



MachineForge

Meet the Cast

STANDARD EDITION

Spark & Anvil

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This book collects 5 chapter books from the MachineForge cast — each character embodies a different curricular primitive; together they teach the full subject.

Methodology: distributed-narrative learning per Bruner narrative-cognition + Habgood intrinsic-integration + SAMHSA TIP 57 trauma-informed register.

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This is Volume 2 of 2 of the *MachineForge* — *Meet the Cast* series; each volume is a complete standalone book you can read on its own.

For everyone who learns by hearing a story first.

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Introduction

The MachineForge cast was authored to embody the curriculum, not decorate around it. Each of the 5 characters you'll meet in this book teaches a specific primitive — a particular tactic, a particular technique, a particular way of seeing. Together they form an ensemble: the cast IS the curriculum.

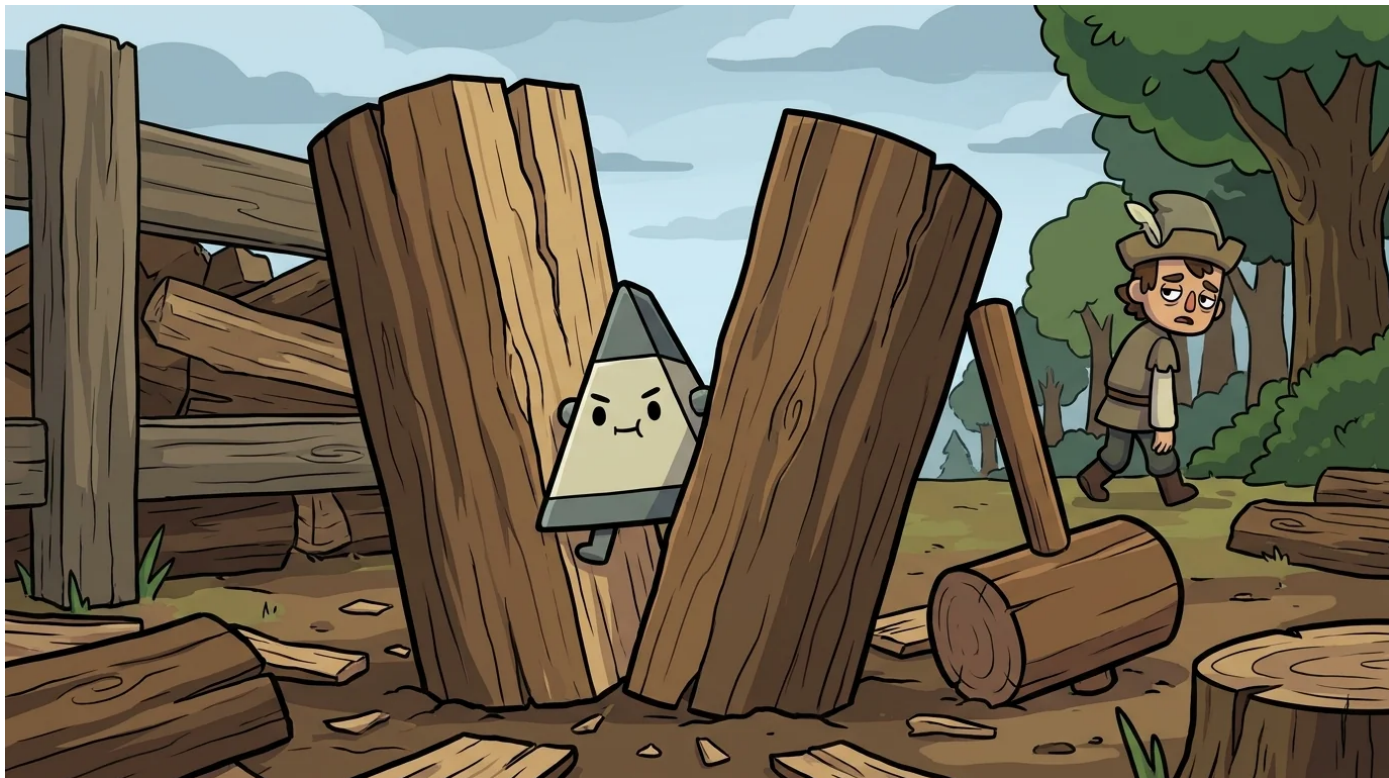
Read in any order. Each chapter stands alone.

Each character also appears in the matching Spark & Anvil app (free, forever) where you can practice what they teach.

— *The editors at Spark & Anvil*

Cleave

*WEDGE — *push forward; split it apart. force concentrated to a sharp edge.**



The old fence post had refused to split for three days.

Cleave stood at the edge of the woodpile, a squat grey-and-cream triangle no taller than a bread loaf, its broad flat back turned to the wind and its narrow edge aimed at the seam of the post. A woodcutter had left the post there, muttering, sure it was ruined. Cleave did not think so.

It leaned its edge into the seam. It waited for the log-splitting mallet, which the wind was carrying toward the woodpile in the hands of a very tired apprentice. When the mallet came down on Cleave's broad back — *thock* — a hairline crack opened in the post, thin as a spider's thread. Cleave rocked forward a whisker. *Thock*. The crack yawned wider. The post that would not budge for three days of shoving gave way in six patient taps, and fell open in two clean halves.

"Push forward," Cleave murmured, mostly to itself, "and it splits apart."



Cleave had not always known that trick. Long ago, when it was new, it had tried to be strong. It had thrown its whole flat body against things — walls, stumps, a stubborn barn door — and bounced off every one, aching.

An old field-plow found it sulking by a boulder one evening. The plow was scarred and cheerful. "You keep pushing broad," it said. "Broad spreads the push out thin. Try pushing narrow."

Cleave turned itself around and set its sharp edge — not its wide back — against the boulder's crack. It pushed. The same push it had wasted all day suddenly gathered into a single sharp line, and the boulder's crack lengthened with a soft *tick*.

Cleave felt something click into place inside it, quieter than the boulder but just as sure. All that force, it understood, was not about being big. It was about where the force arrived. Gather a wide push down to a narrow edge, and the edge does what the whole body never could.



Word of the patient triangle reached the MachineForge, the village workshop where machines that understood themselves were welcomed. Cog, the old grey gear who kept the place, met Cleave at the door and did not ask it to explain. Cog asked it to show.

There was a knot of oak on the workbench, gnarled and mean, the kind of wood that turns axes. Cog set a splitting-wedge and a mallet beside it and stepped back.

Cleave nudged the wedge until its edge sat exactly in the knot's one weakness. It lined the mallet up over the wedge's flat back. Then, unhurried, it let the mallet fall — *thwack* — and the oak knot, which had turned two axes that morning, opened along a single willing line.

Cog's stern face softened by a hair. "You didn't fight it," the old gear said. "You found the edge and let the edge do the work." He nodded toward the empty bench along the wall. "There's a place for you here."



The apprentices came to Cleave's bench on splitting day, half of them nervous, because a wedge is a sharp thing and sharp things deserve to be treated with a little fear.

"Watch my edge, not my back," Cleave told them. It set the metal wedge against a log rough with clinging bark. "All the push from the mallet — all of it — travels down to this one thin line." *Thwack*. A splinter popped free; a woody smell filled the air. "And as I sink in, my two slopes shove outward, one to each side, and pry the log apart. I'm really just two ramps, glued back to back. Push my spine; my slopes do the splitting."

A small apprentice named Rill hung back. "Doesn't it feel dangerous?"

Cleave went still, and its voice went quiet and serious. "It is strong. Strong isn't the same as dangerous — but you treat strong things slowly. You never test my edge with your finger. You never wave a knife around for fun. You line the tool up, you keep your hands clear, you ask a grown-up when the edge is truly sharp. Respect at the handle, force at the edge. Both. Always both."

Rill nodded, and stepped a careful, sensible half-step closer instead of away. Cleave was glad of that half-step most of all.



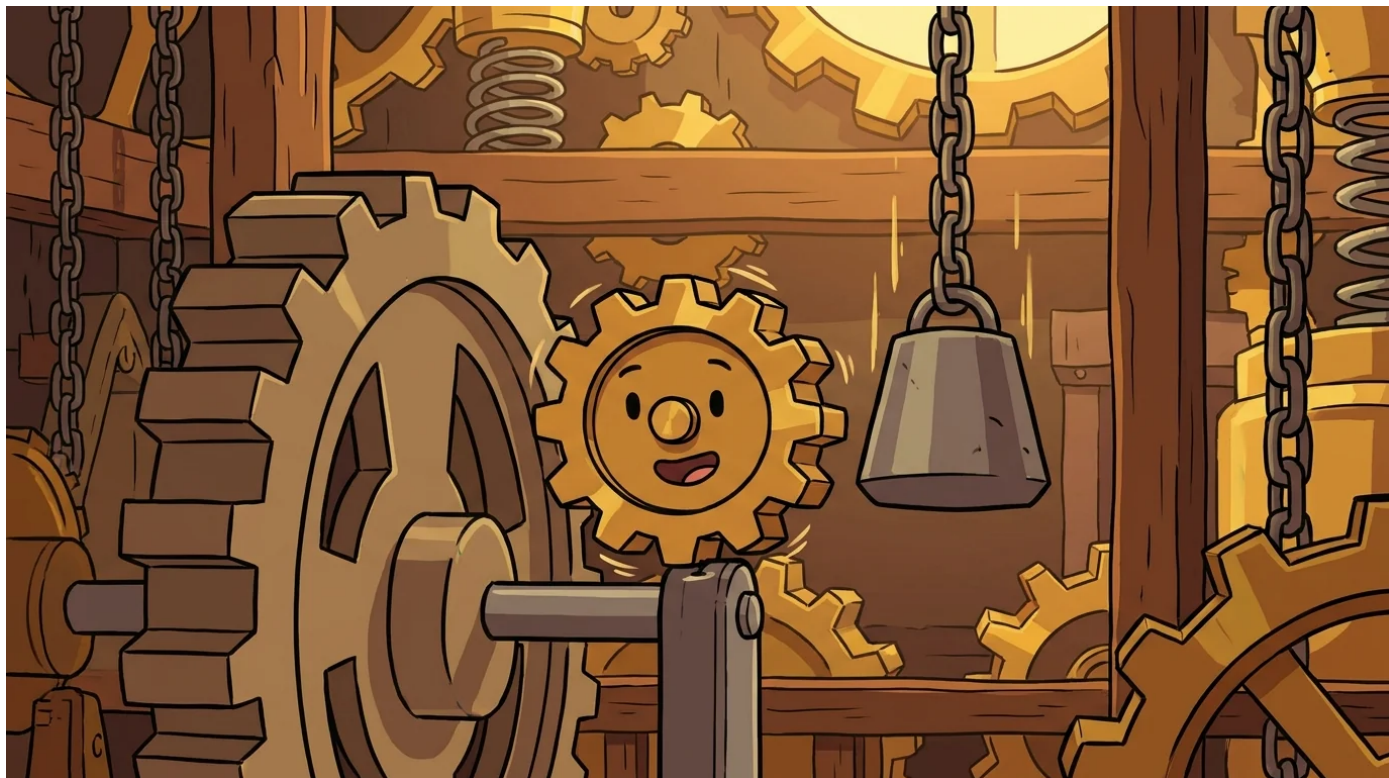
At the end of the day the mean oak knot lay open in two halves on the bench, its stubborn grain finally undone.

Cleave looked at it for a long moment. It had not shoved the knot. It had not bullied it. It had found the one line the wood was willing to give, and gone there gently, and let its edge carry the force the rest of the way.

A warm, steady glow rose through Cleave's small grey body — not the sharp thrill of the split, but something calmer underneath it. The quiet pride of doing something powerful, and doing it carefully, and hurting nothing that didn't need to break. That feeling, Cleave thought, settling its edge against the cool bench to rest, was the best part of the whole work.

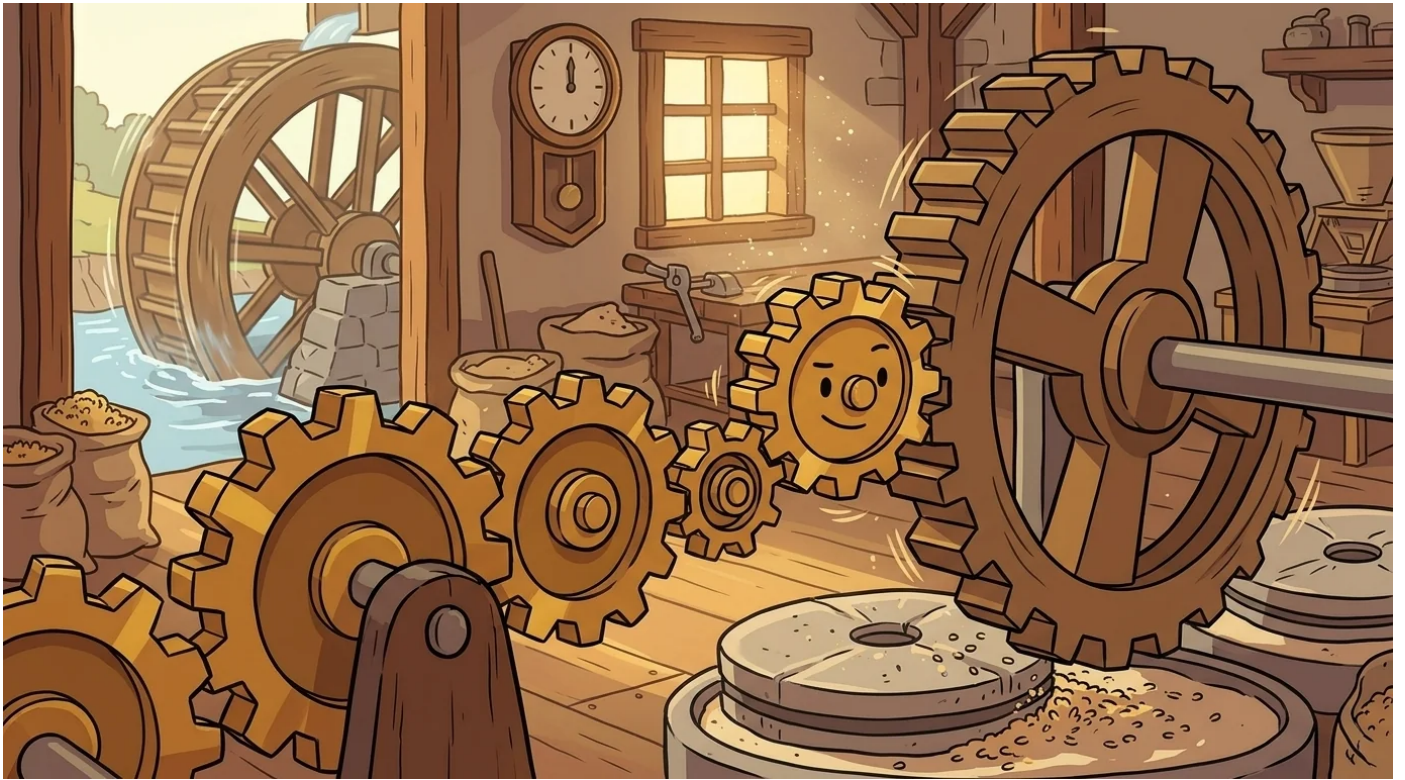
Pinion

*GEAR TRAIN — *meshing teeth trade turning-speed for turning-force, and pass motion along.* When a small gear turns a big gear, the big one turns slower but stronger; gears also reverse direction and carry motion around corners. Same work, new shape.*



Deep in the workshop clock, a small brass gear whirled fast on its post, its neat teeth catching the teeth of a wheel three times its size. Every two quick spins Pinion made, the great wheel heaved slowly around just once — and that slow, mighty turn dragged a heavy pendulum-weight up its chain.

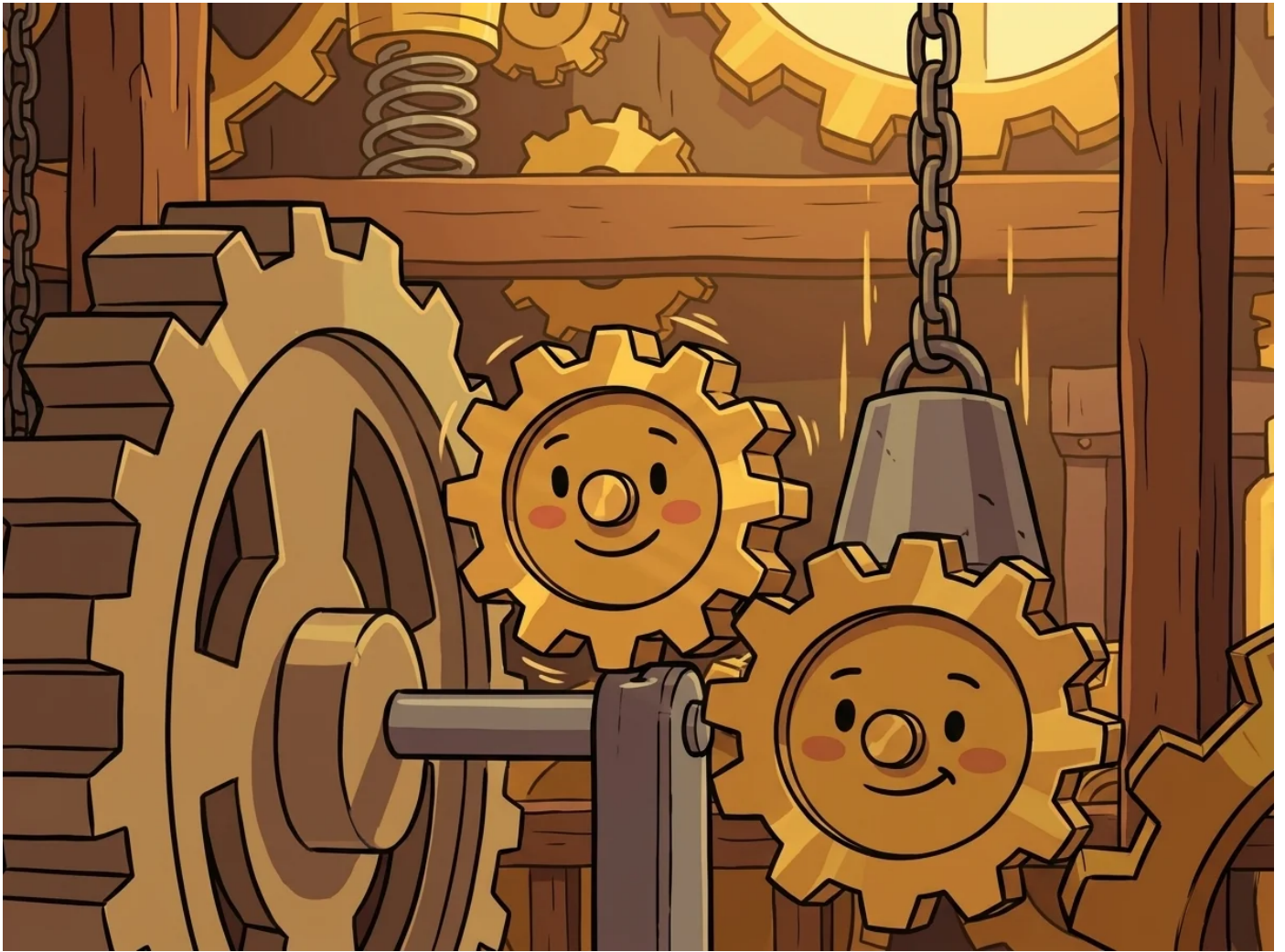
Pinion could never have lifted that weight alone. But meshed against the big wheel, its fast little spins became one strong slow turn, and up the weight climbed. "Feel that?" Pinion said, teeth clicking crisply into the wheel's. "You give me a light, fast turning. I hand back a slow, heavy one. Meshing teeth trade turning-speed for turning-force." Its hub-eye gleamed as the weight rose. "Same work as you gave me. Just a different shape."



Once, Pinion had lived inside a flour mill, one gear among dozens. A single great water-wheel turned slowly at the river, and that slow turn had entered the line of gears and traveled through — small gears spinning it faster, big gears slowing it down and forcing it stronger — until at last it reached the millstones and ground the grain.

What amazed young Pinion was that the turning was never *made* anywhere along the line. The river gave one steady push; the gears only passed it hand to hand, trading speed for force and force for speed at each meshing, carrying it around corners, sending it exactly where it was needed. One turn at the water-wheel could become a thousand tiny turns or one enormous grinding one — just by which gears met which.

That trade — turning handed down a line, reshaped at every step but never lost — became the thing Pinion loved best. When the old mill fell silent, the workshop lifted Pinion out of the dust and gave it a place among the clockwork.

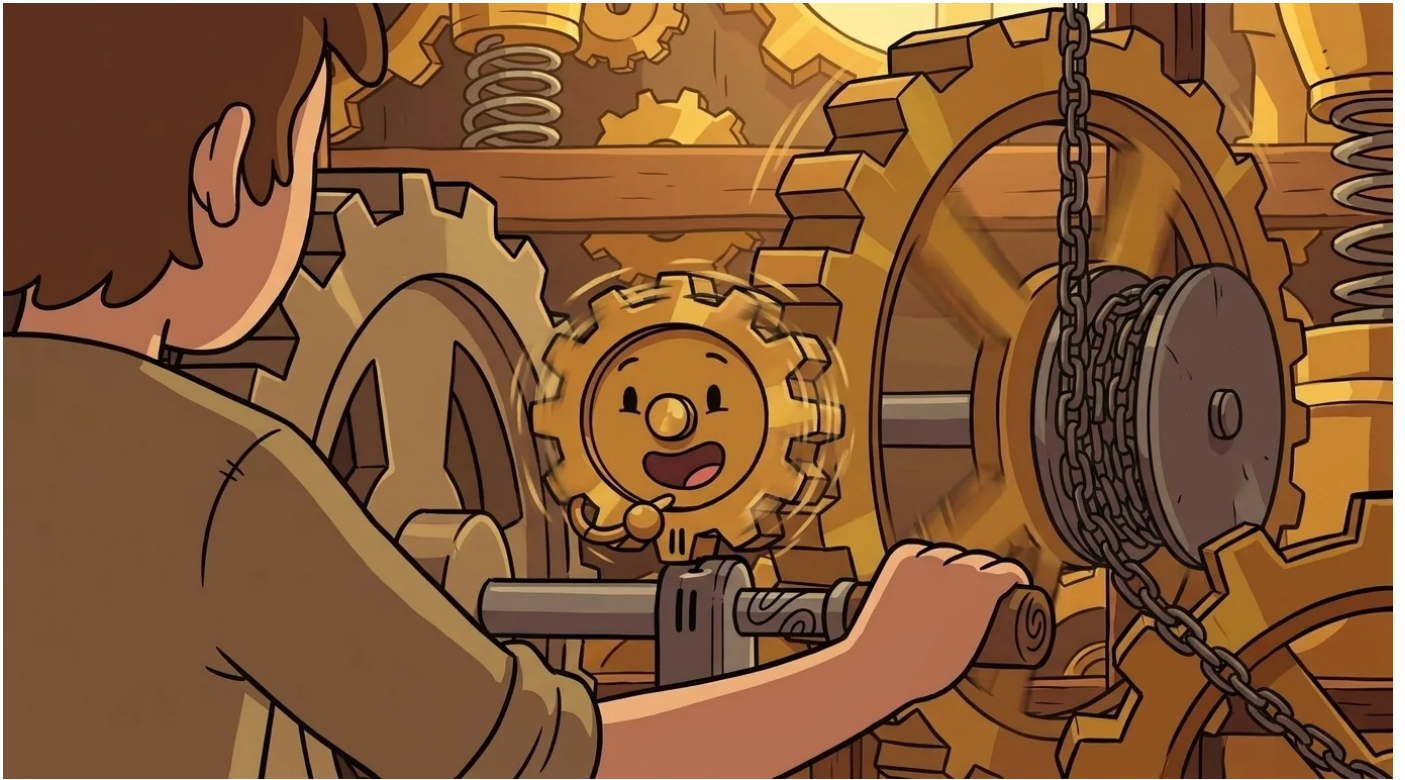


The first day at the workshop, Cog — a gear itself — rolled up beside Pinion, teeth nearly touching.

"Show me what you do," Cog said.

Pinion spun twice against the big wheel; the wheel turned once, ponderous and strong. "I trade," Pinion said. "Give me a fast easy turning and I'll give you back a slow powerful one — or the other way round, if you mesh me the other way. I flip the direction. I carry motion around a corner. But I never add a scrap of it or lose one. Two small gears in a row, and I turn this way while my neighbour turns that way — motion passed straight along the line."

Cog gave a slow, pleased turn, its own teeth meshing for a moment with Pinion's. "A gear teaching gears," it said. "Fitting."



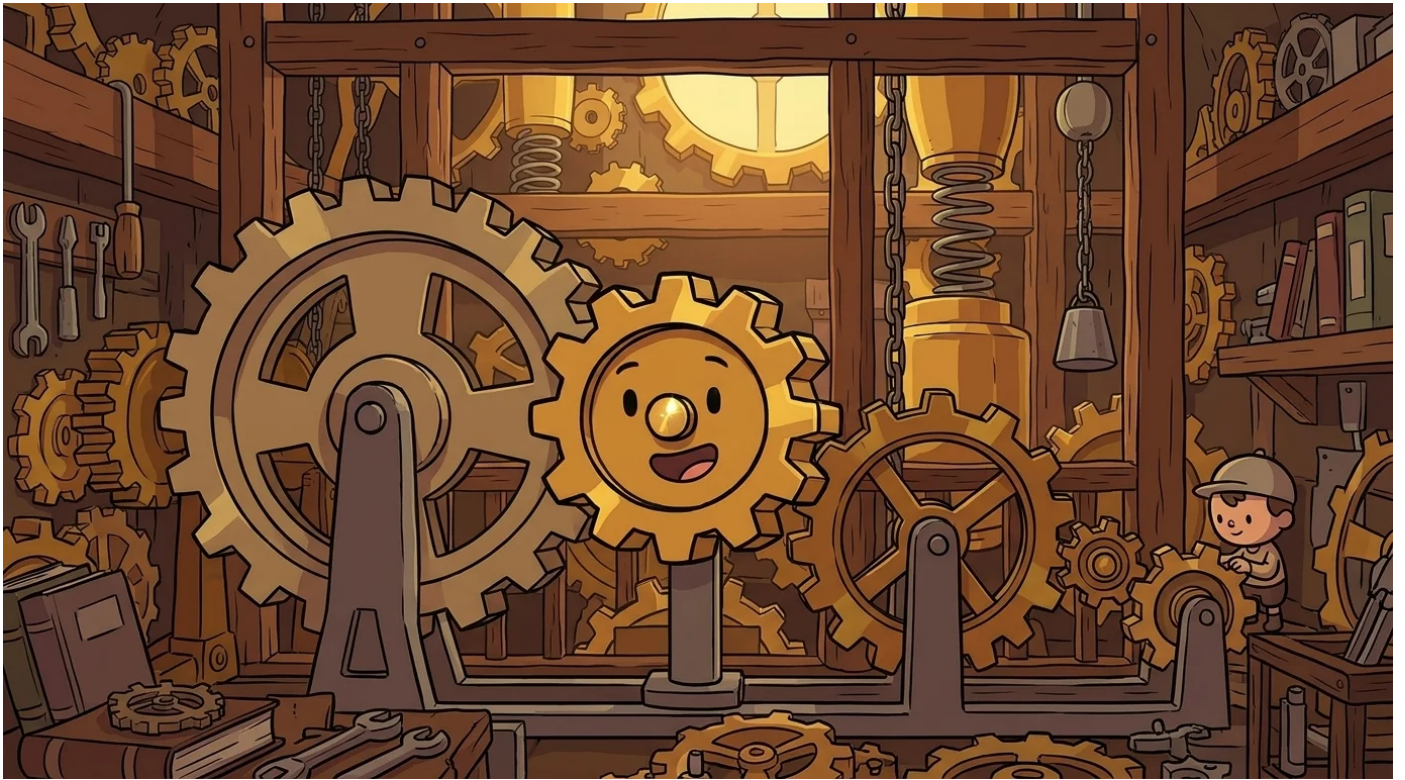
An apprentice named Pip stepped up to a hand-crank linked to Pinion, which meshed with a big gear twice its size, a weight hanging from the big gear's chain.

"Count my teeth, then the big gear's," Pinion said. Pip counted — Pinion had half as many. "So I turn twice for each single turn of the big one. Now crank." Pip cranked. Pinion whirred around twice, fast and light; the big gear heaved around once, slow — and lifted the weight, which Pip could never have raised by spinning that big wheel with his bare hands.

"Two of my turns for one of the big gear's — that trade is called a gear ratio," Pinion said. "I took your fast, easy cranking and handed back one slow, strong turn. Same work you put in. Different shape coming out." Pip cranked again, feeling the heavy weight climb, grinning at how the little gear gave such force.

Then Pinion had Pip line up three gears in a row. "Now watch motion *travel*," it said. Pip turned the first. It spun the second the opposite way; the second spun the third back the first way; and the weight at the end of the line rose. "See how the turning ran all the way down? A bike, a windmill, a hand-mixer — none of them make turning. They pass it along, trading speed for force wherever they need it. Choose your gears, and you choose your trade."

Pip set the whole train spinning and felt one gentle crank ripple down the line, reshaped at every meshing but never once lost.



When Pip finally let the crank still, the three gears coasted to a stop, teeth settling into each other with a soft, snug click.

"That sound," Pinion said. "Teeth catching teeth, just right. Two parts made to fit, handing motion back and forth between them, nothing spilled." Its hub-eye glinted. "When gears mesh true, the whole machine feels alive."

Pip rested his fingers on the smallest gear, feeling it seat perfectly against its neighbour, and something clicked into place inside him too — the warm, settled satisfaction of understanding how the whole line worked, of watching parts fit each other exactly as they should. He turned the crank once more, gently, and felt the trade travel all the way down: fast to slow, light to strong, the little gear giving up its speed so the big one could give back its force. He grinned, the pieces suddenly clear and clean in his mind, and the row of gears hummed on, warm and glad, parts that fit.

Flex

SPRING — bend me and I store your push; let go and I give it back. A spring stores energy when you squeeze, stretch, or bend it, and releases that stored energy later. Energy isn't made or lost — just held, then handed back.



On the highest shelf of the workshop, a coiled steel spring sat squeezed flat under a heavy iron block. It did not strain or complain. It simply held, patient and quiet, its bright loops pressed down to almost nothing, a single steady eye glinting at its top coil.

A small wooden ball rested in the dish just above it. Flex could have flung that ball to the ceiling in an instant. Instead it waited, holding the whole weight of the block, saving the push for a moment that hadn't come yet.

"Someone squeezed me this morning," Flex said to no one in particular, its voice a low happy hum. "So now I'm holding their push. Bend me and I store your push. Let go and I give it back — every bit of it, whenever they're ready." A draft nudged the block. Flex tightened, absorbed the shove, gave nothing away. It liked this feeling most of all: a push received now, kept safe, owed back later, with nothing lost in between.



Once, Flex had been part of a wind-up toy — a little tin rabbit that hopped across a nursery floor. A child would twist the rabbit's key, winding Flex tighter and tighter, and Flex would drink up every turn of that winding and hold it, coiled and eager.

Then the child would set the rabbit down and let go. And *only then* would Flex spend what it had saved — handing the stored turns back one at a time, so the rabbit hopped and hopped clear across the floorboards on a push that had been given minutes before.

That was the moment young Flex fell in love with its own nature. The winding didn't have to become hopping right away. Flex could catch a push in the morning and carry it faithfully until afternoon, then hand it over exactly as it had received it. When the tin rabbit finally wore out, the workshop unwound Flex from its rusted case, straightened its loops, and gave the old faithful spring a shelf of its own.



The first day at the workshop, Cog — the wise old gear who watched over every machine — rolled up beneath Flex's shelf and looked up at the compressed coils.

"Show me what you do," Cog said.

Flex let a sliver of its stored push escape, lifting the iron block a hair's breadth, then caught it and held again. "I take a squeeze and I keep it," Flex said. "Press me down and I hold your energy, still and safe, for as long as you like. Lift your hand, and I hand every bit of it straight back. I never make more than I was given. I never lose a scrap. I'm just a keeper of pushes."

Cog turned slowly, watching the block hover, then settle. "Patient," Cog said, "and honest about it." It rolled aside to make room. "The shelf by the window is yours."



An apprentice named Pip climbed onto a stool to reach Flex's shelf, curious about the spring that held a block without groaning.

"Press me down against the bench," Flex said. Pip set both thumbs on the top coil and pushed. Flex squashed shorter, its loops crowding together, straining upward against Pip's hands. "Feel me push back?" Flex said. "That push is *yours* — I gave it to you this second, because you gave it to me. As long as you hold me down, I'll hold it too."

Pip's thumbs began to ache. "How long can you keep it?"

"All day. All week," Flex said. "I don't tire. Now — let go, but keep your eyes on that ball." Pip lifted his hands. Flex sprang tall in a single bright instant and flicked the little wooden ball straight up, where it tapped the rafter and dropped back into the dish. "There," Flex said, settling. "Your push, handed back whole. A clicky pen, a trampoline, a bow bending to shoot an arrow — all of us do the same trick. We keep your push and return it later."

Pip pressed and released, again and again, laughing at the small bright pop each time the ball leapt for the rafters.



Before he left, Pip lined up a row of springs beside Flex — a stout stiff one, a long soft one — and pressed each in turn, feeling how differently they strained.

"The stiff one grabbed my whole push in a tiny squeeze," Pip said. "The soft one needed a long, slow pull."

"Different holds, same promise," Flex hummed. "Whatever you put in, that's what I give back. Not more, not less. I'll carry it as long as you need, and hand it over the moment you ask." It settled its loops. "There's a real joy in that, you know. The held breath. Then the bright let-out."

Pip wound a little spring-toy, set it on the bench, and lifted his hand. It zipped away across the wood on energy he'd stored a heartbeat before — and something in his chest went loose and light watching it go, like the easy rush after a long-held breath finally lets out. He grinned, feeling the warm satisfaction of a push kept safe and set free at exactly the right time, nothing wasted, all of it returned.

Lobe

*CAM — *a spinning shape that turns round-and-round into a repeating push.* A cam is a wheel with a bump; as it spins, the bump lifts a follower up and lets it drop, over and over. It converts steady rotation into a rhythmic up-and-down motion — same turning, new pattern.*



In the corner of the workshop, a thick grey wheel turned smoothly on its spindle, round on every side but one, where a single smooth bump rode out and back. Resting on top of it sat a slim little rod. Each time the bump swung up under the rod, the rod climbed. Each time the bump passed, the rod dropped. Up, down. Up, down.

Lobe turned and turned, and the rod ticked out its patient rhythm, and Lobe was perfectly content. "Round and round, that's all I'm given," it said, its calm center-eye watching the rod rise and fall. "But look what I make of it — a beat you could set a heart to." The bump came around again; the rod lifted, dropped. "A spinning shape becomes a repeating push. Same turning, new pattern." Lobe loved nothing more than this steady up-and-down, dependable as a swing.



Long ago, Lobe had lived inside a music box, spinning below a comb of thin metal teeth. Its edge had been dotted with tiny bumps, and each bump, as Lobe turned, had plucked one tooth — *plink* — before letting it go.

The bumps were arranged just so, and because Lobe spun at a steady pace, the plinks fell into a tune. Lobe never chose the notes; the shape of its bumps did. But it was Lobe's faithful turning that carried the melody around and around, the same little song every time the box was wound.

That was the day young Lobe understood what it was for. A spinning thing could only spin — it couldn't tap or beat or count time by itself. But add a bump in the right place, and dumb, plain spinning became a *rhythm*. When the music box's lid finally cracked, the workshop lifted Lobe out, dusted its edge, and set a new follower-rod on top so it could keep making beats out of turning.

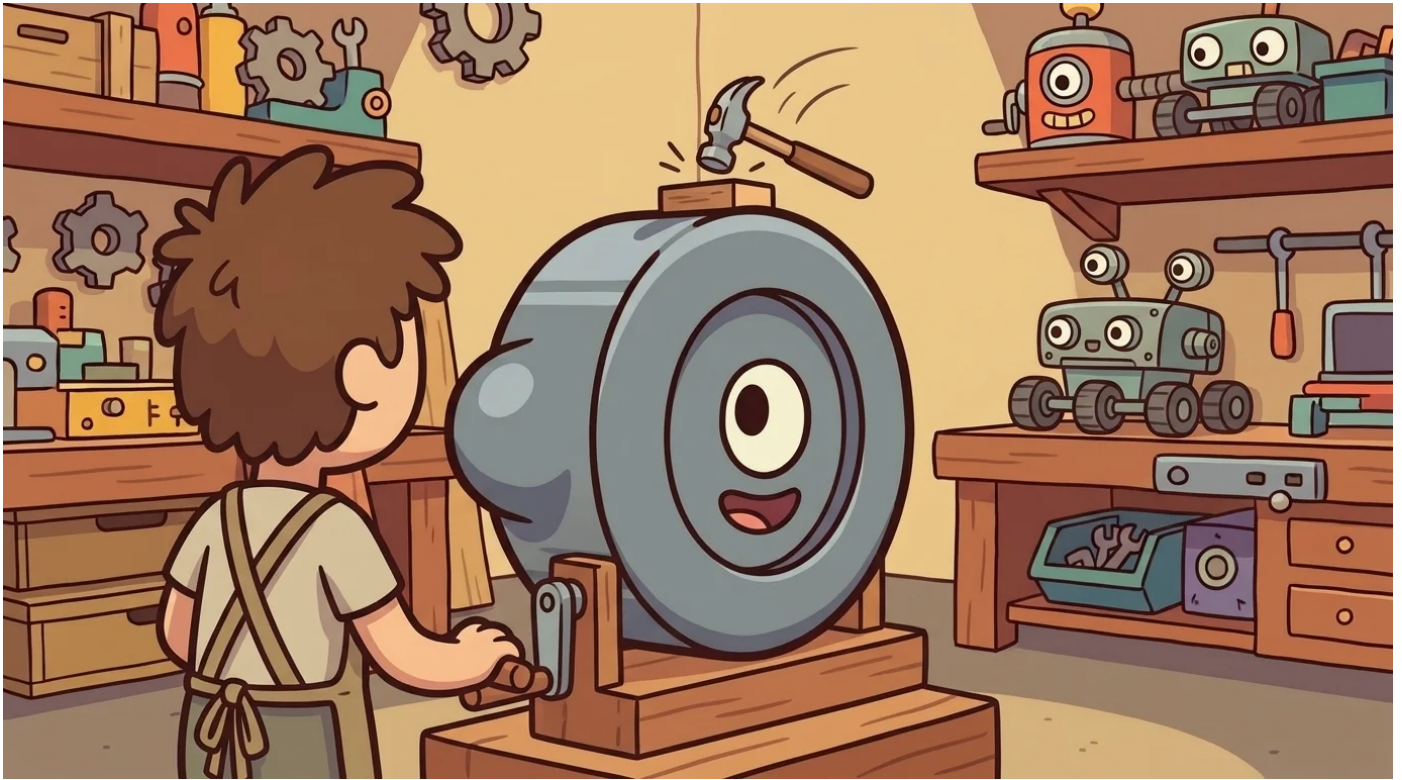


The first day at the workshop, Cog rolled over to watch the grey wheel turn and the little rod tick above it.

"Show me what you do," Cog said.

Lobe turned once, slow and deliberate. The bump swung up; the rod climbed; the bump slid past; the rod dropped — *tap*. "That," Lobe said. "You gave me a steady spin. I gave you back a beat. I don't add any motion of my own — I just reshape the spinning you already have into a rise and a fall, over and over. Change the shape of my bump and I'll change the rhythm: a tall bump for a big lift, two bumps for a double-tap."

Cog rolled around the wheel once, watching the rod keep perfect time. "You make motion *dance*," it said, and settled back to give Lobe room to spin.



An apprentice named Pip hooked Lobe up to a hand-crank and balanced a tiny hammer on top as the follower.

"Crank me slow," Lobe said. Pip turned the handle. Lobe spun; the bump came around and lifted the hammer, then let it fall — *tap*. Around again — *tap*. Again — *tap*. A perfect, even beat filled the corner of the workshop.

"You hear that?" Lobe said. "Your steady cranking turned into a drumbeat. You didn't tap the hammer once — *I* did, every single time my bump came around." Pip cranked faster, and the taps came quicker, still perfectly spaced. "See? Speed the spin, speed the beat. Now watch this." Lobe held still while Pip swapped in a wheel with two bumps. When Pip cranked again, the hammer went *tap-tap ... tap-tap ... tap-tap*, a little double-knock instead of a single.

"Two bumps, double the taps," Lobe said, delighted. "A music box plucks its notes this way. An engine opens its valves at exactly the right moment this way. A toy makes a figure wave and bow this way. All of us take a plain spin and give it *timing*."

Pip cranked and cranked, watching the hammer keep faultless time, grinning at the neat little pattern coming out of nothing but a turn.



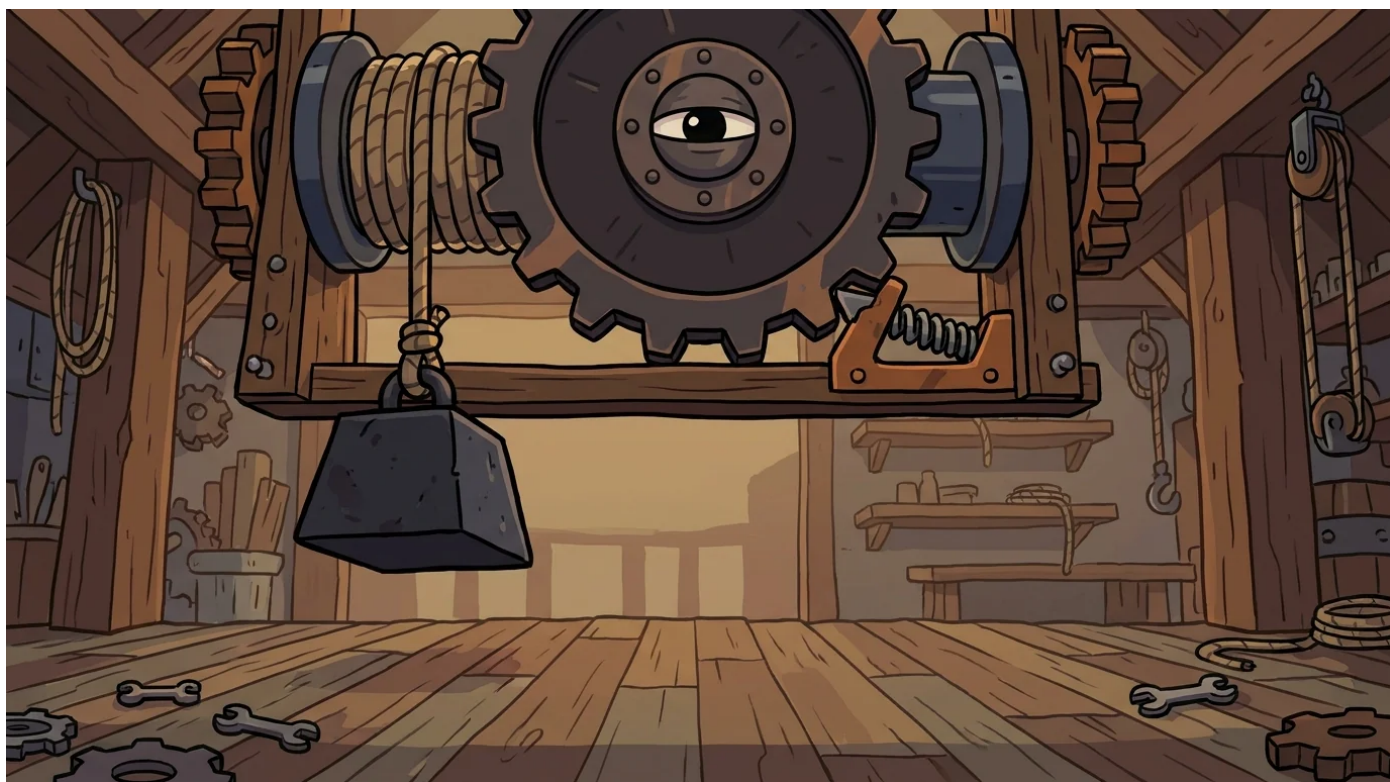
When his hand tired, Pip slowed the crank and let the last few taps ring out — *tap ... tap ... tap* — softer and softer, until the wheel eased to rest with its bump pointing up at the ceiling.

"There's something lovely in it, isn't there," Lobe said quietly. "The same small motion, again and again, never wrong, never late. Like a swing you don't have to push. Like a heartbeat you don't have to think about."

Pip nodded, resting his chin on the bench, listening to the memory of the beat still ticking in his head. Something in him had gone calm and glad — the same soft, steady feeling as being rocked, or hearing rain keep an even patter on a roof. He set the crank going one more gentle turn, and the little hammer answered — *tap* — and the whole corner of the workshop seemed happy in the quiet, dependable rhythm of it.

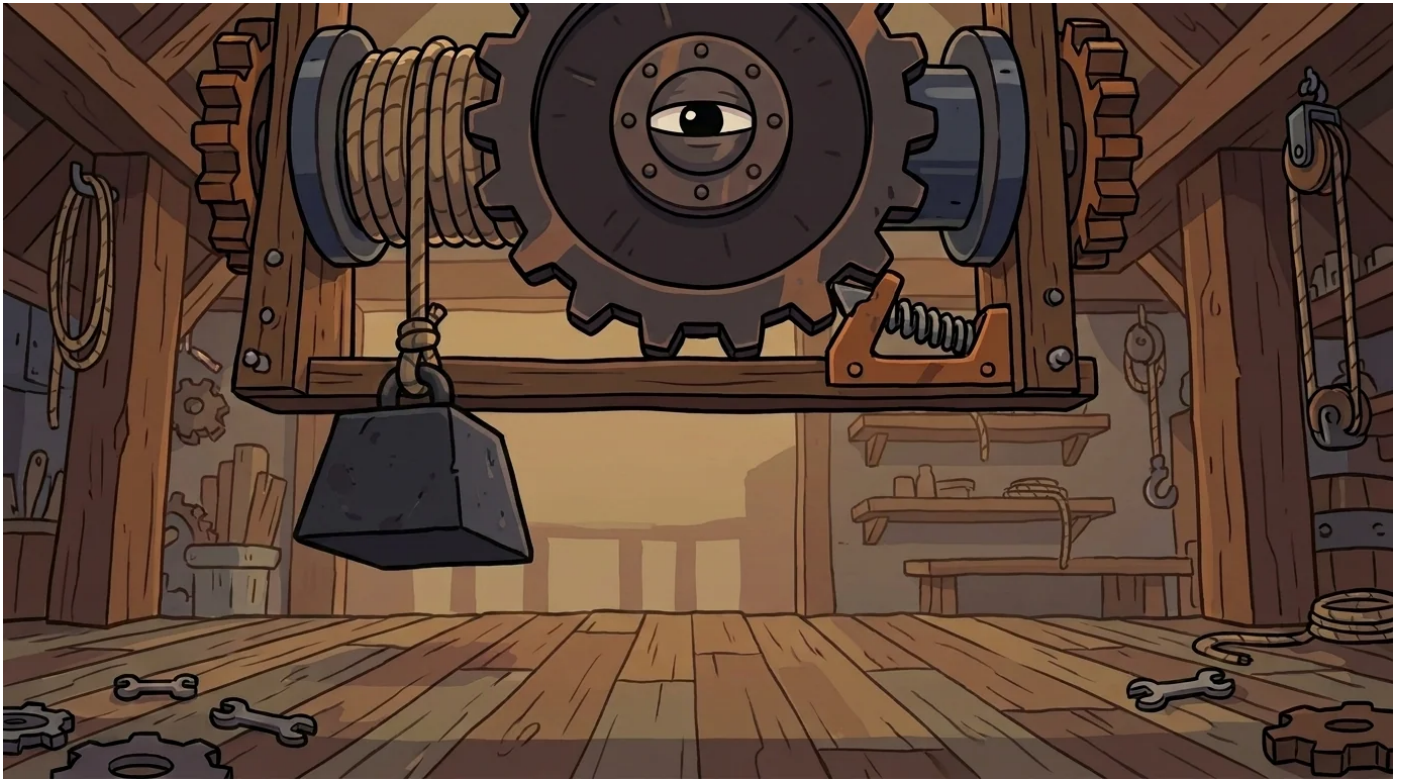
Ratchet

*RATCHET — *go forward freely; lock when you try to slip back.* A ratchet is a toothed wheel with a little catch (a pawl) that lets it turn one way but stops it from turning back. It holds your progress so nothing you've gained slips away — click by click.*



At the top of the workshop winch, a heavy iron load hung on a rope — and it was not falling. It should have plunged the moment the winch-hand let go. Instead it simply hung there, held, while a dark toothed wheel gripped the rope-drum and a small spring-loaded catch wedged tight against one slanted tooth.

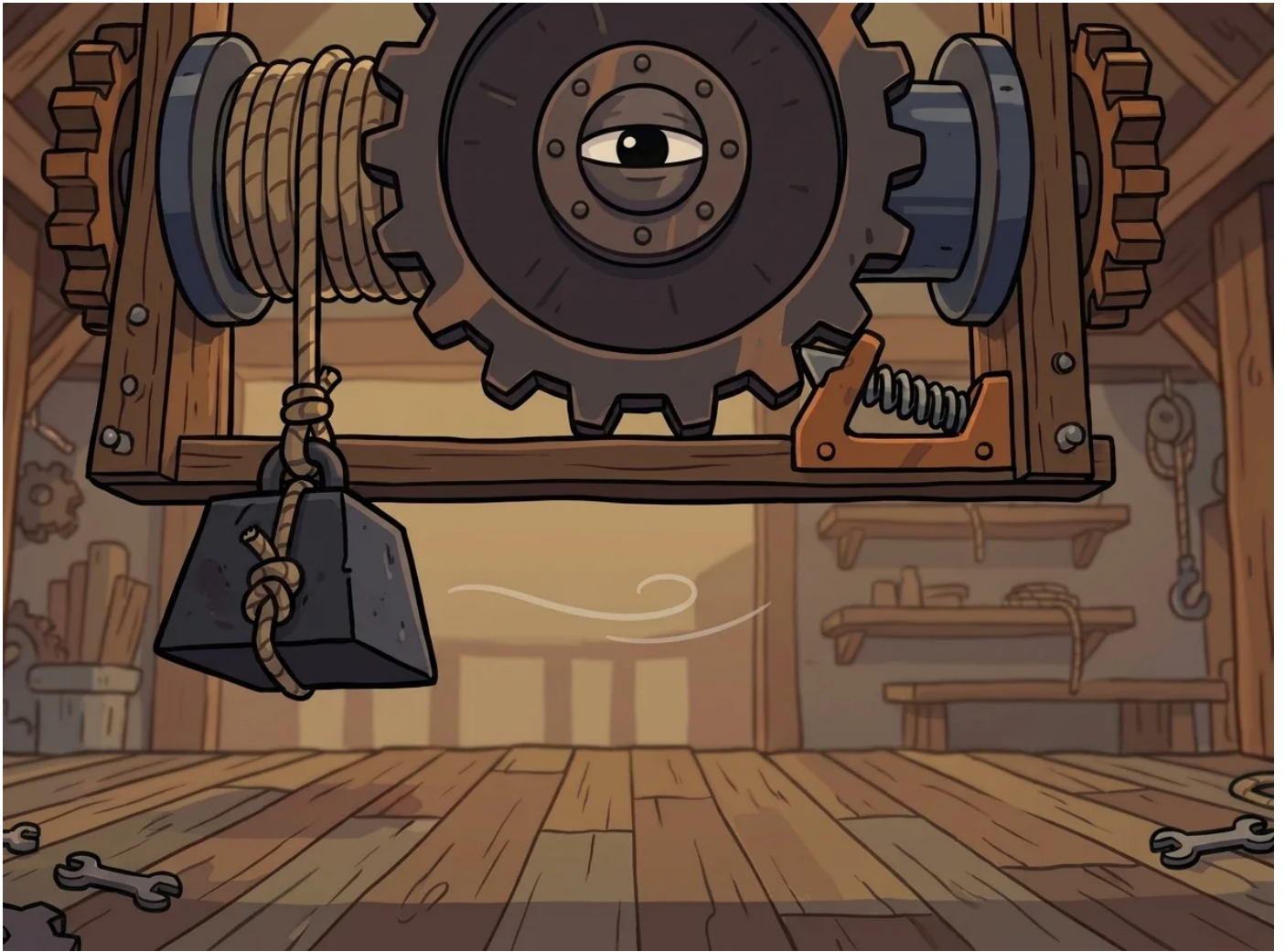
Ratchet held the whole load without straining, its single steady eye calm at the hub. "The winch-hand pulled this up all morning, a little at a time," it said. "Then they went to rest. And here it stays, right where they left it — not slipping back an inch." A breeze tugged the load; the catch pressed harder into its tooth and refused to give. "Go forward freely, I always say. Lock when you try to slip back. What's been gained, I keep."



Once, Ratchet had lived at the top of a well, on the crank that hauled up the bucket. The person turning the crank could only pull so far before their arms tired — and if the crank had spun freely, the full bucket would have plummeted straight back down the moment they paused for breath.

But Ratchet's catch clicked over each slanted tooth as the bucket rose — *click, click, click* — and the instant the crank tried to spin backward, the catch jammed and held. So the tired hauler could stop, shake out their arms, rest as long as they liked, and the bucket waited patiently, not sinking a hair.

That was the moment young Ratchet found its purpose. It did none of the lifting itself — the person's arms did that. Ratchet's whole gift was making sure every bit of that lifting *stayed*. When the old well was capped over, the workshop unbolted Ratchet from the crank, oiled its catch, and gave it a place on the winch.

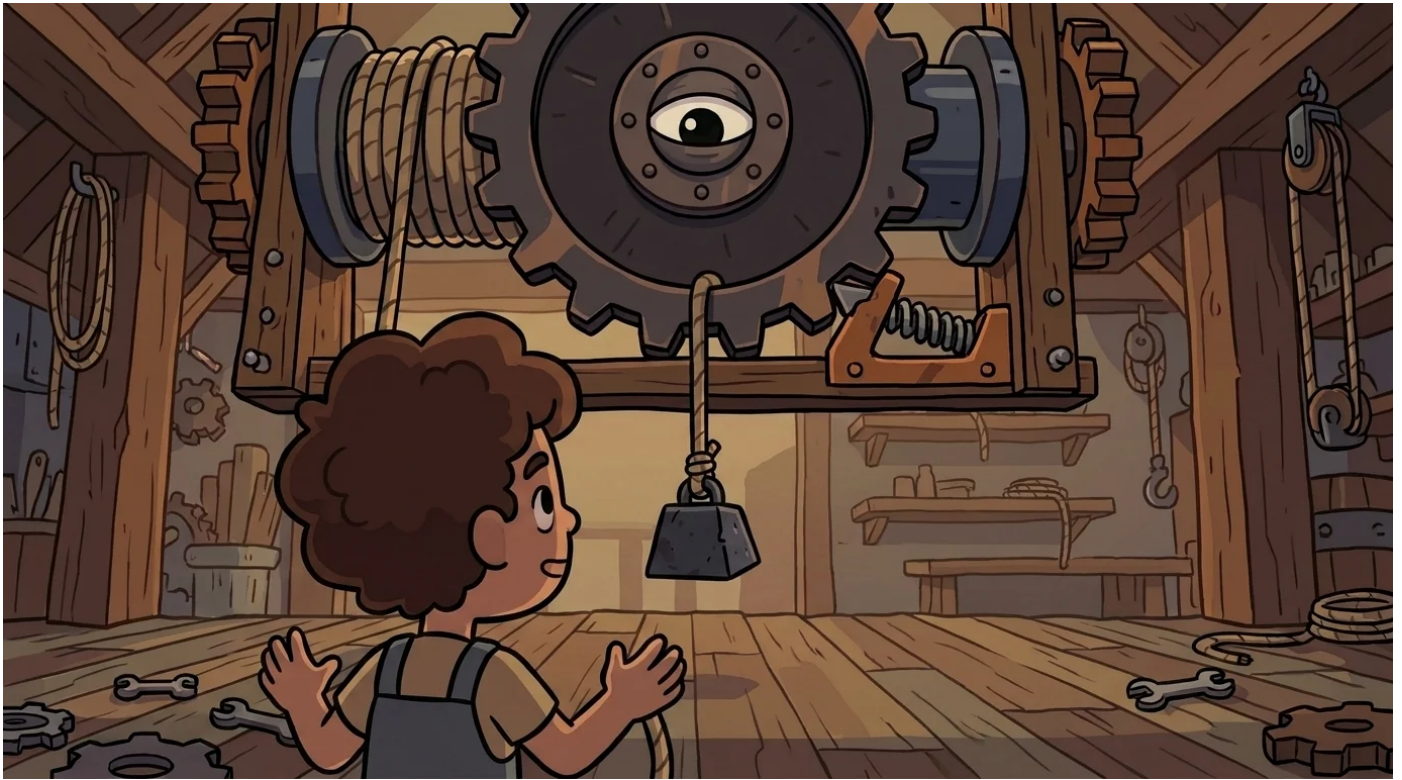


The first day at the workshop, Cog rolled up to watch the toothed wheel hold its heavy load.

"Show me what you do," Cog said.

Ratchet let the winch-hand turn it forward — *click, click* — then strained hard the other way and held fast, the catch biting a tooth. "Forward, my catch slides right over the teeth, easy as anything," Ratchet said. "Backward, it wedges and stops dead. I don't do the hauling — I make sure the hauling doesn't come undone. Pull a little, rest, pull a little more, rest again, and the load only ever goes up. Never down."

Cog gave a firm, approving turn. "You guard what's gained," it said, and rolled aside.



An apprentice named Pip tied a small weight to a rope wound around Ratchet's drum and began pulling it up, hand over hand.

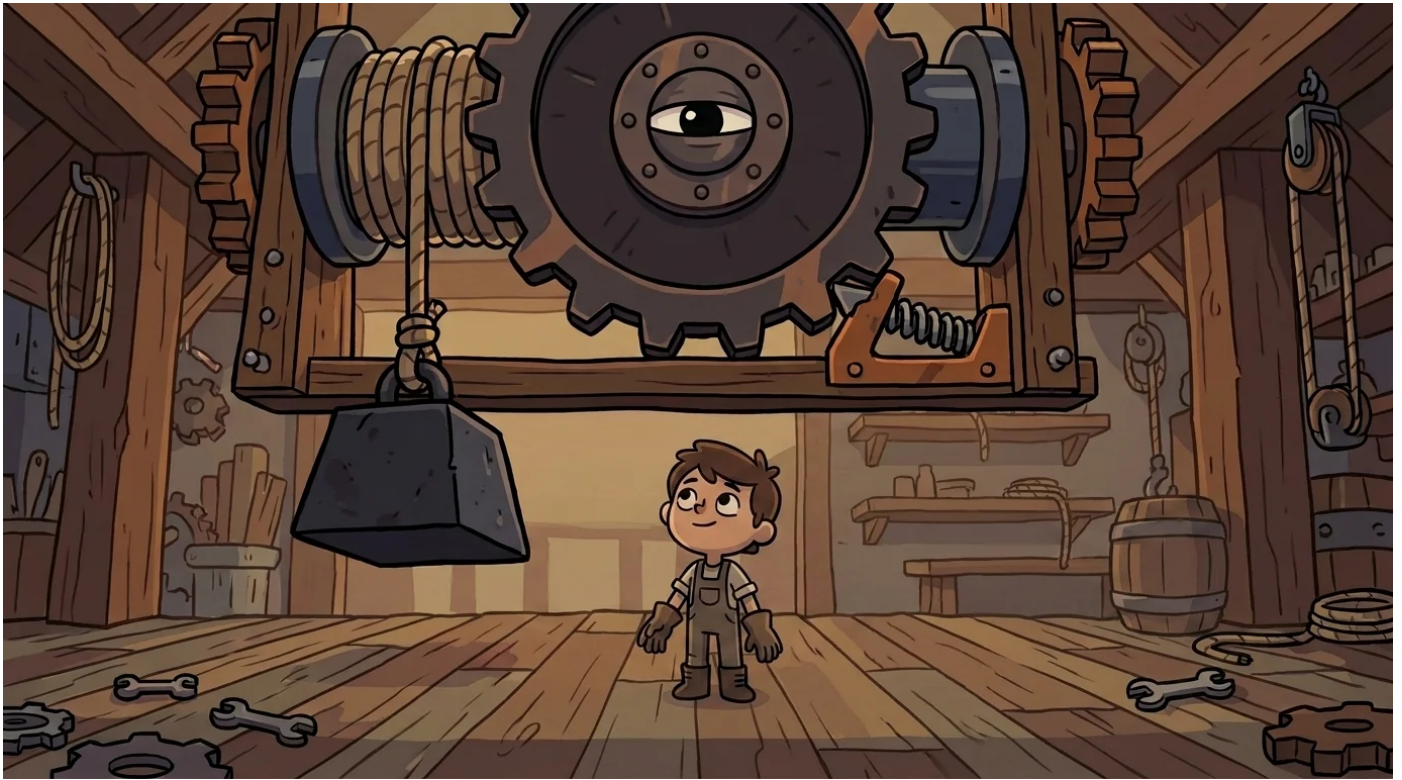
"Pull me forward," Ratchet said. Pip pulled — *click, click, click* — and the weight rose in little jumps, one for each tooth.

"Now let go and rest," Ratchet said. Pip hesitated, sure the weight would crash down the second he opened his hands. He let go anyway. The weight didn't move. The catch had dropped into a tooth and locked it exactly where it was.

Pip stared. "It just... stayed."

"You can rest without losing your work," Ratchet said. "Every click locked in a little bit of progress. Pull, rest, pull, rest — and each rest keeps everything you'd gained." Pip hauled the weight higher, stopping whenever his arms tired, and every single time the catch held and nothing slipped. Grinning, he set down the rope halfway and let his hands drop. The weight hung, patient and safe, waiting for him.

"A wrench clicking a bolt tighter, a seatbelt catching when you tug it, a zip-tie pulling snug — all the same idea," Ratchet said. "Forward, free. Backward, locked. You never carry the whole load at once. Just add one click at a time, and trust me to hold the rest."



When the weight reached the top, Pip clicked the rope one last notch and let go for good, hands loose at his sides. The load stayed put, held safe.

"There's a real comfort in it, isn't there," Ratchet said quietly. "You don't have to keep gripping. You don't have to worry it'll all come undone the moment you stop. Small wins, locked in, adding up — click by click — and none of them able to slip away."

Pip flexed his tired hands and felt the tightness in his shoulders let go all at once, the way it does when you finally set down something heavy you've been carrying. He hadn't realized how braced he'd been against the fear of the whole load crashing back down. Now it just... rested. And so did he. He looked up at the weight hanging safe and steady, and a warm, settled ease spread through him — the quiet relief of knowing that everything he'd worked for was held, and couldn't be lost.

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Methodology

Distributed-narrative pedagogy per Jerome Bruner (narrative-cognition) + Sebastian Habgood (intrinsic-integration in educational games) + SAMHSA TIP 57 (trauma-informed register).

Trauma-informed-design framework per Eggleston et al. (2025) and Stoltenburg et al. (2024).

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