

CARL & JERRY



By John T. Frye W9EGV

“The Lightning Bug”

from the November, 1963

Popular Electronics

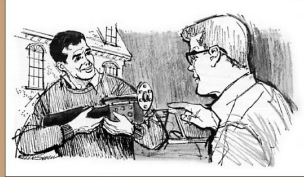


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CARL & JERRY

Their Complete Adventures
from *Popular Electronics*

Volume 5: 1963 - 1964
Topic Index
Two New Stories



By John T. Frye W9EGV

This story has been excerpted from *Carl & Jerry: Their Complete Adventures, Volume 5*. The print book contains 20 stories, originally published in *Popular Electronics* from January 1963 through November 1964. Printed books may be ordered through Lulu.com at the following URL:

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An index with summaries of all Carl & Jerry stories may be found here:

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A Carl and Jerry Adventure in Electronics

The Lightning Bug

Carl, Jodi, Jerry, and Thelma were parked in a secluded spot on a country road not far from the campus of Parvoo University. It was a beautiful, late-October, Indian-summer kind of evening, but their conversation was not of romance.

"You girls ready to be introduced to the Lightning Bug?" Jerry asked.

"It won't hurt us, will it?" Thelma inquired nervously.

"Of course not!" Jodi scoffed. "I told Carl and Jerry we needed something unusual that would sort of uncurl the Tonis of those pledges we're initiating tomorrow night, and they spent their whole weekend at home building this— this *thing*. We're ready, Jerry."

Jerry turned off the headlights, and Carl took a bulky object from the trunk and carried it several yards down the road in front of the car and placed it on the black-topped surface. Then he returned to his place in the back seat with Jodi.



When Jerry flipped the headlights back on, the thing in the beam of light instantly came to life. It lumbered around in a little half-circle and headed for the car with an odd, hunting, zigzagging motion. Snapping sounds like the clicking of teeth came from it, and the rear part of its body glowed intermittently after the fashion of a lightning bug. The closer it came, the faster it moved, and Thelma, sitting beside Jerry, let out a little shriek.

Jerry turned the headlights off again, and immediately the strange object halted and sat there in front of the car, completely silent and motionless.

"Here, take this flashlight and walk around on the other side of the Lightning Bug and turn the light on it," Carl instructed Jodi.

A little hesitantly, Jodi got out of the car and walked in a very wide circle around the silent object in the road. Finally, from a distance of several yards, she turned the beam of the powerful flashlight on it. Immediately the body began to pulse with light, and the thing wheeled around and started for her. She started backing up, but it picked up speed and began to gain on her.

"Turn off the flashlight!" Carl shouted.

She obeyed, and instantly the "animal" seemed to die in its tracks.

Jerry turned the headlights back on once more, and they all got out and joined Jodi. As the weird creature headed back toward the car, Carl fearlessly picked it up and did something to it that seemed to quiet its snapping and flashing.

Standing around the object in the light from the automobile, the girls saw that it was crudely shaped like a huge lightning bug. The body of the "bug" was some 30 inches long and a foot high. Tucked down out of sight under the body were three small rubber-tired wheels. The rear two were on a straight axle, but the front one swiveled. Most of the mechanical creature was made of painted plywood, but the back lower half was constructed of translucent plastic. Carl lifted off the top to show the girls a couple of small electric motors operating through gear trains and belts to drive the two rear wheels. There were also some six-volt lantern batteries and a few other electronic parts wired together.

"Tell us how it works," Jodi said, obviously impressed by the device.

"Well," Jerry began, "both rear wheels are driven by a separate permanent-magnet, high-torque motor. They don't draw much current, and they're geared way down so they don't have much work to do."

"But what makes that thing come after you when you shine a light on it?" Thelma asked.

"These two 'eyes' here on the head that look sort of like glass-topped power transistors are actually a special type of photocell whose resistance varies with the amount of light falling on them," Jerry explained.

"The right eye is in series with a lead to the motor driving the left wheel, and the left eye is in series with a lead to the motor driving the right wheel. Each eye 'looks' toward the side as well as straight ahead because they're mounted at a forty-five degree angle. If light comes from the right, the resistance of the right eye drops, and the left-hand motor starts up and turns the bug toward the light. When it's facing the light head-on, both eyes receive the same illumination and the two motors make it move straight ahead. As more and more light falls on the photocells, the motors run faster and faster."

"Aren't photocells only supposed to carry tiny currents?" Jodi asked. "I don't see how you can run the motors."

"This brand-new LDR-25 Power Photocell developed by the Delco Radio Division of General Motors at Kokomo, Indiana, is the only one I know of that will carry the kind of current needed," Jerry answered. "When you mount one on a heat sink, it'll dissipate twenty-five watts without any trouble. It's nonpolarized and handles d.c. current up to half an amp, and a.c. or d.c. up to two hundred volts."

"In the dark, its resistance is half a meg, but it falls to four hundred ohms with ten foot-candles of light, to eighty ohms at a hundred foot-candles, and to fifteen ohms at a thousand foot-candles. I tried putting a little NE-2-H neon lamp right up against it, and the resistance dropped to seventy-five ohms!"



“What sort of things can you use it for?” Thelma wanted to know.

“Almost any kind of photocell control circuit handling up to forty watts,” Jerry replied. “It can be hooked in series with a small a.c. motor of the type used on food

mixers or electric sewing machines, and the speed of the motor can be varied continuously just by regulating the amount of light falling on the cell.”

“I suppose we could make the cell even more sensitive by using a lens to concentrate the light,” Carl suggested.

Jerry shook his head. “That’s not a good idea with this cell. The active area is about nine-tenths of a square centimeter, and all of this should share in the heat dissipation. A lens would concentrate the current and the heat in a small portion and might damage that spot, even though the total heat dissipated was below twenty-five watts.”

“Are these cute little antennae that curve down and back from below each eye just for looks?” Thelma asked.

“No, those are really fiber-optic rods made up of bundles of very thin glass fibers treated so that they can conduct light just like a wave guide conducts radio waves. The rods are curved so light coming from angles at the rear of the bug will be conducted to one or the other of its eyes and make it wheel around. A snapper working off the wheels makes the clicking sound. It’s just for effect. So is the pulsing light shining through the plastic. A light-blinker inside is turned on by a relay in series with the common battery lead so it comes on when either motor is drawing current. The lantern batteries are hooked in series to produce twenty-four volts for the motors. That’s about all there’s to it.”

“I think it’s wonderful,” Jodi exclaimed. “Boy, will it scare those pledges to death tomorrow night, especially since it’s Halloween!

“On the way out to that old barn where we’re holding the initiation we’ll talk about the battle between man and insects and how super-insects born of resistance to insecticides and mutations caused by atomic radiation may even now be lurking in dark corners ready to attack.”

“Then we’ll send them into the old barn to make sure it’s safe for the rest of us to come in,” Thelma broke in. “The Lightning Bug will be back there waiting in a dark corner for their flashlight beam to bring it to life. It still scares me a little, even though I know how it works. I can just imagine what it will do to them in that dark, cobwebby old barn.”

“We’ll be sure not to arrive before ten o’clock,” Jodi promised. “That will give you boys plenty of time to set up the Bug and get out of there before we send in the pledges.”

Nine o’clock the next night found Carl and Jerry walking across a field toward the old deserted barn that stood beside the charred ruin of what had been a house. While a road ran past the ramshackle building, the boys decided it would be wiser to park in a lane down the road and walk back. The weather was still warm, but a strong damp wind was blowing gustily from the south, and now and then a fast-flying cloud scudded across the face of the full moon just coming up over the horizon.

Carl and Jerry let themselves into the dark, musty-smelling barn through a door whose rusty hinges squeaked with a spine-tingling sound right out of a Class-B horror movie.

“I’ve seen cozier places,” Carl muttered as he played his flashlight around over the dusty floor and the rotting harness hanging on pegs beside the empty stalls. “What say we put the Bug right over there in that corner? The girls will be sure to shine their light there, and when the Bug starts moving it will seem like it’s trying to cut off their exit through the door.”

“Sounds good to me,” Jerry agreed. “Let’s hurry up and get out of here. This place gives me the creeps.”

He held the flashlight while Carl carefully arranged the Bug in the corner and swept away the straw in front of it so that the rubber wheels would have good traction. Just as he finished, Jerry abruptly

turned off the flashlight and whispered hoarsely, "Someone drove up in a car! Do you suppose it's the girls already?"

"I don't know, but we've got to get out of sight or we'll spoil the whole thing. Let's climb up in the hayloft until we see what gives."

Guided by the moonlight shining through cracks in the side of the barn, Carl led the way up a rickety ladder he had spotted when they first entered. Jerry was right behind him.

They barely had time to stretch out on the floor of the empty hayloft and wipe the cobwebs off their faces when the screeching hinges of the door announced the arrival of company. Peering down through wide cracks in the floor, the boys could make out the restless beam of a flashlight and two shadowy masculine figures.

"Are you sure this is the barn you heard Thelma talking about, Roger?" a voice asked.

"Sure I'm sure. I just want to look it over a bit, and then we'll park the car down the road and come back. Sid, we're going to give those girls a scare they'll never forget, and I don't mean just the pledges! Let's take a look up in the hayloft. That's where we'll hide when the girls get here."

In the darkness Jerry could feel Carl's head turn toward him questioningly, but he never had to make a decision. The wandering spot of light below fell on the Lightning Bug, and it immediately came to life. Flashing its tail, snapping menacingly, it crawled out of the corner straight toward the frozen boys.

"Wh—wh—what's that?" Sid quavered, edging toward the door.

"I don't know, but don't leave me here with it," Roger, who held the flashlight, begged as he circled out of the way of the relentlessly approaching machine. His dodging did no good, for the Bug followed every move of the flashlight.

"It's getting mad ... its tail is flashing faster and its teeth are snapping worse! I think it's getting ready to spring!" Sid shouted from the open doorway.

Roger had backed into a corner directly beneath the boys. As the light grew brighter on the photocells, the motors speeded up and the Bug seemed to be literally lunging at the horrified youth.

He gave a scream of pure terror, dropped his flashlight, and made a great leap over the attacking machine. There was a wild scramble of feet on the gravel outside, and then a car motor started and roared off into the night.

Carl and Jerry, peering down through the hole in the hayloft floor, saw the Lightning Bug crawl to the still-burning flashlight and then stop as the shadow of its own body cut the light off from the photocells.

The boys scrambled down and placed the Lightning Bug back in the corner to await the arrival of the girls. Then they walked to their car and started toward the campus. They had gone only half a mile when two cars, headed in opposite directions but stopped side by side in the middle of the highway, blocked their way. In one car were Jodi, Thelma, two sorority sisters, and two wide-eyed pledges. Roger and Sid were talking earnestly to them.

"I tell you," Roger said to Thelma and Jodi, "you're crazy to go into that old barn. It's infested with some kind of horrible rats as big as Shetland ponies, and—I know this sounds kooky—but their tails light up. One attacked us not more than twenty minutes ago, and we were lucky to get out alive. I wouldn't go back there for a guaranteed six-point-zero index for the semester—and believe me, I could use it."

"The things have long curving tusks, too," Sid threw in.

Jodie looked questioningly at Carl, who nodded very slightly.

"It's awfully sweet of you fellows to warn us," she said smoothly in her rich Southern drawl, "but membahs of this sorority have to be brave. They really do. Drive on, Thelma."

"I just hope," Carl reflected as he watched them drive away, "that those pledges turn out to be braver than Roger and Sid!"

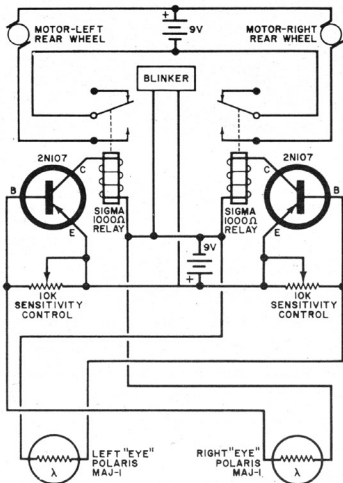
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[Editor's Note: What Carl and Jerry built in this story is a popular gadget even today, and called a "beambot" in the generic. The term means any simple mobile robot that follows a beam of light or some other very simple steering signal, such as a white line on a dark floor, or a dark line on a white floor. The concept (if not the term itself) goes way back. I first

saw it in *Popular Electronics* in the March, 1962 issue, in article called "Emily, the Robot with the One-Track Mind" by Bernard Dickman. In 1966 I built Emily from the instructions in the article, and won a trophy in my 8th grade science fair. My classmates thought the device was uncanny, and to this day, the 55-year-old "kids" from my grade school still think of me as "the robot guy." In 1999, I helped my nephew build a similar beambot with modern parts, and many variations are out there on the Web, free for the googling. It's a great "design it yourself" project because the principles are so simple.

He Builds "The Lightning Bug"

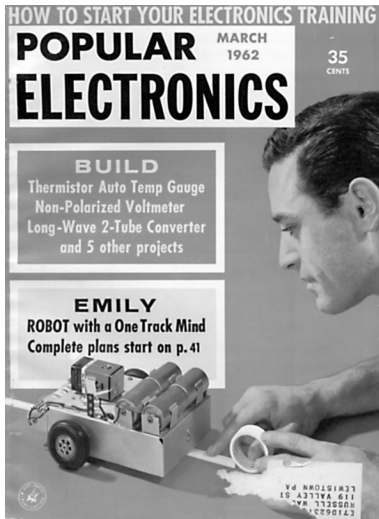
■ The statement you made recently that "The Lightning Bug" (Carl and Jerry, Nov., 1963) exists only in the story is false. Needing a new stunt for a Halloween party, I built a prototype. The schematic shows



the design used—the exterior is a matter of taste. Currently I'm working on "The Girl Detector" (Carl and Jerry, Jan., 1964).

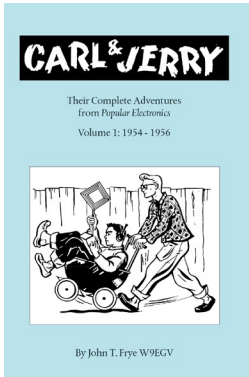
RALPH M. REESE, JR., WN4QAA
Niceville, Fla.

We hope you make out well with your second project, Ralph!



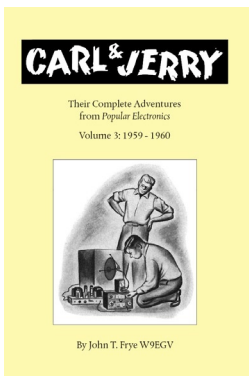
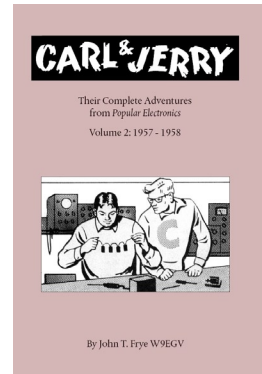
In the meantime, *Popular Electronics* published a circuit in the Letters column in the July 1964 issue, sent in by a reader who actually built a Lightning Bug of his own. The circuit (left) looks good to me, and because the motors are individually controlled, can move forward in a relatively straight line with both motors energized. (Emily, by contrast, could only run one motor at a time and staggered drunkenly along a light beam or a line on the floor.) Some experimentation might be needed to get modern photocells to work in the circuit—and any silicon PNP transistor could fill in for the now-collectible 2N107s—but it would be a great starter project in robotics!]

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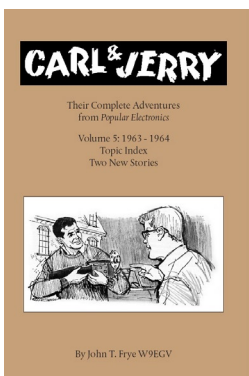
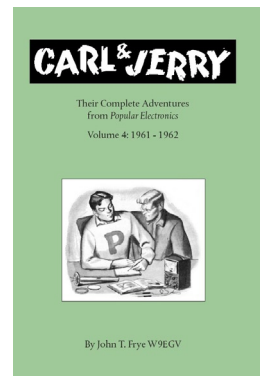
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