These are the largest devices that can usually be fitted into concealing objects. A standard purchasable device or object, or a device defined using the rules for *Calculating Machines, Mechanical Mentalities, and Information Storage* (pp. 7-18), can fit in three spaces if it weighs no more than 2 lbs., but the GM should apply common sense as to what a given space can accommodate.

Air Bottle (TL6^): A supply of compressed air with an attached mouth tube and a nose clip, allowing a user to breath underwater (or in some gas-filled rooms) for up to five minutes. Not very realistic without TL7 scuba technology! Refilling the bottle costs $5. $50, 2 lbs.

Cane Rifle: See p. 31. In effect, a cane rifle is a three-space item with minimal concealment that lets it pass as a regular gentleman's stick. Such a weapon could be concealed within any object of the right general shape – so, for example, a hiking staff could conceal a gun and some spare ammunition or other devices.

Climbing Belt (TL5): A belt with an attached strap that loops around a telegraph pole or similar for aid in climbing; +2 to skill in those circumstances. The strap can support up to 250 lbs. $65, 2 lbs.

Enhanced Tool Kit (TL5): Similar to the concealed tool kit (p. 44), but with a better selection of larger tools. Once again, its usefulness depends on the job at hand, but it's almost always *some* use. For routine problems that don't involve physically large or heavy components, it can stand in for a mini-tool kit (p. 40). $100, 2 lbs.

Grapnel (TL6): A folding grappling hook with attached rope. A plausible TL6 version has a hook and seven yards of rope, all able to support 200 lbs.; $40. A TL(6+1) or somewhat cinematic version has 20 yards of rope, and the assembly can support 250 lbs.; $50. A distinctly cinematic TL(6+1) version comes with a high-power spring launcher that takes three seconds to cock, with 50 yards of rope, and the hook and rope can support 300 lbs.; $200. All versions weigh 2 lbs. in total. *Throwing* a hook to lodge somewhere requires a ranged attack roll against Throwing skill or DX-3, with a maximum range of ST×2 yards. Using the spring launcher requires a roll against Crossbow skill, but it can be aimed, with Acc 1, and it is fully effective out to 50 yards. (Shooting an opponent with it would be a desperation measure; damage 1d-2 cr.) All ranges are halved when shooting upward to more than 60°. Gathering up the rope and hook after a missed throw or shot takes 2d seconds.

Miniature Telegraph Set (TL6): A miniaturized version of the device on p. 19, with a dry battery and 20' of paired wire. Two spare batteries take up another space if also carried concealed and cost $3. For use, it must be spliced into a telegraph line (needing just a pocket knife and an Electrician or Electronics Repair skill roll at +5, but somebody may have to climb a telegraph pole). The undersized key gives -3 to Electronics Operation (Communications) skill. The battery lasts for 10-15 minutes of operation. $60, 1 lb.

Spyglass (TL5): See p. 38. A full-sized spyglass designed for this sort of concealment costs $50, and has HT 9 to resist damage from misuse. Note that it will need to be concealed in something at least 12" long, and is impossible to hide while in use.

No enterprise is more likely to succeed than one concealed from the enemy until it is ripe for execution.
– Niccolo Machiavelli

Example Combinations

Explorer's Staff: When venturing into disputed territory, a fellow doing research for his country may prefer to be taken for a harmless wanderer, while being prepared to buy his way out of minor difficulties. This hiking staff incorporates a coin holder, a magnetic compass (under a cover at the top of the staff, for ease of quick reading), a mini-torch (mounted just below the compass, with the bulb under a concealing cover directed at right angles to the staff, and a similarly concealed on-switch), a sealed capsule, and a microscope. The whole assembly weighs 4.3 lbs. (plus anything in the coin holder and capsule) and costs $205.

Gentleman's Necessary Cane: A regular gentleman's stick with a stylish lacquer-and-gilt finish (+2 reactions from admirers of gentlemen's fashion who get to look at it), incorporating a drink flask and a magnetic compass (to enable one to find one's way home after consuming the contents of the flask). $220 and 1.75 lbs., plus the contents of the flask.

Lady-Spy Garb: A female spy might go fashionably dressed in a Status 1 medium-weight outfit with *heavy layering, heavy structuring,* and *moderate embellishment,* and *stylish* enough to give +1 reactions from admirers of fashion; this example is also crafted by her secret employers' specialists for *undercover* use (+1 to Holdout skill). See *Garment Modifications,* p. 23, for details on the various modifiers. Then, the makers give the dress half weight for +50% cost; see *Reduced Weight,* p. 23. This garment includes a fancy hat, and the lady-spy can also have high boots as *stylish* as the dress. From head to toe, the lady-spy carries a concealable camera in her hat (sharp-eyed observers might sometimes notice the lens emerging from between the glass-bead decorations), a miniature pistol in her right sleeve, a TL6 monocular in her left cuff (from which it can be deployed or folded away in an instant), 30 rounds of spare ammunition for the pistol and a set of lockpicks in hidden pockets under the ruffles on her bodice, a foldout periscope hidden in her bustle, a dagger sheathed in her right boot, and a wire saw in the left. She *also* has a total +3 to Holdout rolls when secreting yet more items on her person. The entire dress gives her DR 1 against non-impaling damage, and the rigid elements (the corset, bustle, and hat) provide another +1 DR against all damage on the relevant locations. The dress with its hidden items does weigh 15.95 lbs. plus 3.25 lbs. for the boots (with dagger), and the whole ensemble costs $3,876, but this lady is ready for anything.

Assassin's Arm: A cinematic TL(6+1) prosthetic arm (see p. 47). The hand and forearm contain a large knife. The blade itself is held within the forearm, and a spring mechanism in the hand can lock onto it at the touch of a switch and draw it forward instantly to extend over the upper side of the hand. It is never entirely released; rather, the user can fight with it in that position (though learning to use it this way requires familiarization). Also, the upper arm contains a mini-torch, which folds sideways out of the limb for use; the user typically walks around with the arm raised and bent at the elbow while using the torch. $4,320 and 9.25 lbs. total.

Diana Prince: Is this what passes for armor in your country?
Etta Candy: Armor? Well – it's fashion. It keeps our tummy's in!
– Wonder Woman

Steampunk Prosthetics

In game terms, prostheses are Mitigators (p. B112) that let the wearer "buy off" crippling physical disadvantages with the help of technology. However, they may also impose additional minor disadvantages. For example, at TL5, rather clumsy but serviceable constructions of wood, rubber, and catgut make the following possible.

Prosthetic Arm (TL5): Replaces One Arm [-20] with One Arm (Mitigator, Can be removed with difficulty, -70%) [-6], Ham-Fisted 2 (One Arm, -40%) [-6], and a minor variant Taboo Trait; the user can't take any trait (or attempt any task) that requires sensitive touch with that hand. $2,000, 3 lbs.

Prosthetic Leg (TL5): Replaces Missing Leg [-20] and the associated Basic Move reduction [varies] with Missing Leg (Mitigator, Can be removed with difficulty, -70%) [-6], Basic Move reduced to 3 [varies], and a further Basic Move -1 (Mitigator, Can be removed with difficulty, -70%) [-2]. $2,000, 6 lbs.

At the same TL, the One Hand disadvantage allows the possibility of a crude "gripper" prosthesis for free. This gives some manipulatory ability, but -2 to any task performed with that hand. The GM may choose to make the penalty worse for some tasks (up to the equivalent of Bad Grip 2 or Ham-Fisted 2 in that hand only). Likewise, other tasks – especially those that require a working sense of touch – are functionally impossible with that "hand" (as with the Taboo Trait mentioned for the prosthetic arm). Blatantly mechanical prostheses like these are not only in period for the Steam Age, they fit the steampunk aesthetic rather well. TL5 prostheses, being mostly made of wood, are DR 2 and have 6 HP per limb or 2 HP for a gripper hand, and have HT 10, Injury Tolerance (Unliving), and Fragile (Combustible).

More advanced technology permits better prostheses. Real-life TL8 designs use microprocessors, miniature electric motors, and hydraulics, responding to movement in the tendons and muscles in the wearer's stump to give a fairly comprehensive set of abilities, even restoring movement to people who have lost both legs. This sort of thing might be partially emulated by steampunk mechanical ingenuity, and steampunk *superscience* might go further. (TL8 science is even developing prostheses that actually interface with the nervous system, but steampunk superscience rarely gets *that* effective.) The following are possible designs at a divergent and slightly advanced TL6.

Prosthetic Arm (TL(6+1)): Replaces One Arm [-20] with One Arm (Mitigator, Can be removed with difficulty, Needs rewinding every 10 minutes, -60%) [-8]; Taboo Trait (No delicacy of touch). A cinematic version adds Arm ST 6 (One Arm; Breakable, DR 4, Machine, SM -2, -40%; Can Be Stolen, Must be forcefully removed, -10%; Nuisance Effect, Each second of use counts as a minute of use for the Mitigator, -10%) [8]. $4,000, 5 lbs.

Prosthetic Hand (TL(6+1)): Replaces One Hand [-15] with One Hand (Mitigator, Can be removed with difficulty, Needs rewinding every 10 minutes, -60%) [-6]; Taboo Trait (No delicacy of touch). A cinematic version adds Arm ST 6 (One Arm; Accessibility, Hand grip only, -40%; Breakable, DR 4, Machine, SM -4, -35%; Can Be Stolen, Must be forcefully removed, -10%; Nuisance Effect, Each second of use counts as a minute of use for the Mitigator, -10%; Limitations restricted to -80%) [4]. $2,000, 1 lb.

Prosthetic Leg (TL(6+1)): Replaces Missing Leg [-20] and the associated Basic Move reduction [varies] with Basic Move reduced to 2 (Mitigator, Can be removed with difficulty, Needs rewinding every 10 minutes, -60%) [varies]; Missing Leg (Mitigator, Can be removed with difficulty, Needs Rewinding every 10 minutes, -60%) [-8]. A cinematic version adds Basic Move +2 (Breakable, DR 4, Machine, SM -2, -40%; Can Be Stolen, Must be forcefully removed, -10%; Nuisance Effect, Each second of use counts as a minute of use for the Mitigator, -10%) [4]. $4,000, 8 lbs.

Prosthetic Legs (Pair) (TL(6+1)): Replaces Legless [-30] and the associated Basic Move reduction [varies] with Basic Move reduced to 0 (Mitigator, Can be removed with difficulty, Needs rewinding every 10 minutes, -60%) [varies]; Legless (Mitigator, Can be removed with difficulty, Needs Rewinding every 10 minutes, -60%) [-12]. A cinematic version adds Basic Move +4 (Breakable, DR 4, Machine, SM -2, -40%; Can Be Stolen, Must be forcefully removed, -10%; Nuisance Effect, Each second of use counts as a minute of use for the Mitigator, -10%) [8]. $8,000, 16 lbs.

The Taboo Trait included with the arm and hand works as for the TL5 arm (p. 46); the person simply cannot take traits or attempt tasks that require tactile sensitivity in that hand. Any of these prostheses can also justify taking the Distinctive Features quirk; a clicking, riveted brass-and-iron limb is hard to hide! Steampunk prostheses are DR 4 and 8 HP per limb or 4 HP for a hand, with HT 10 and Injury Tolerance (Unliving).

Concealed Devices

In addition, prosthetic limbs can hold concealed devices (pp. 43-45). With TL5 prostheses, there is room for one space in *each* of the upper arm, forearm, and hand (three in all) of an artificial arm; one in a low-tech artificial "grabber" hand (p. B147); and two in the upper leg, one in the lower leg, and one in the foot (four in all) of an artificial leg. Add the option of an extra space to each arm or leg in cinematic games, where the matter of providing enough room for the limb's internal mechanisms can be hand-waved away. In all cases, add $50 to the cost for each space added, as the prosthesis has to be hand-modified by a specialist craftsman.

Steampunk TL(6+1) prostheses cannot plausibly feature concealed devices, as most of their interior space has to be given over to their advanced mechanisms. However, cinematic or superscience versions might manage the trick anyway, providing as much space as for the TL5 versions.

It might be just about possible to conceal a cane rifle-style firearm (pp. 31, 45) inside a prosthetic limb, especially in a cinematic game. It would occupy three spaces in the limb, and would only work with the limb extended straight out, with the lock and two sections of the barrel bolting together in this position. How long the weapon would take to deploy or unlock would then be up to the GM; it would take seconds in a very cinematic game, minutes in something more "realistic." Reloading one-handed would just be a matter of practice and double time.

Steampunk Chemistry

While steampunk technology is mostly assumed to be a matter of steam and steel, a complete view of the Steam Age has to encompass its medicine and chemistry, which does sometimes head off into the realms of superscience. Certainly, historically, TL6 was largely started by the development of synthetic chemistry (see ***Steampunk 1,*** p. 19).

> *I should much wish . . . to float along an infinite ocean cradled in the flower of the Lotus . . .*
>
> *– Samuel Taylor Coleridge*

Medical Treatments

Unfortunately, the medicine of this period realistically didn't feature antibiotics, and surgical anesthesia only became fully effective as the 19th century progressed. Indeed, antiseptics, sterile procedures, and the most basic understanding of the causes of disease evolved from a very low starting point during the period. Hence, the chance of surviving many significant medical problems was frighteningly low, and treatments tended to be painful as well as unreliable. See ***GURPS Bio-Tech,*** especially Chapter 5, for rules for medical and surgical treatments, noting how many important technologies didn't appear until late TL6, and the original ***GURPS Steampunk,*** pp. 63-65, for rules for period medical and surgical treatments, complete with painful and risky consequences, that can still be used with ***GURPS*** *Fourth Edition.*

However, period superscience and fictional convention can get around these problems for the sake of keeping games from getting too dark. For example, if "vitalism," the idea that life is defined by an intangible force, is valid, then TL(5+1)^ medical scientists might be able to manipulate and channel this *élan vital.* They might, say, amplify a person's "life energies" to help him resist disease, or direct additional energy into an injured patient to bring about rapid recovery from injury.

And if blood typing is not only unknown but also invalid, then emergency blood transfusions from whoever are available, as seen in Bram Stoker's *Dracula,* might not be such a terrible idea as they would be in real life.

Some Historical Drugs and Medicines

Activated Charcoal: First produced on an industrial scale at the start of the 20th century (TL6) and taken in the form of tablets, this can partially absorb substances in the stomach, giving +3 to HT rolls to resist ingested poisons. However, it is *not* effective against some substances, including strong acids or alkalis, cyanide, and alcohol. $1/dose.

Anesthetic Gases: Ether had been known for centuries as a chemical with occasionally interesting effects on people, while nitrous oxide ("laughing gas") was first synthesized in 1772, and was soon found to have an intoxicating effect. A minor fad for recreational use of both gases followed during the early 19th century. Meanwhile, chloroform was first synthesized around 1831. Then, during the 1840s, doctors realized that all three could be used to render patients unconscious during surgery, making this a TL5 invention, although the technique was refined over subsequent decades. The chemicals are applied to the face on a cloth (in the case of chloroform) or through a mask. After five minutes for chloroform or nitrous oxide, or 10 minutes for ether, roll vs. HT-3 for chloroform or ether or HT-1 for nitrous oxide; on a failure, the patient falls unconscious. (Cinematic chloroform works much faster!) Note also that ether is very flammable and can be explosive. $5/dose.

Aspirin: The trademarked name for acetylsalicylic acid, invented in 1853, with efficient synthesis invented in 1897 (TL6). This is a useful treatment for chronic pain, inflammation, and fever, though potential toxic side effects have made it less popular in our time. A low dose (1-2 tablets) negates the penalty from pain (p. B428) after all other modifiers have been applied by -1 for 4-6 hours. Higher doses can negate the penalty by -2, but require a HT roll to avoid nausea (p. B428). $3/100 tablets.

Cocaine: Extracted from the South American coca plant in 1855 and investigated as a medicine over the next couple of decades (TL6), this is a powerful stimulant (p. B440), and was legal in the Steam Age. Sherlock Holmes was famously an occasional user, and Sigmund Freud enthusiastically explored its medical potential, apparently becoming a borderline addict for a short period, before discovering the dangers of psychological addiction. It can also be used as a local anesthetic, giving High Pain Threshold in the area into which it is injected. $2/dose.

Morphine: Derived from the opium poppy at the start of the 19th century (TL5) and put on the market a few years later, this became a widespread medical painkiller; use the rules for *Depressants* (p. B441). Unfortunately, being an opiate, morphine is addictive and sometimes misused. $1/dose.

Opium: Used medicinally (and recreationally) for millennia, possibly since TL1 times, this was widespread (and entirely legal) in the 19th century, often in the form of *laudanum* (opium dissolved in alcohol), which was the basis of many patent medicines; see also ***Steampunk 1,*** p. 47. It is commonly part of the doctor's tool kit for dealing with pain and inducing sleep. Use the rules for *Depressants* (p. B441), treating this as a sedative, and allow users +2 on rolls to resist the effects of pain. Careless use can definitely lead to addiction. $2/dose.

Patent Medicines: The Steam Age was an era of unregulated off-the-shelf medicines, generally advertised with grandiloquent claims. Some were harmlessly ineffectual and might even have helped via the placebo effect, a few (at the GM's whim) may have contained a few herbal ingredients with some kind of beneficial qualities, and some were downright toxic, though rarely instantly fatal. Many contained a high proportion of alcohol, making some users all too keen to keep taking them. In game terms, this effect would usually represent a -10-point Addiction (cheap, incapacitating, legal) rather than Alcoholism, because the user wouldn't *know* that binging on booze would achieve exactly the same result! Prices could be almost anything, but a dollar or two a bottle is plausible.

Atavism and Recapitulation

The development of Charles Darwin's theory of evolution in the Steam Age opened questions about human beings; if they were descended from animals, how much did they have in common with these ancestors? Could human beings even demonstrate *atavism,* reverting to pre-human forms or behaviors?

Certainly, in the late 19th century, studies of mammal and bird embryos showed that they manifested features that seemed to come from an earlier stage of evolution as they developed, such as gill-like structures; human embryos also seemed to grow and then lose tails. This lead German biologist Ernst Haeckel to suggest that "ontogeny recapitulates phylogeny"; in other words, that the development of an organism through its existence recapitulates each stage in its evolutionary history. Today, this is regarded as a massive oversimplification at best, but as period superscience, it offers some possibilities; see, for example, *Ontological Atavizing Drugs,* pp. 51-52.

Likewise, Steam Age psychologists became increasingly open to the idea that human behavior might sometimes be, essentially, atavistic, even "bestial" – a very frightening possibility! The story of Dr. Jekyll and Mr. Hyde (see p. 49) involves Jekyll exploring his baser instincts and shifting to a *physical* form that seems somehow animalistic in the process. The Sherlock Holmes story "The Adventure of the Creeping Man" involves similar ideas.

Steampunk games may feature themes of atavism and recapitulation. However, if they are to preserve a period feel, this sort of thing should seem like a worrying challenge to the established order of things, in which humanity is seen as unique and superior. Fright Checks from social disorder may be in order; see ***Steampunk 1,*** pp. 40-43. Conversely, of course, steampunk games may be about a brave and challenging new world, in which a clear-eyed understanding of the true nature of humanity offers wonderful possibilities for progress.

The Jekyll Treatment

Robert Louis Stevenson's *Strange Case of Dr. Jekyll and Mr. Hyde,* from 1886, is a classic tale of period superscience and atavism (see p. 48). Hence, it is something of a standard steampunk text.

The basic plot is well-known: The respectable and brilliant doctor Henry Jekyll creates a potion that temporarily transforms him into the hideous and brutal Edward Hyde, who commits various crimes until the transformations start to run out of control. Eventually, Hyde is killed. In the original novella, Hyde looks quite unlike Jekyll; later dramatizations like to have both played by the same actor, albeit with different make-up and mannerisms. Also, Hyde is described as *smaller* than Jekyll, which is explained by the fact that Hyde is created as a repository for the rather minor dark aspects of Jekyll's personality. (Don't ask where the spare mass goes.) Conversely, some modern treatments make Hyde a hulking brute, not only bigger than Jekyll but possessing superhuman strength and resilience.

Initially, the transformation is only triggered by use of Jekyll's potion, but as time goes by, it starts to occur spontaneously. Jekyll tries to use the potion to control it, but this proves ultimately unsuccessful. (There are hints that certain *impurities* in some of the ingredients of the first batch were actually necessary for it to work properly.) Eventually, Hyde takes over entirely.

In ***GURPS*** terms, the original "Jekyll treatment" induces a variant form of the Split Personality disadvantage (p. B156), with the peculiarity that the two personalities can have significantly different appearances. Although Hyde is smaller than the tall, dignified Jekyll, he displays a lot of brutal vigor, so giving both of them the same physical attributes is reasonable. However, if someone used the same treatment to produce an even smaller and weaker – or bigger and more forceful – alternate, the package of variant character details might also include some attribute variations. Some quite minor events act as "stressful situations," and the self-control number on the disadvantage starts to fall (at least for Jekyll) in the course of the story.

This game version might have -28-point disadvantage packages, giving Jekyll Code of Honor (Hippocratic Oath) [-5], Oblivious [-5], Overconfidence (12) [-5], Pacifism (Reluctant Killer) [-5], Shyness (Mild) [-5], and the quirks "Always displays gentlemanly behavior," "Ashamed of unspecified personal vices," and "Looks for easy fixes to problems" [-3], while Hyde has Bad Temper (12) [-10], Bloodlust (15) [-5], Callous [-5], and Ugly [-8] (he gives an indefinable impression of evil). Both have a Secret (their dual nature) that starts at -10 points, and rises to -20 when Hyde is wanted for murder. However, Jekyll created the formula specifically as a way for him to indulge those unspecified (and quite likely fairly minor, by modern standards) personal vices. It is entirely possible that if someone else recreated and sampled his formula, they would come up with two rather different personality packages. Indeed, variants might divide out, say, someone's "controlled and rational" and "intuitive and spontaneous" or "casually romantic" and "fiercely loyal" aspects. And although Jekyll's control over Hyde ultimately collapses, a better version of the formula, and two personae who reached some kind of equilibrium, might keep a Jekyll-Hyde division fairly stable for an indefinite period – so long as the "Hyde" side could avoid becoming a hunted criminal.

Super-Hyde?

To emulate modern treatments of the idea that present Hyde as a superhuman villain, use the Alternate Form version of Shapeshifting (p. B83-84), with the human Jekyll as the base form. The alternate form might eliminate some of the base form's disadvantages, such as Pacifism; simply add the cost to do so to the alternate's template, as if it were an advantage.

The conditions to force Hyde to switch back might be simple time, an "antidote" chemical, or Jekyll's deepest principles being threatened and the Jekyll-persona winning a Quick Contest of Will against Hyde. If the transformation requires the potion, add suitable gadget limitations. The advantage might also have another limitation, "Preventable" (-10%), to reflect the fact that other individuals can intervene to prevent the transformation, but it is more likely that the advantage will take the Uncontrollable limitation. If Hyde remains Hyde even if knocked unconscious, add a +50% enhancement ("Once On, Stays On") to the base 15 points, and raise the form-specific cost from 90% to 100% of the template cost.

Quinine: Isolated from a South American plant in 1820 (TL5), this fever treatment became a key element in the history of colonialism (see ***Steampunk 1,*** p. 17). It suppresses but does not actually cure malaria, giving +3 to HT rolls to recover from the symptoms, or, if taken preventatively, +5 to HT rolls to avoid contracting the disease. $1/dose.

Steampunk Drugs and Medicines

"Steampunk science" can encompass chemistry and medicine as well as engineering, and weird and wonderful drugs and medicines certainly do crop up in period stories and occasionally in modern steampunk. These tend to be marvelous or scary one-off creations of borderline mad science (or full-on craziness), rather than the products of a coherent pattern of technological progress, but there are exceptions. Steampunk drugs may also interact with other period superscience, such as semi-rationalized spiritualism. Some are simply weird botanical discoveries imported from underexplored regions of colonial empires, with effects that don't really *have* to be explained much, because they are new to science. In any event, all of the following are entirely fictional!

Psychic Drugs

These may be available in a game where various Victorian-style psychic powers actually work. See also *Converting Third Edition Psychic Technology,* below.

Ecstatin: A TL(5+1)^ invention that can be used to induce the ability to enter a deathlike trance, exactly as for the Metabolism Control advantage (p. B68). Administration requires an attending doctor, who must make a Physician roll at -1 per level of the advantage effectively granted. A critical success grants the equivalent of Metabolism Control 10, a normal failure just causes the subject to enter normal sleep, and a critical failure does 1d HP injury per intended level. Optionally, subjects in a trance may gain use of the Astral Projection power from ***GURPS Psionic Powers,*** pp. 26-30, with the abilities Astral Sight and Astral Travel at levels equal to the effective level of Metabolism Control; the controlling skills are temporarily gained at default+3, or can be learned normally to make the drug more useful. The treatment costs $250 per intended advantage level granted if the trance is the only effect, or $1,000 per level if the drug also grants Astral Projection.

Etheric Affinity Compound: The product of TL(5+1)^ scientific research into direct human sensitivity to etheric vibrations, this chemical temporarily bonds to the user's nervous system and enhances that sensitivity by resonant effects. In game terms, 10 minutes after consuming a teaspoon-sized dose, the user gains +3 to Will rolls to enter a trance to use Channeling (p. B41) and needs only 30 seconds of concentration to do so, halves the time required to trigger the Medium advantage (p. B68) if it was bought with Preparation Required, and gains Spirit Empathy (p. B88) but with -2 to the IQ roll and no ability to use Influence skills on spirits – or, if he already has that advantage, he gains +3 to the IQ roll and +1 to Influence skill rolls on spirits. The drug also grants +2 to rolls to use the Mind Probe, Mind Reading, or Telecommunication advantages if they have the Telepathic limitation. However, it *also* gives other people +4 to use any advantages on the user that have the Telepathic limitation, or the Psychic Vampirism limitation if using ***GURPS Psionic Powers.*** Spirits attempting to use Possession with the Spiritual limitation (pp. B75-76) on the user do so with +2 to the IQ roll, and the user has -2 to Will rolls to resist. All of these modifiers decline by 1 for each full hour since the chemical was ingested. For example, after an hour, the user is at +2 to enter trances and +1 to use Telepathic advantages, and spirits attempt Possession at +1 and are resisted at -1. Each dose costs $10, or more if the drug is still experimental; multiple doses have no cumulative effect.

Spiritual Inhalant: A TL5^ invention based on various plant extracts which were traditionally held to have "spiritual" qualities, this mixture must be vaporized in a special "nebulizer" and then inhaled. The user immediately suffers 2d FP loss and -2 DX, will want to sit or lie down, and suffers a numb throat, making it impossible to speak in more than a whisper. He must also make a HT roll, at -2 if unfamiliar with the practice. On a successful roll, he gains +2 levels to ESP and Telepathy Talents – or, if using the rules in ***GURPS Psionic Powers,*** +2 levels in any leveled advantages already possessed in the Astral Projection, ESP, and Telepathy power categories, and +2 to skill in any non-leveled abilities in those categories. On a critical success on the initial roll, the bonuses are +4 rather than +2; a critical failure just leaves the user incapable of speech for 1d+2 hours. Otherwise, all effects, good and bad, last for 1d+27 minutes. If multiple doses are taken, only the bad effects are cumulative. A dose costs $20; the nebulizer and other paraphernalia (wonderful props even for complete frauds) cost $500, weigh 4 lbs., and are quite fragile.

Yet, the Universe is real enough to the conscious beings in it . . .
– Helena Blavatsky

Converting Third Edition Psychic Technology

Psychic and psionic powers are handled a little differently in ***GURPS Fourth Edition*** than in earlier books; hence, drugs and other technologies that interact with them need a little converting. Three substances from ***GURPS Steam-Tech,*** pp. 105-110, are translated here: *spiritual inhalant, etheric affinity compound,* and *ecstatin.*

Drugs and other "psychic technology" in Third Edition games either enhance *power,* which encompasses a range of related psionic effects (for example, Telekinesis power covers moving things at a distance, creating a defensive shield against physical attacks, and other options) or improve the user's *skill* with a specific effect. The latter corresponds more or less directly to the kinds of rolls that are enhanced by a power Talent in Fourth Edition; any bonus to skill granted by a drug or technology can generally be applied to such rolls and be treated as a temporary increase to the relevant Talent.

Power enhancers are more complicated. Power may determine range, effect durations, the mass affected, the damage caused, or other variables. Where these are easily variable in Fourth Edition terms, simply increase the value by one reasonable step per +1 power – say, +1d damage, +3 DR protection, +50% mass affected, or whatever. Ranges might also be improved by one step on the *Long-Distance Modifiers* table (p. B241). Alternatively, convert bonuses to power into bonuses to effective psi Talent, which can represent power as much as finesse – for example, a more powerful telepath may be better at reading minds because of greater subtlety or because of raw power cutting through barriers – and higher Talent can compensate for range penalties.

If the game uses the alternative, more complex rule systems in ***GURPS Psionic Powers,*** the conversion process is actually simpler. Bonuses to skill in Third Edition terms convert directly to bonuses to the psionic skills defined in that book, and modifiers to power convert to modifiers to the levels defined for many abilities there. Where an ability lacks multiple levels, change power modifiers into skill modifiers.

Atavistic Features Table

Advantage Bestowed	*Week of Pregnancy*	*Physician Penalty*	*Cost per Course*	*Notes*
Doesn't Breathe	6th	-5	$80,000	[1]
Amphibious	9th	-5	$110,000	
Scales	11th	-2	$18,000	[2]
Sharp Teeth	16th	-3	$45,000	
Claws	17th	-1	$25,000	[3]
+4 ST	21st	-4	$90,000	
Catfall	24th	-3	$55,000	
Discriminatory Smell	26th	-2	$40,000	
Fur	28th	0	$11,000	[4]
+2 DX	33rd	-3	$9,000	
Brachiator	35th	-1	$33,000	

Notes

[1] With the limitations "Can still be strangled in air," -30%, and Gills, -50%.

[2] A perk that prevents sunburn. In addition, on attaining adult growth, the person can also buy DR 1 or 2 with the Flexible limitation (pp. B46-47).

[3] May be Blunt Claws or Sharp Claws. At the GM's option, the person may also suffer from Bad Grip 1 (p. B123), as the claws get in the way.

[4] On attaining adult growth, the person can also buy DR 1 with the Flexible limitation or Temperature Tolerance 1 or 2 (or both).

Atavistic Misfortunes Table

Roll	*Monstrosity*
2	-4 IQ *and* Bestial (-10-point version).
3	Non-Iconographic, Odious Personal Habits ("Creepy" behavior, -1 reactions), *and* Short Attention Span (9).
4	Clueless *and* Odious Personal Habits (Reflexively animalistic behavior, -3 reactions).
5	Roll 1d: 1 – Bad Smell, 2-3 – Disturbing Voice, 4 – Dwarfism, 5-6 – Hunchback.
6	Bad Temper (12), Berserk (6), *and* Bloodlust (9).
7	Alcohol Intolerance, Nervous Stomach, *and* Unusual Biochemistry.
8	Colorblindness.
9	Bad Grip 3.
10	Cold-Blooded (-10-point version).
11	Cannot Speak.
12	Roll again, twice.

Ontological Atavizing Drugs

These are actually a collection of related treatments using TL(6+2)^ drugs which are administered to pregnant women. They exploit the period superscience idea that human embryonic development recapitulates human evolution (see *Atavism and Recapitulation,* p. 48). They are given to the women under controlled conditions, and collectively, produce fixed atavistic features that last beyond birth, taking the form of advantages or attribute improvements for game purposes. (If the theory of recapitulation is erroneous in the setting, some mad scientists may be experimenting with ineffective versions of these drugs, producing only horrible mutations.) The drugs must be given over the course of a week at the correct stage of pregnancy, and require a successful Physician roll at a penalty dependent on the atavism required; see the *Atavistic Features Table,* above. Multiple treatments may be (and often are) applied to one pregnancy, but each treatment after the first requires another Physician roll, at an additional cumulative -2.

Realistically, some of these features would be easier to add to the human body plan than others. It would, for example, be very difficult for a mammal to extract sufficient oxygen from water using gills, which would also cause persistent, severe problems with body heat loss in water. The GM may modify the list to reflect such concerns.

In addition to the listed benefits, if these treatments are rare or secret, the offspring will probably suffer from Distinctive Features (p. B165) or some level of Unnatural Features (p. B22), determined by the GM, reflecting visible gill slits, webbed extremities, strange posture, fur, scales, pointy teeth, etc.

A Physician roll failed by 4 or less means the drug has no effect. A worse ordinary failure indicates miscarriage, while a critical failure results in the baby being born alive but with some monstrous atavism. This takes the form of 1d-1 (minimum 1) levels of Unnatural Features (forked tongue, pointed ears, odd pigmentation, etc.) and a Taboo Trait (Appearance better than Average). *In addition,* roll 2d on the *Atavistic Misfortunes Table,* above, choose something from that table that fits the atavism being attempted, or make up something new and ghastly. In some settings, some *successful* treatments – say, on an exact success on the Physician roll – may *also* produce such monstrous effects.

Use of atavizing drugs is most likely to feature in screampunk games, with scientist-doctors of questionable sanity (or morally bankrupt governments) meddling with the very basis of human life to create monsters to serve some dubious purpose or just because they *can*. The situation of mothers who agree or are forced to submit to these treatments could make things especially dark. However, it might be possible to run a "steampunk transhumanist" game in which carefully controlled atavism is used to move humanity forward, and people are proud to give their children extra capabilities, even at some risk.

The existence of these drugs can of course serve to justify giving PCs special advantages and disadvantages. If they are very rare or obscure, this may also require an Unusual Background.

Acalliopine

The Steam Age was acutely aware of the posited relationship between creative artistic abilities and certain psychological problems, which were sometimes actually referred to as a "poetic temperament." This TL5^ drug represents a chemical solution to the issue as it was perceived at the time. It costs $5 per dose – an ounce or two of black, sour-tasting, oily liquid.

It can act as a Mitigator (p. B112) to Chronic Depression or Manic-Depressive, probably at the daily dose (-60%) level, although some cases may permit weekly treatments (-65%), and the drug may be expensive (+5%) or experimental (+10%) in some settings. However, it also inflicts Incompetence (p. B164) with both Connoisseur (Poetry) and Poetry; all users have this as a quirk (just one quirk – the skills are closely related, and can be accessed by coming off the drug).

In addition, some users gain an intense psychological Addiction (p. B122) to the clear, orderly view of the universe which acalliopine grants. It is cheap, legal, and highly addictive, for -5 points. Treat it as a stimulant, except that it doesn't affect FP or grant Doesn't Sleep, and the Overconfidence it provides only applies to intellectual pursuits. A lucky few addicts *also* gain some level of Mathematical Ability (pp. B90-91), with a -5% limitation ("Acalliopine-Based") to reflect the fact that if they come off the drug, they lose the Talent. If they shed the addiction, they must also buy off this limitation; alternatively, some recovering addicts reassign the points from that Talent to some combination of Versatile (p. B96), Poetry skill, and buying off the quirk.

Invigramine

Many Victorian patent medicines (see p. 48) claimed to enhance or restore personal vigor, often with a hint of improved sexual function. This TL(5+1) example actually *works,* in its way – better than is realistic for any known stimulant, in fact. It is marketed as intended solely for men, but actually functions in exactly the same way for both sexes.

When a dose is taken, roll vs. HT. On a success, it completely restores all lost FP *and* increases the user's base FP by an amount equal to *half* the margin of success of the roll, rounded up. However, success or not, the user always gains the Lecherousness disadvantage with a self-control number of 12, or if he already has that disadvantage, the self-control number drops by one level, to a minimum of 6 (thus, 15 becomes 12, 12 becomes 9, and 9 becomes 6). On a critical failure on the HT roll, the user only gains Lecherousness (6).

All effects last for 2d+55 minutes, after which, any FP lost while the drug was in effect, plus an extra two, are subtracted from the user's normal FP score; if that reduces FP to zero, take the rest from HP. Additional doses taken while the first is in effect or for two hours afterward have no effect on fatigue, but have the full, cumulative Lecherousness effect.

Invigramine costs $5 for a dose, taking the form of a small bottle full of greenish liquid. The manufacturer adds a peppermint scent for no particular reason.

Explosives

An explosive's relative explosive force (REF) defines its power; see p. B415. The best type available at TL5, for almost every purpose, is "black powder" (known at the time simply as gunpowder). The black powder on the *Explosives Table* (p. 53) represents the best available. It is traditionally carried in 100-lb. kegs, which do 6d×14 cr ex damage if they explode.

Advances in chemistry at the start of TL6 create a lot more choices. The three most useful options available by the end of the 19th century are:

- Dynamite, invented in 1867, for demolitions and mining.
- "Smokeless" powders, developed in the 1880s, for firearm propellants.
- TNT, invented in 1876, for demolitions and military warheads.

Dynamite consists of the powerful but unstable liquid explosive nitroglycerin, soaked into a stabilizing material. Its specific behavior makes it unsuitable for warhead use. Although it is very safe to handle when new, it "sweats" and becomes dangerously unstable with age. It typically comes in 0.5 lb. sticks (9d+1 cr ex damage).

Smokeless powders, while not entirely smokeless, produce much less smoke than the usual firearm propellants. They burn hotly, but they don't typically explode.

TNT (trinitrotoluene) comes in blocks of various sizes. Its use became so widespread that its concussive power is used as a reference point for all other explosives.

See ***GURPS High-Tech,*** pp. 183-188, for more on these and other historical explosives.

Steampunk explosives could take many forms, but for a proper wild-eyed effect, they should be powerful but tricky to handle or expensive. For a restrained option, assume that TL(6+1) "advanced explosives" are comparable to TL7 plastic explosives, being very stable and easy to handle. For a more frightening option, assume that TL(5+2)^ steampunk science can come up with something analogous to a fuel-air explosive – say, "compressed phlogiston" (see below), with an increased blast radius (see p. B104); divide damage by only (2 × distance in yards from the center of the blast). Of course, any and all activities involving such an explosive, including simply transporting it in a ready-to-use state, should demand rolls against Explosives (Demolition) skill, with a perpetual looming threat of catastrophe.

Explosives are typically LC2 when sold in serious quantities, but a steampunk super-explosive could well be LC1.

Explosives Table

TL	*Explosive*	*REF*	*Cost/Pound*
5	Black Powder	0.5	$5
6	Smokeless Powder	0.8	$7.50
6	Dynamite	1.2	$10
6	TNT	1	$10
(6+1)	Advanced Explosive	1.4	$30
(5+2)^	Compressed Phlogiston	5	$50

Phlogiston and Caloric

Phlogiston theory is a scientific idea that was widely accepted before the invention of modern chemistry at the start of the Steam Age. It posits the existence of a subtle substance or fluid called *phlogiston,* which is released when something is burned or rusted, and also expelled by animals when they breathe. Flammable substances are rich in phlogiston, which tends to flow from them to the air until the air is saturated, or "phlogisticated"; hence, phlogisticated air prevents combustion and respiration. Plants extract phlogiston from the air and concentrate it; animals then absorb it by eating plants (or each other). When oxygen was first discovered, it was thought to be "dephlogisticated air," because it promoted combustion.

The main problem that emerged with this theory during the 18th century was that various substances were shown to increase in weight when they were burnt; they were apparently gaining something, not losing it. This led to the suggestion that phlogiston had negative mass, or at least that it was lighter than air, though by the end of the century, it was seen more as a principle or quality than a substance. Eventually, however, the idea was discarded.

Likewise, *caloric theory* is the idea that "heat" is actually a fluid substance, perhaps a weightless gas, that permeates matter but that tends to repel itself; hence, it flows from hotter to colder bodies. It cannot be created or destroyed; conservation of caloric is a fundamental law. This idea was introduced as phlogiston was being discarded, but was rejected in favor of the modern "kinetic theory" of heat in the 19th century.

Period Superscience Uses

Either of these ideas could be treated as period superscience for a game of weird technology. If phlogiston could be isolated or manipulated, it might be *used.* If it does indeed have negative mass, it could in principle be used to lift incredibly efficient lighter-than-air craft. However, the potential for disaster with this technology would make hydrogen-filled airships look like paragons of safety. If *flows* of phlogiston could be controlled directly, this could help enhance the efficiency of advanced steam engines, or just create effective steampunk fire-suppression systems. (These might also act as deadly weapons, suffocating living targets by preventing them from expelling excess phlogiston.) In general, though, phlogiston-based science and technology would come with a lot of dangers attached. At the very least, it would involve highly energetic chemical processes. At an advanced level, it might be comparable to nuclear engineering in our world. Engineer (Phlogiston Processors) would be a valid specialization in these settings, ideally only taught to students with calm heads and steady hands.

Somewhat similarly, if a technology developed that allowed direct manipulation of caloric, it would allow the creation of incredibly efficient heating and cooling systems. (Steampunk refrigeration and air conditioning would be just part of it.) The GM who wants to avoid unintended logical consequences should be careful to make it clear, however, that a "caloric pump" always requires more energy than can be extracted from the temperature differential it creates; otherwise, it would produce a perpetual motion machine that generated free energy.

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