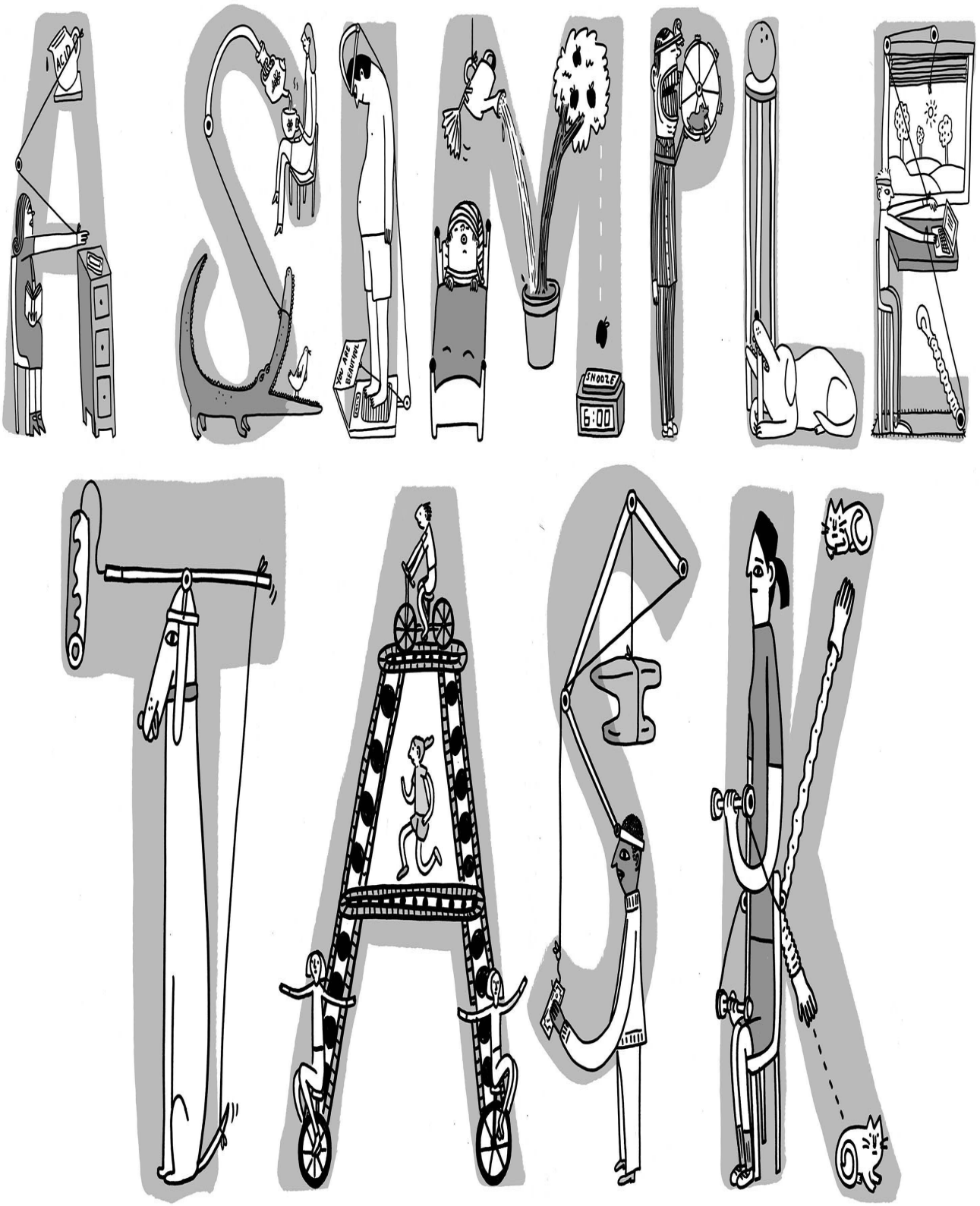
www.theverge.com/2015/4/22/8381963/rube-goldberg-machine-contest-history-ide



www.theverge.com/2015/4/22/8381963/rube-goldberg-machine-contest-history-ide

Inside the whimsical but surprisingly dark world of Rube Goldberg machines

By Brendan O'Connor

On the eve of the 2015 Rube Goldberg Machine Contest college nationals, six teams gather in Columbus, Ohio's Center of Science and Industry children's museum to set up their machines around the walls of the hangar-like space and eye up the competition. The teams have made the trip here by car, their carefully assembled machines, months in the making, broken down and borne by trucks and U-Haul carriers. Team members lean over each other to place a golf ball here and balance a domino there, assembling their delicate contraptions for the next day's judging.

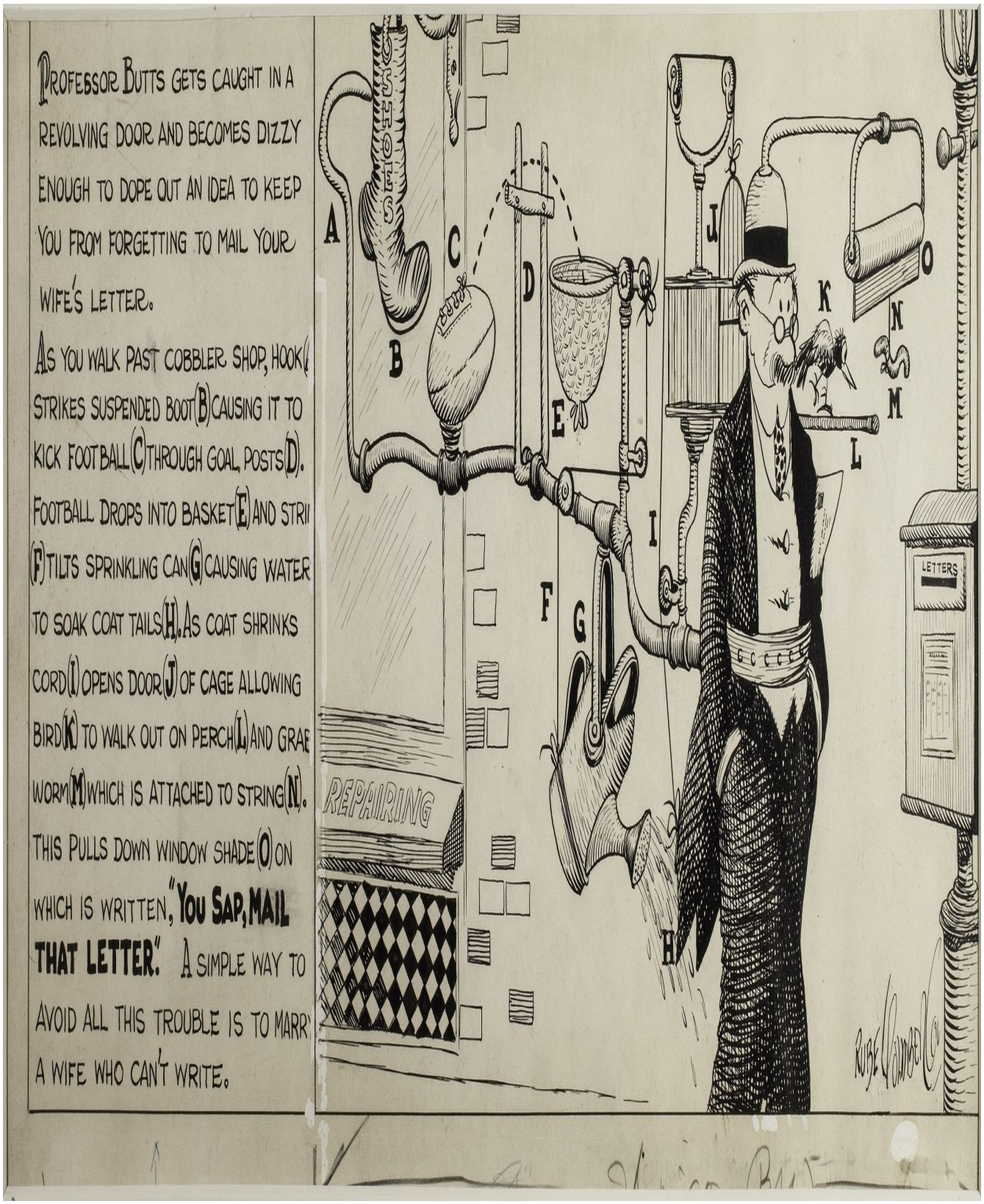
Made famous by 20th century cartoonist and erstwhile engineer Rube Goldberg, the machines that carry his name accomplish mundane tasks in over-elaborate ways — ideally with a sense of humor. Every year, Rube Goldberg Inc., the company established by Goldberg's son, hosts nationwide competitions at middle school, high school, and collegiate levels with new challenges. This year's task: erase a chalkboard.

There's no monetary prize on the line, but bragging rights are at stake: last year's college nationals winners — a team from Purdue's Society of Professional Engineers (PSPE) — appeared on *Jimmy Kimmel Live*, and they've returned to defend their title. They set up quickly, with a few team members tweaking obscure parts of the machine but most just lounging around, checking out the other machines with small smiles, superior without being condescending. They've been here before.

I'm here to see the team from Penn State — members of the undergraduate club Society of Engineering Scientists (SES) — compete. Of all the crews in the national championship, the SES team is the least experienced: half the team are freshman and none have ever participated in a Rube Goldberg competition before. Making it to the nationals was a long shot, and now they have to face off with veterans.

But the SES team, or their machine, are nowhere to be found. Fifteen minutes before the museum closes, they finally arrive. Their trip was foiled by the machine bearing their machine: their truck broke down on the way to Columbus from State College, Pennsylvania. The transmission fluid in their car was low, and then there was snow and four accidents. They'll have to wait for the morning to set up their machine, test it, and fix anything that might have broken during travel.

www.theverge.com/2015/4/22/8381963/rube-goldberg-machine-contest-history-ide



Though in life Rube Goldberg was known to the world as a cartoonist, he was first an engineer. He graduated

from UC Berkeley in 1904 and took a job in San Francisco where he worked on the city's sewer systems. But he didn't last long. A naturally talented artist, Goldberg became a sports cartoonist for the *San Francisco Chronicle* earning $8 per week.

Goldberg was earning a salary of over $1 million by today's standards

He moved to New York in 1907; by 1915, his cartoons were nationally syndicated. This was an era in which a syndicated cartoonist could make a healthy living: according to a short profile published by *The New York Times* in 1963, Goldberg was earning a salary upwards of $50,000 by 1916 — over $1 million by today's standards.

Over the course of his decades-long career, Goldberg drew cartoons that were variously political and frivolous. He penned three nationally syndicated, weekly comic strips —"Boob McNutt," "Mike and Ike: They Look Alike," and "Lala Palooza" — and wrote a single-frame cartoon called "Foolish Questions." At the peak of his career, he wrote three editorial page cartoons every week, which appeared in 43 newspapers across the country.

Goldberg's work made him famous: he was named the first president of the National Cartoonists Society in

1946; in 1948, he won the Pulitzer Prize for a political cartoon satirizing nuclear power. (The conservative Goldberg was invited to the White House by Presidents Eisenhower and Nixon.) Goldberg "has won as many trophies as even his most prolific trophy-inventing machine might devise," reads a short *Times* profile on the occasion of his 80th birthday. "He takes them seriously but not too seriously, like nearly everything else in life."

But Goldberg's engineering studies were not entirely wasted — no cartoons left as indelible an impact on popular culture as his mechanical chain-reaction illustrations. Goldberg drew his cockamamie inventions intermittently from the beginning of his career — he drew the first, "Automatic Weight Reducing Machine," in 1914, and in 1921 Marcel Duchamp published some of Goldberg's designs in *New York Dada*. But the majority of these cartoons come from a bi-weekly series he drew for the magazine *Collier's Weekly* from 1929 to 1931 called "The Inventions of Professor Lucifer G. Butts." Professor Butts (the "G" stood for "Gorgonzola") was a parody of a Berkeley engineering professor who had once asked his students to design a machine that could weigh the world. Goldberg, one of those students, found this to be a preposterous task.

The machines were symbols of "man's capacity for exerting maximum effort to accomplish minimal results."

The surrealism of Goldberg's cartoon inventions — in one, someone has sent Professor Butts a mail bomb, which he uses to build a device that will blow up inflatable armbands to go swimming — is meant to entertain, but it also reveals a dark skepticism of the era in which they were made. The machines were symbols, Goldberg wrote, of "man's capacity for exerting maximum effort to accomplish minimal results." The early 20th century was a time of great technological upheaval — inventions of unprecedented complexity were introduced to the world as novelties and quickly became ubiquitous.

Charlie Chaplin and the Billows Feeding Machine from 1936's Modern Times

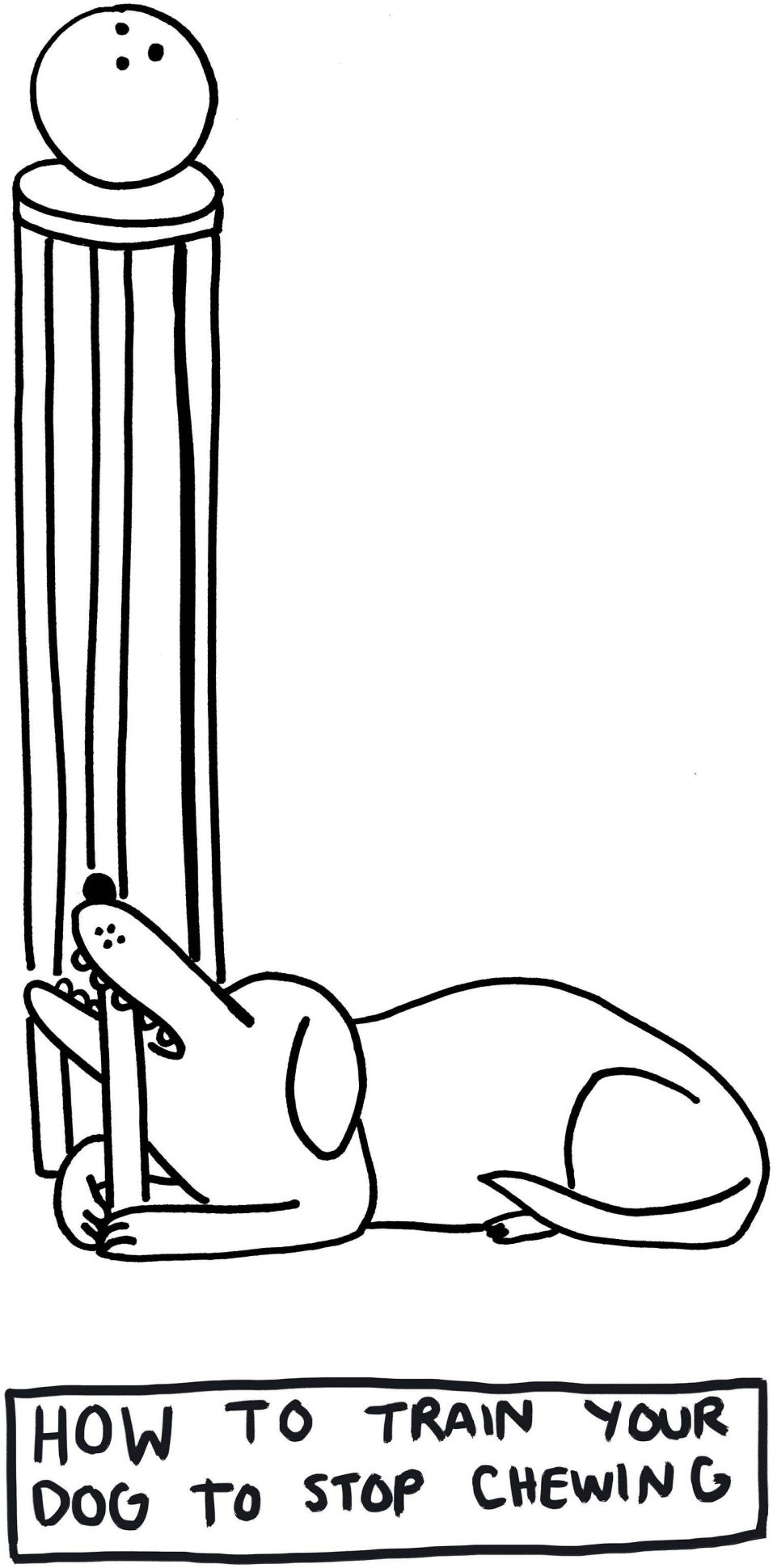
It was also the era of increasing automation, and increasing concern about automation, exemplified in Charlie Chaplin's 1936 masterpiece *Modern Times*. One of the film's dystopian curiosities, the Billows Feeding Machine, invented by Mr. J. Widdecombe Billows, has a distinctly Rube Goldbergian quality to it — this is likely no coincidence, as Goldberg and Chaplin were friends. "The Billows Feeding Machine will eliminate the lunch hour, increase your production, and decrease your overhead," the film's narrator announces. "Don't stop

for lunch: be ahead of your competitor." A factory worker is strapped into the feeding machine by his neck; the device malfunctions spectacularly.

Many of Professor Butts' inventions blurred the distinction between man and machine, incorporating people and animals into the mechanical process. In "Idea for Blowing Up Water Wings," a giant razor is used to cut a dog's hair, who then catches a cold and sneezes, which fills up the inflatable arm bands. "If razor kills spaniel, then you will sink and never know that Professor Butts has failed for the first time in his life," the caption reads. "Automatic Suicide Device for Unlucky Stock Speculators" includes a toy glider hitting the head of a "dwarf," who triggers the next step by jumping up and down in pain. "The things may look impossibly foolish, but at the same time they are quite logical," Goldberg said of his inventions. "For instance, when I have a goat crying in one of my cartoons, I have to give a satisfactory reason for having him cry. So I have someone take a tin can away from him."

The machines built in Rube Goldberg's name today (he never actually built one himself) are largely whimsical things — any social commentary subsumed by the "gee whiz" impulse toward engineering for engineering's sake (nowhere is this better displayed than in the gate-opening machine from 1985's *The Goonies*). They seem to have taken on a new life, too, in our internet era: five years ago, the band OK Go released a music video featuring a Rube Goldberg machine that has since been viewed nearly 50 million times; Joseph Herscher, an artist from New Zealand, builds Rube Goldberg machines and posts them to YouTube where they're viewed millions of times; and a video of a machine built within the game *Minecraft* has been viewed a little over 2 million times. "I think the internet gave Rube a whole new meaning, a whole new life," Jennifer George, Rube

Goldberg's granddaughter told me. "Any Rube Goldberg machine worth its salt goes viral."



hine-contest-history-ide

To qualify for the Rube Goldberg Machine Contest college nationals, teams must first compete at regionals. The rules are simple: machines must be composed of a minimum of 20 steps and a maximum of 75, and they must complete their run in under two minutes. Teams are permitted to use no more than two air compressors, power cords, or water hoses. Elements of the machine may not travel beyond its 10-square-foot footprint, and machines can be no more than 8 feet

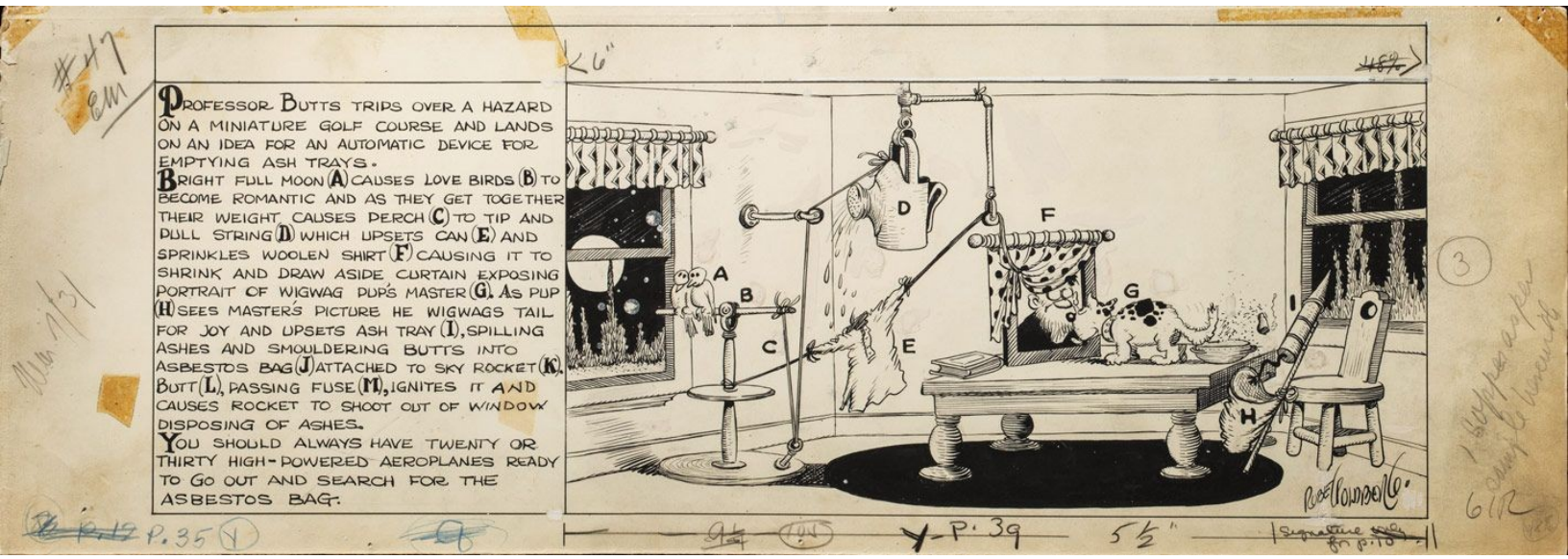
tall.

The earliest iteration of the Rube Goldberg Machine Contest took place for a few years in the early ’50s between two engineering fraternities at Purdue. The trophy from that

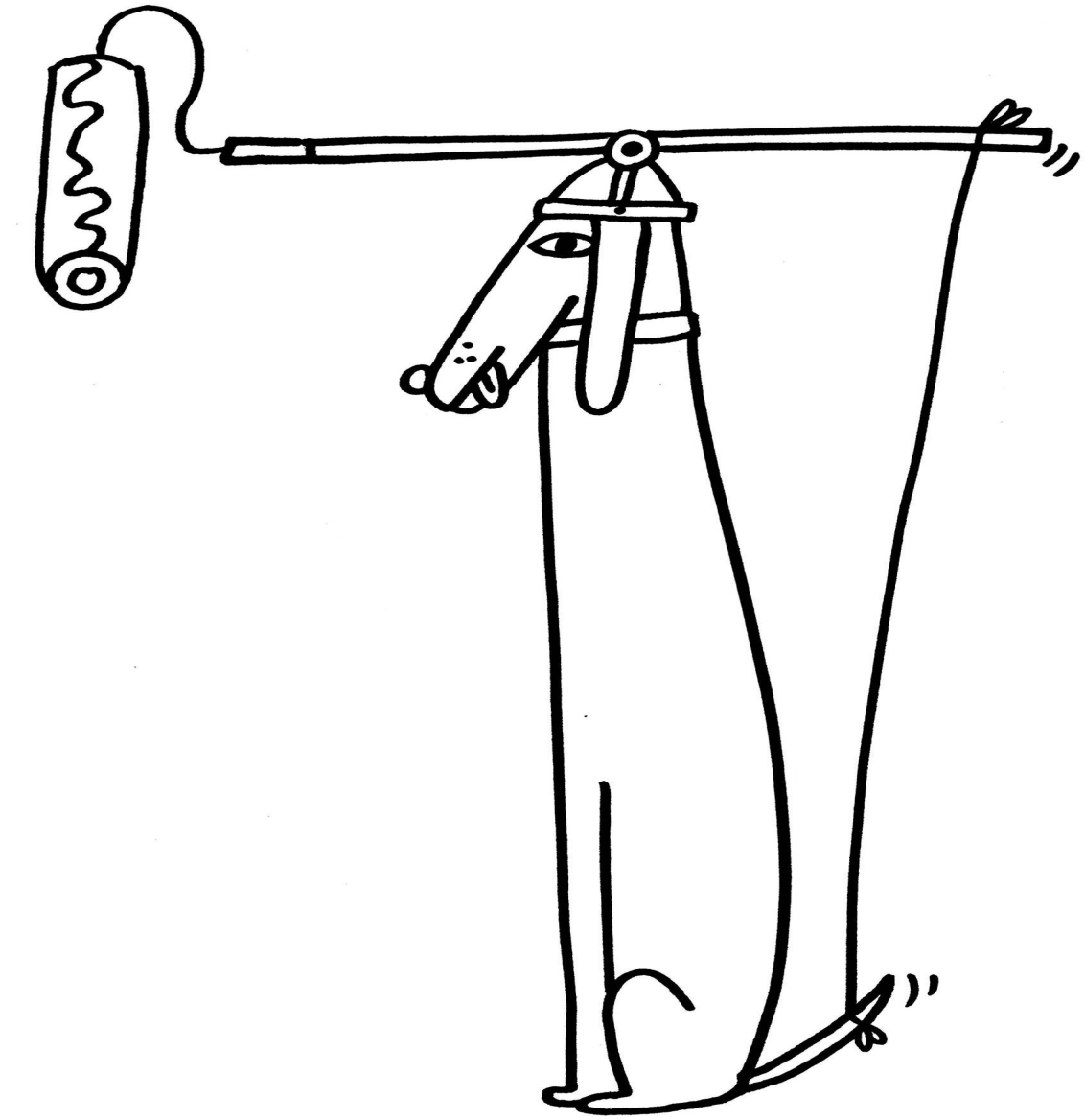
competition ended up with the Theta Tau Fraternity until 1983, when a pledge named Lonnie Oxley, who was tasked with dusting it off, was inspired to bring the event back to life. Reviving the competition took some work: "The most critical thing," Oxley told me over the phone, "was getting a second machine. Wouldn't be much of a contest with just one machine." The second year, the competition was sponsored by Pepsi — the task was to pour the soda into a cup. One of the teams, Oxley said, built a sign advertising Pepsi into their machine. (This year, Purdue's regional competition was sponsored by General Motors and Nucor Steel.)

In the late '80s, Rube Goldberg's son, George W. George, created a company called Rube Goldberg, Inc. to manage registrations, trademarks, and licenses. Eight years ago, Jennifer George, Rube's granddaughter, took over the family business and decided to grow it from a hodgepodge of events and trinkets to a full-fledged enterprise. "My father, he was happy to just give the plant enough water so it didn't die," Jennifer told me. "I am intent on fertilizing this plant, and putting it in the sun, and making sure it's watered every day. Somebody asked me last year, 'Where do you see yourself in 10 years?' I said, 'Waiting in line for the Rube Goldberg roller coaster.' That's how I see this thing. I think it's giant."

The relevance and appeal of Rube Goldberg machines today, George told me, is in what it reveals about how technology — and the way we live with it — has changed. "This is a very complex machine," George said, holding up her phone. "But is it a Rube Goldberg? No." She added, "When your phone doesn't work…can you fix it?" Rube Goldberg machines remind us of a time when we could see how the machines around us worked: you could pop the hood of your car and — theoretically at least — fix it, or learn how to. Now, you pop the hood of your car and there's a computer inside.



www.theverge.com/2015/4/22/8381963/rube-goldberg-machine-contest-history-ide



HOW TO UTILIZE YOUR DOG'S MINDLESS JOY

A week before the nationals, I visited Penn State to meet the Society of Engineering Scientists team and see their machine. The Penn State SES team has previously participated in regional Rube Goldberg Machine Contests, but they've never qualified for nationals before. Last year, the team didn't compete at all; this year's team is full of novices, and they're scrappy. They picked up tricks from watching videos of Purdue machines from years past, and they built their machine in an empty office of a labyrinthine engineering building.

"An engineer is supposed to look at a complicated problem and come up with a simple solution," said freshman Rebecca Terosky, the team's wide-eyed co-captain. "This," she said, referring to Rube Goldberg machines, "is the opposite of what an engineer is supposed to do. You're using everyday materials, making it whimsical. You don't feel like you're working, you feel like you're playing with toys."

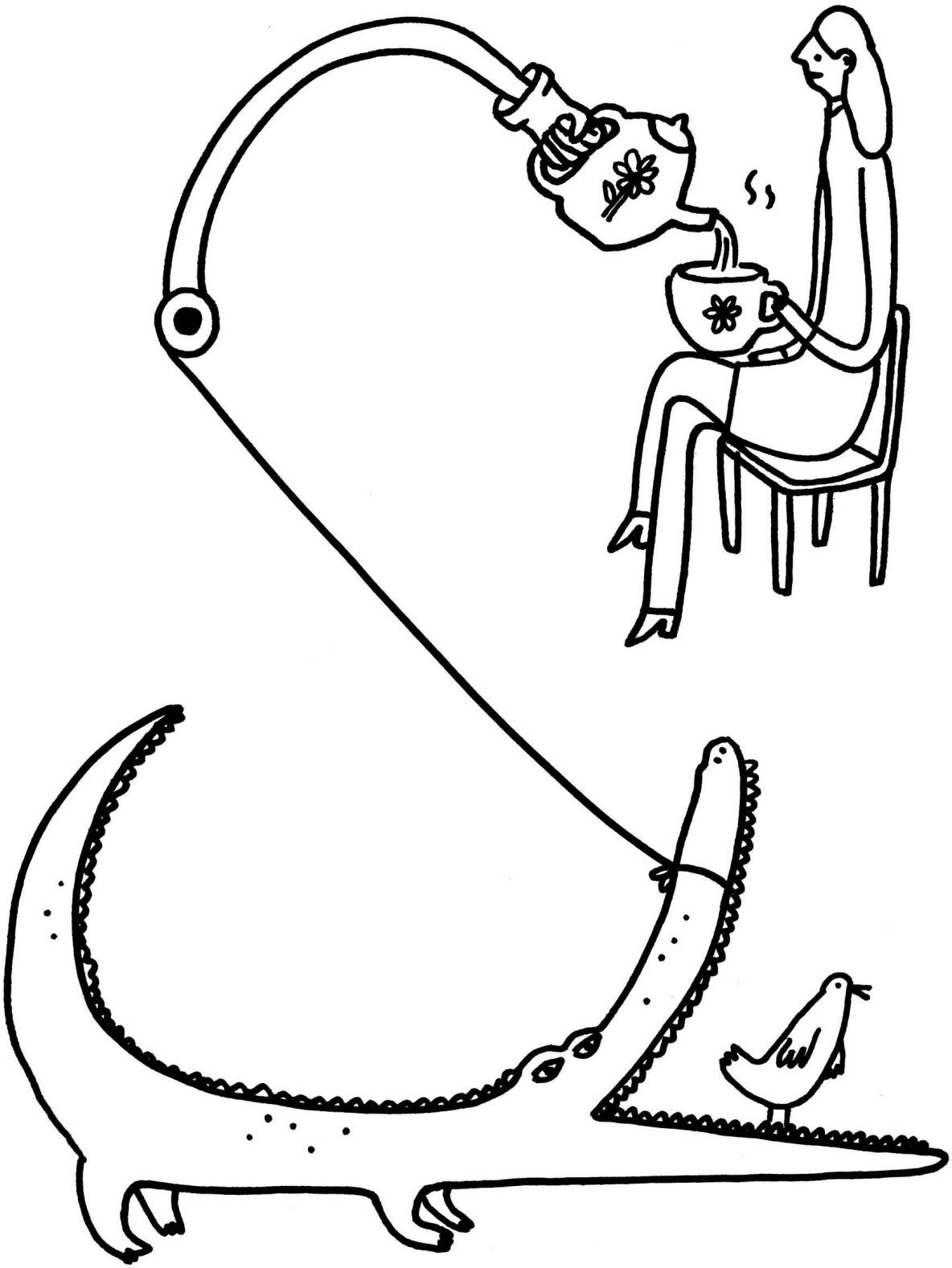
On my visit, the team was building a key component that involved a ball falling off a table onto a button, which triggered a wind-up car. The members of SES were relaxed — someone would hammer in a step and then stop to talk about a chemistry quiz or gossip about a professor with a massage chair in his office before debating the best way to cut foam.

The team has a sponsor, however, who is more serious-minded about the competition — an engineer and Penn State alumnus named Glen Chatfield. Chatfield offered the team funds for supplies and travel with the stipulation that they had to take a measured, analytical approach to designing and building their machine. "Our sponsor wanted to see math in addition to guess and check," Terosky said. "If someone's giving you money, you want to make them proud."

Speaking over the phone, Chatfield sounded as much like a businessman as an engineer. Chatfield said that "the kind of cobble-it-together, craftsman approach" to building Rube Goldberg machines was outdated. "The more modern approach is more process-oriented," he said. "Engineering's all about numbers — what are the numbers, what do the numbers mean….Any product that you design that's done in that brutal way is just not competitive in the marketplace. And that's not the skill that you want your engineers to really have."

"Humor can be a design objective," Chatfield told me. "But, I mean, how do you quantify humor?"

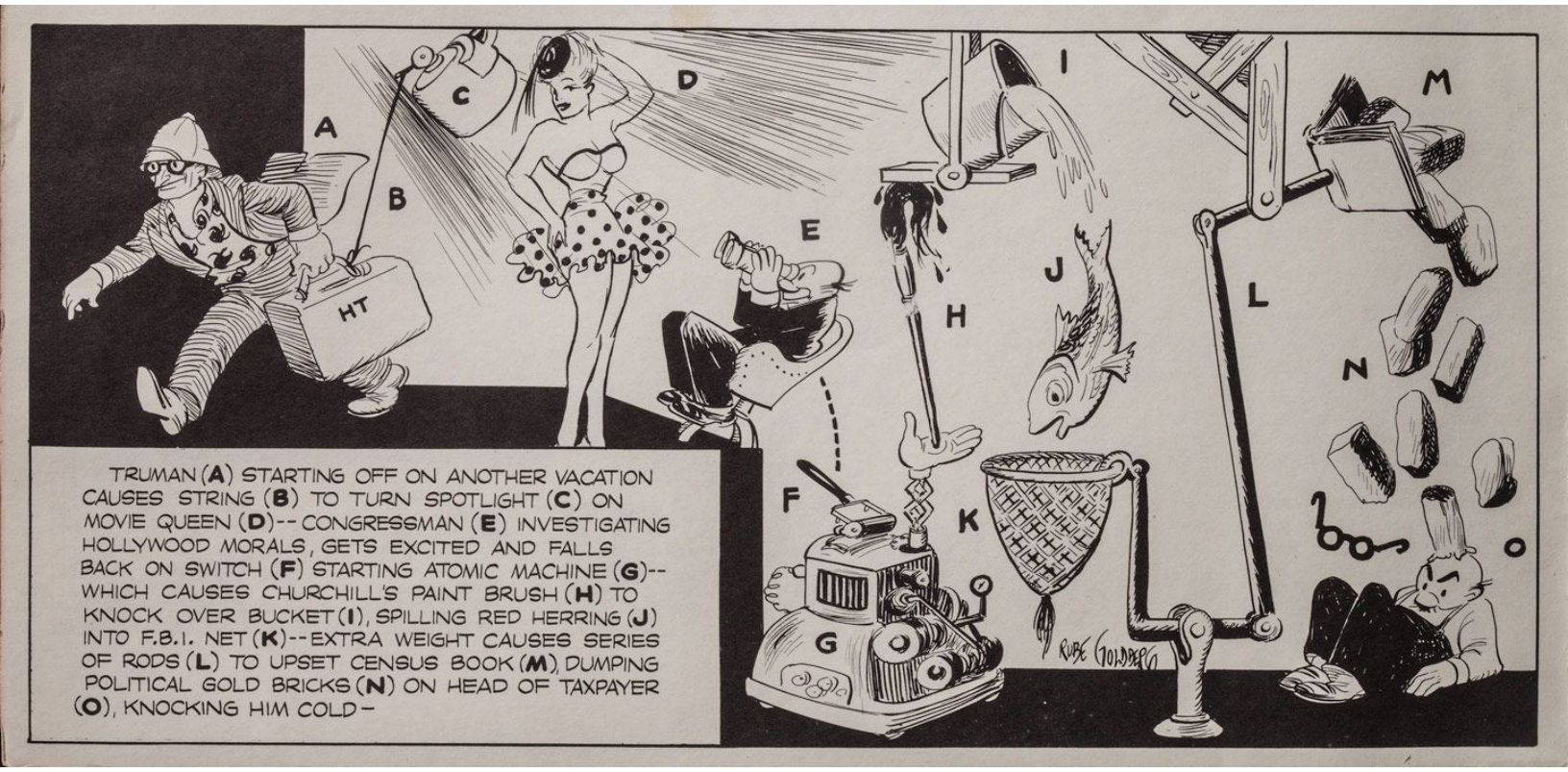
-history-ide



HOW TO SERVE TEA

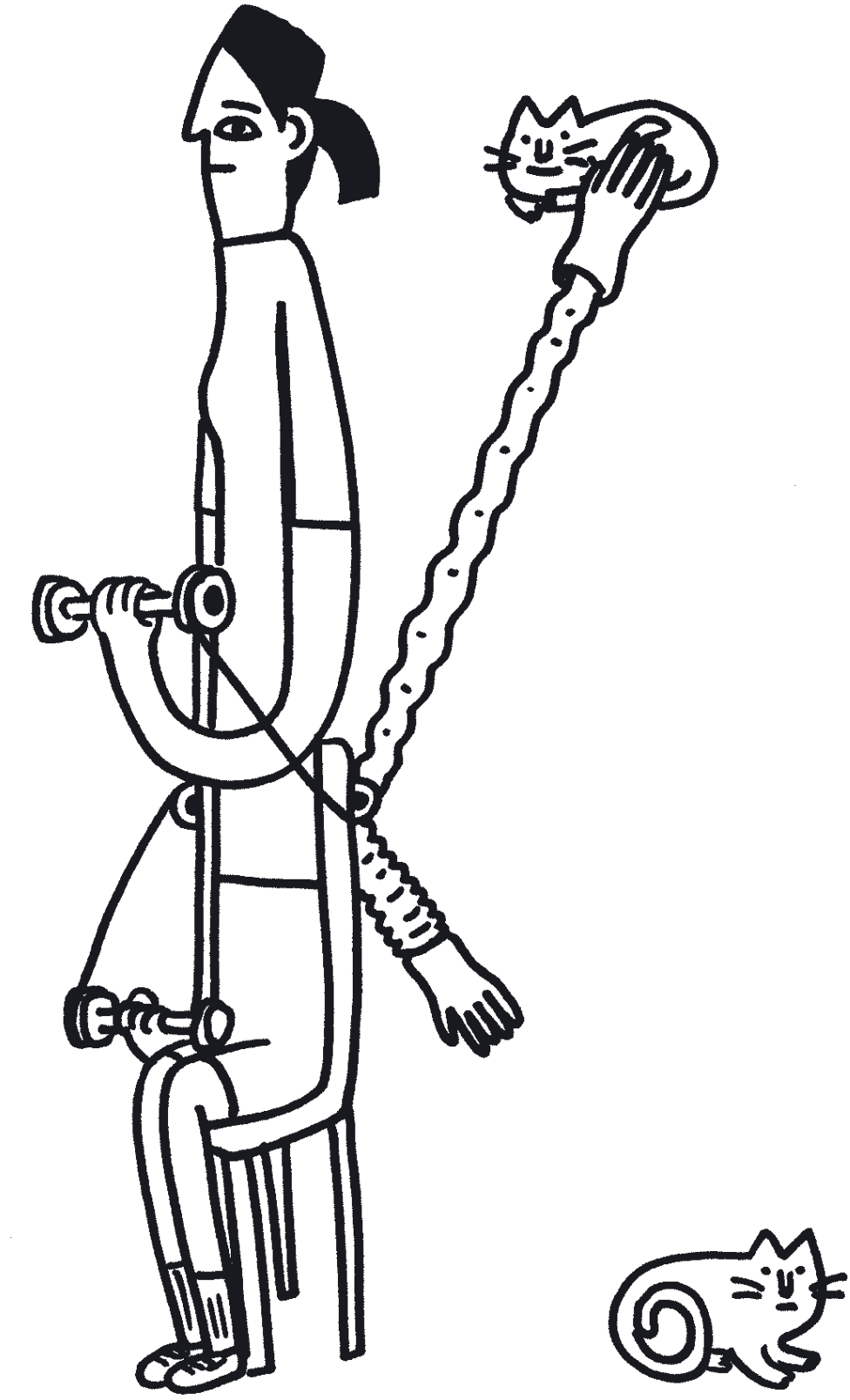
The SES team devised a machine that illustrates a school calendar. The team broke into four groups, each responsible for designing and building separate sections that roughly correspond to the seasons and come together to navigate the viewer through the school year. Holidays and changes in the weather are dramatized: a Santa dumps presents down a chimney for Christmas; water, signifying spring rain, pours through a tap into a bucket.

Much to everyone's surprise — including their own — SES took first place at regionals. "We did not expect to win," Terosky said. "We were just hoping not to embarrass ourselves." By winning, they qualified for nationals; by qualifying for nationals, they found themselves facing a new set of problems. "Our machine is… not very durable," Terosky said. The drive to the hotel where regionals took place was only 15 minutes, and even in that time parts broke.



"Before making a basic frame, we had to recognize that this has to come apart and go somewhere else. This is a real engineering problem, when you're making airplanes or amusement park rides. It's the most applicable to the real world of engineering, the biggest challenge of the whole competition," she conceded.

ıry-ide



HOW TO PET YOUR PETS WHILE DOING YOUR REPS

By Saturday morning, the day of the nationals, SES has set up and tested their machine. The space begins to fill up with a crowd of three or four hundred people, many of them children. A cherry-picker in the middle of the room is rigged with a camera: during the judging process, video of the machines is streamed and projected onto an overwhelmingly large screen over the stage, where, afterwards, awards are presented.

SES are set up right next to last year's champions from Purdue. Rube Goldberg machines are fickle by design, and one errant step can derail the best-laid machine. The champions' first test-run of the day fails almost immediately. "First question," someone from PSPE asks. "Is it plugged in?" It's not. Someone jumps up, plugs it in, and the machine runs without issue, telling the story of Rube looking for a comic he'd drawn, and lost.

The machine moves through 73 steps in less than a minute, suggesting a desperate search by Rube as he upends his house looking for the comic. At one point, a ball drops, and a mechanized dog springs out of his house to grab it. The machine finishes — the cartoon was in a cupboard — and Dexys Midnight Runners' "Come On, Eileen" plays. (The name of the machine, I learn, is "Eileen.")

"I feel like everyone involved in Rube Goldberg nowadays is really looking to push the limits in terms of engineering feats," junior and team president Jordan Vallejo told me when I spoke to her on the phone before the competition. She was on the team last year, too, and appeared with them on *Jimmy Kimmel.* "It's becoming harder to make these machines humorous and playful, but it's important to try," she said. "A lot of people think of engineering as a very serious career. Which it is! But it's important to take things lightly, to laugh, to learn from mistakes."

On the other side of SES sits the Iowa State team. The eye is drawn to this machine in a way that it is not with the others, which are spiky and chaotic and sort of hard to look at. When Iowa State arrived the night before, other teams stopped and stared — even the champions from Purdue sat up a little bit straighter. The machine is detailed and precise, like the others, but without appearing precarious or spindly. As they assembled it, Rube Goldberg's granddaughter, Jennifer George, raised her eyebrows. "I'll be interested to see if it works," she said.

"It's becoming harder to make these machines humorous and playful, but it's important to try."

On Saturday morning, Iowa State is having difficulties. Their machine is designed to resemble a big-screen television, divided into 12 boxes that contain iconic scenes from movies that the contraption will enact, one after another: a "Movie Marathon Machine," for watching a dozen movies in three minutes. To everyone's frustration, the truck from *The Dark Knight* won't flip. The machine was built 1,000 feet above sea level — lower than Columbus — in an uninsulated shed — colder than Columbus. The team says the condition changes are preventing the air compression device meant to flip the truck from generating sufficient force. After a half-dozen incremental pressure increases, the truck is flipping properly — but then, something starts smoking. "It's an effect," one team member jokes while another scrambles up a ladder to fan away the haze. "It's a really good effect."

Late in the morning, judging begins. Surrounded by a crowd of the teams' families, visitors, and lots of children, the judges move counterclockwise around the room. Before each run, teams have three minutes to introduce and narrate the scenarios their machines depict — crews are judged here on their showmanship and storytelling ability.

3881963/rube-goldberg-machine-contest-history-ide

A team from Penn State's Harrisburg campus is decked out in *Star Wars* and *Star Trek* costumes as they present their machine, "Out of this World: Tale of an Outer-Space Pinball." It's hard to follow what is happening in this machine — many of the steps are small, move too quickly, or are hidden behind other, more prominent elements. Apparently, buried somewhere in the machine, there is a miniature Gauss cannon, which one of the judges will later describe as "basically a railgun, it's pretty cool."

The University of Wisconsin-Barron County's machine is a saccharine, barely functioning tribute to a retiring engineering professor. Then come the Purdue champions. PSPE's experience as engineers and storytellers is evident; their speaker is comfortable describing "Eileen" to the growing crowd. During deliberations, one judge would describe the machine itself as the year's "most Rube Goldberg-ian." The mechanized dog fetching a dropped ball is a big hit.

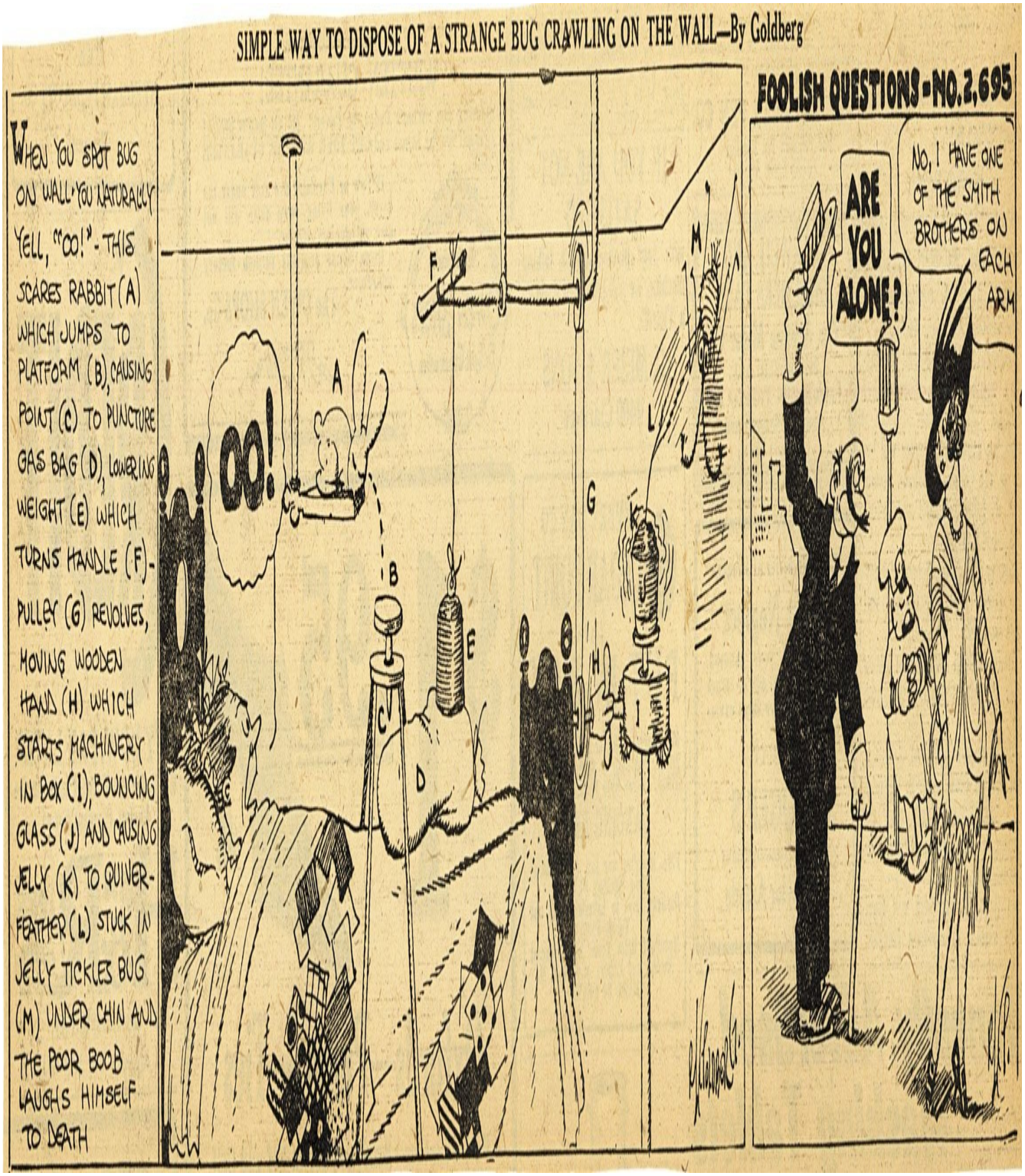
SES follows Purdue. Terosky is nervous as she describes their machine, but she is funny and entertaining — the calendar machine, working its way through the year in a matter of seconds, doesn't have a narrative story, exactly, so much as an amusing description of one event after another. The machine's first run is perfect — the machine doesn't stop once; an intervention is necessary on the second run, however: "I'm trying not to be disappointed, just because other people are," Terosky tells me. "Gotta keep morale up." The crowd, which

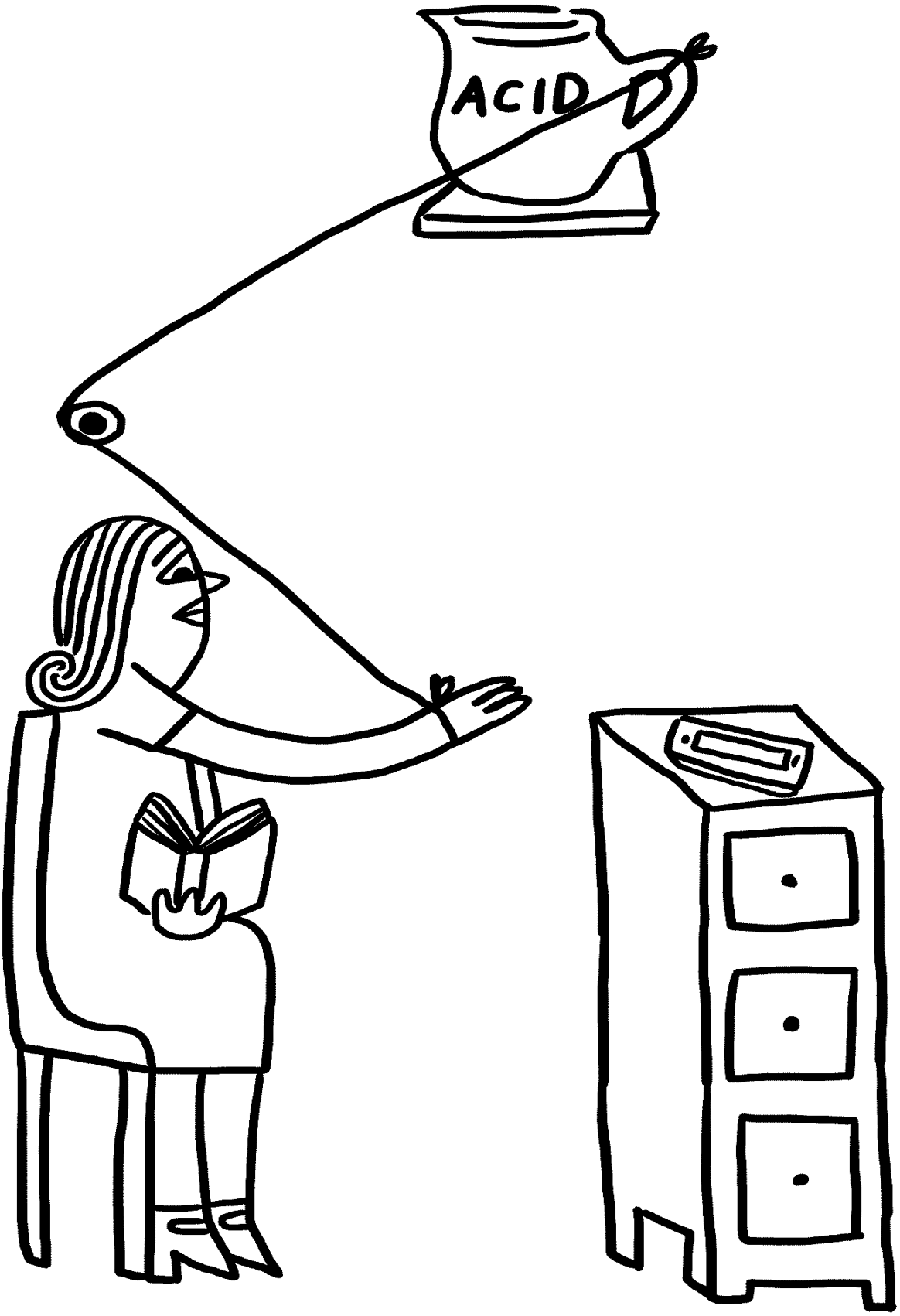
includes 30 or 40 elementary school-aged children, cheers when an eraser finally wipes the board clean.

After SES, the judges and crowd turn to Iowa State. Its first run on Saturday morning — in front of the judges — is the first time that the team has tried to run the machine from start to finish. Steps start triggering out of order and then the whole thing — which, it turns out, is essentially a very long and elaborate marble-run — sets off all at once. One Iowa State team member has to get up and move the marble along with his finger, ushering it through one scene after another.

It comes as no surprise when PSPE repeats as champions, taking home both the first place prize as well as the prize for Funniest Step. Second place goes to another team from Purdue, the American Society of Mechanical Engineers, whose machine — a "haunted" classroom — subverts the task by pouring slime over a chalkboard. Penn State SES, with their rickety, mostly cardboard machine, takes third. Iowa State is awarded Best Design, "even though it didn’t really work that well, and it wasn’t really a Rube Goldberg machine," Jennifer George said as she presented the award.

www.theverge.com/2015/4/22/8381963/rube-goldberg-machine-contest-history-ide





HOW TO STAY FOCUSED

A year after her father died in 2007, Jennifer George attended the Rube Goldberg competition for the first time. "Showing up as Rube's granddaughter, you're kind of like this strange mascot," she told me. "It's like being mother to many, many children." What she saw there upset her. "Some of those machines were so spectacularly beautiful, but beautiful in a way that a car is a beautiful machine," George recalled. "The winning machine was basically a glorified marble run," she said, repeating her criticism of Iowa's machine. "A beautiful, precision marble run. But it was not a Rube Goldberg machine. There was nothing about it that was a Rube Goldberg machine."

A week after the competition, I spoke to Iowa State senior Brendan Favo, who designed his school's mechanical movie-watching contraption. "Had our machine worked, we would have been in contention," he said. "We were trying to make a machine that was interesting visually, to push what 'Rube Goldberg' means." Maybe; maybe not.

The team worked on their device every Saturday and Sunday from the beginning of January up until the competition, with some weeknights thrown in as well. "I hate to tell you this, but I don't really know why I did it," Favo told me when I asked why he'd spent three long months working on the machine. "At no time while doing it did I question why — it was fun. But there's no great explanation why I built the machine." He added, "I just saw it as an opportunity to build something."

Almost a century old, Rube Goldberg machines retain their appeal: "There's something in our brains that likes to see cause and effect played out, to see it in a way that we can understand," Joseph Herscher, the Brooklyn-based artist, told me. Herscher has judged at the past three college national competitions but was absent this year. "Most of the technology we live with is designed to be invisible," he said. "A computer is the ultimate example: it's so advanced, so sophisticated, and yet it's not interesting to watch it run whatsoever." When we watch the movements of a Rube Goldberg machine, "it's our world that we're seeing, and it makes us appreciate our world. You don't see that nowadays."

Meanwhile, most of Goldberg's comics seem dated: the jokes don't make sense or are lame, and cultural references fall flat. But some feel as relevant ever, and maybe that's because the technical absurdities that the cartoonist parodied are still very real. Our modern era is riddled with machines doing ever less consequential tasks in ever more complex ways. The machines are digital, not mechanical, but the difference between the maximalism of the Rube Goldberg machine and the minimalism of the iPhone is perhaps not so great after all.

There are apps that seemingly accomplish the simplest thing — hailing a cab — in the simplest way: a push of a button. But that simple task is the work of thousands of lines of code, hundreds of developers, a billion dollars, and drivers that have gone into making that button do what it does. The mechanisms of our world are not necessarily any more efficient than they've ever been; they're just more obscure, hidden in the invisible digital distance behind our screens. And just like in Goldberg's cartoons, there are living things — human beings, even — caught up in the machine, carrying out their tasks in chain reaction, their movements as sure as gravity itself.