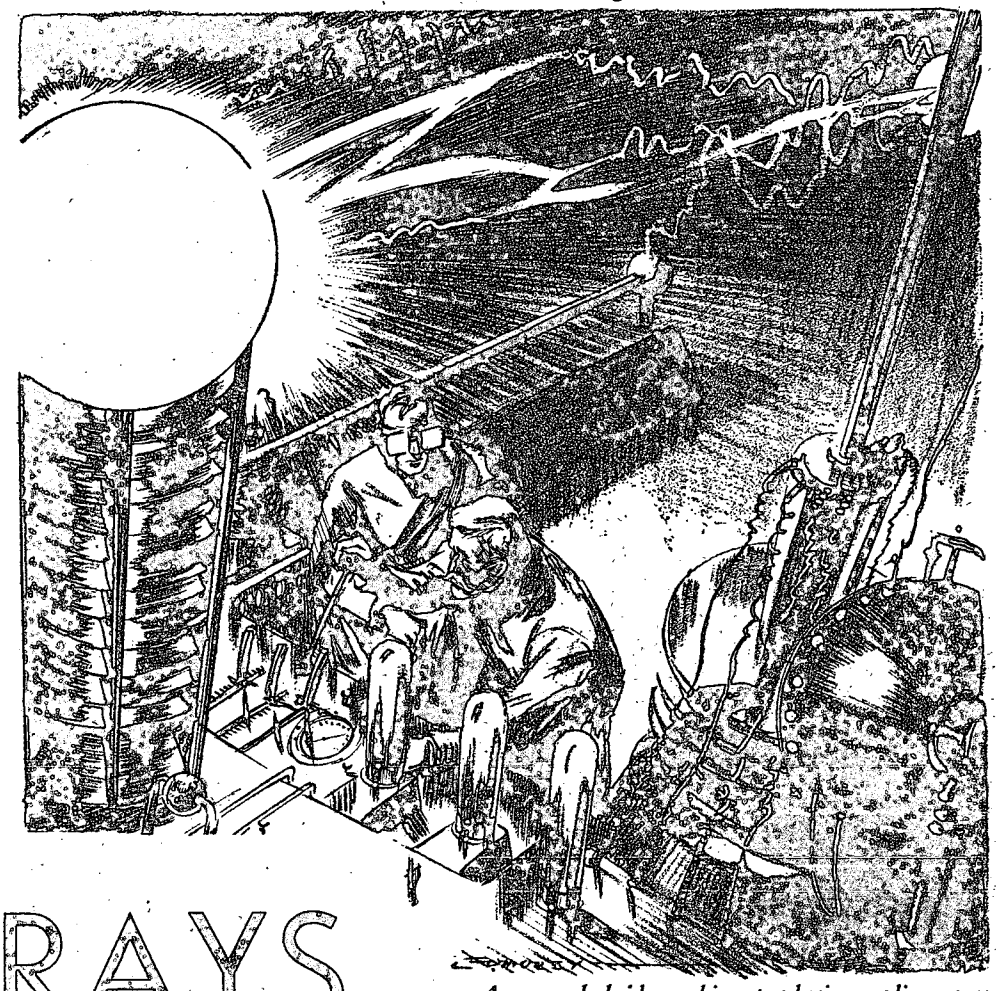
Only One Man's Skill Could Save Humanity from Loss of Vision—
But That Man Was Sightless!



A queer hybrid machine producing radio waves and power charges

RAYS OF BLINDNESS

By WILL GARTH

Author of "The Bloodless Peril," "The Night-Men of Mars," etc.

LONG, slender fingers—musician's fingers that gave proof of the sensitive, scholarly mind controlling them—caressed the sleek, smooth outline of an upright cathode tube. Somehow, there was an infinite sadness in the gesture. The train of associations engendered by the exploring fingers gave their owner a clear mental picture of the tube's intricate insides—its sturdy grid of tantalum, target plate of tungsten, and platinum filaments.

A mental picture, nothing more. For the man whose sensitive touch went so sadly over the tube was blind!

Every morning for ten years Thaddeus Harper had come into his labora-

tory and caressed its apparatuses with that melancholy, aching feeling that seemed to tear his soul out by the roots. Every morning his stroking fingers started memory patterns and he would picture himself moving and working among the instruments, tuning, adjusting, experimenting.

A certain apparatus always engaged most of Harper's attention, in this dream laboratory. It was large, complicated, a maze of coils, tubes and spinning parts. The fiery heart of it always glowed mysteriously, as if it held a great secret. Then, suddenly, there would be a shower of sparkles. A searing, blinding beam would spring forth from the machine, an awful radiation of unleashed fury. Always, in this dream, it had stabbed straight toward him, toward his eyes.

Thaddeus Harper shuddered and a low wail escaped from his tight lips. Ten years ago it had happened, yet the horror was fresh in his mind. His eyes had been burned out, forever. His career as a scientist was ended. His great researches in the atomic field had been blasted by that eye-searing explosion. For what good was a blind scientist?

Thaddeus Harper started as he heard the door latch click. His sensitive ears recognized the entering footfalls as those of his young son-in-law, Burt Chandler. Then he heard his cheery greeting.

"Good morning, Skipper! Always beat me here, don't you? And you always look fresh as a daisy!"

But young Burt Chandler's face did not echo his hearty greeting. It always depressed him to see this old, stoop-shouldered white-haired man fumbling sadly with his helpless hands. Chandler loved him for his kindly soul, and as the father of his wife, but pitied him more.

Thaddeus Harper turned his wrinkled, prematurely aged face in the direction from where Chandler's voice had come. His sightless watery eyes seemed to strain to picture the face he had never seen.

"Burt," he pleaded in his quavering old voice, "let me help you today. I won't be in your way."

Chandler's shoulders jerked from the pathos of it, yet it could not be. Old Harper *would* be in the way. He meant well, but his fumbling fingers would offer no real help. And his mind, though perhaps as keen as ever, had a habit of wandering off at all odd times, in day-dreams that made his efforts futile.

Trying to frame his lips in gentle remonstrance, Chandler paused and turned to the door. Alicia, his wife—Harper's daughter—had entered. They exchanged sympathetic glances.

"No, father," said the girl softly. "Burt is working on a very delicate experiment. That new book has arrived anyway, Father — *Atoms and Subatoms*. Shall we go in the garden? I can read it to you."

They treated him as if were a child —cajoling, chiding, bribing. One part of Harper's mind realized that and resented it. But the other part, that which had been strangely affected by the accident of ten years before, yielded to these simple methods of governing.

Harper, murmuring unintelligibly to himself, made his way toward the door, using the light stick in his hand to warn him of walls and bench corners.

Alicia's face reflected the ache in her heart for the weary, stooped figure shuffling toward the door. Then she turned to her husband. Her eyes were moist. Strangely, so were Chandler's. But both knew it wasn't what it seemed. They had steeled themselves, in sheer necessity, to keep their pity for the old scientist locked deep.

"I see it has affected you too!" exclaimed Alicia, looking into her husband's eyes. "Burt, what can it be? Is it really a terrible epidemic? Your eyelids are tinged with red, the whites of your eyes are bloodshot, and the pupils contracted. Those are the same symptoms dad had before his eyesight—"

"Nonsense, dear!" scoffed Chandler. "In my case, it's overwork—common eyestrain, from working too late at night. I've been putting all I've got into this research and, by glory"—his voice became enthused—"I'm getting results! My atomic vortex—"

His tone had become preoccupied

and his tall, athletic body moved gracefully toward the tube beside which the old scientist had stood. Atomic energy was his goal, in common with the newest army of young scientists all over the world. He wished to rouse the Titan who lurked in the locked citadel of the atom, and make it do the world's bidding.

"But, Burt," remonstrated Alicia, "the epidemic is spreading. It's showing in the baby's eyes too."

"Eh?" Chandler turned his head momentarily. "Then you'd better call the doctor." He bent over the tube, eyes intent.

OLD Thaddeus Harper, comfortably seated in a lawn chair in the garden of their home, felt contented in the warm, pleasant sunshine that laved his skin. Alicia's soft, well modulated voice read to him from *Atoms and Subatoms*, the latest work in atomic physics.

"Alicia!" exclaimed the old scientist suddenly interrupting her in the middle of a sentence. "What were you talking to Burt about just before we left the laboratory? Some epidemic affecting the—eyes?"

The girl started. Her father had put a peculiar emphasis on the last word. Naturally, he would. She leaned over and patted his hand soothingly.

"It's nothing, dear. Nothing for you to worry about." She leaned back and resumed her reading.

Sometime later a deep voice was heard from the garden gate, calling a general greeting. Harper recognized it immediately as the voice of their family physician, big, bluff Dr. Howard. He heard the heavy footsteps crunch in the gravel path up to them. He sensed the doctor's eyes on him.

"It's the baby," said Alicia, maternal concern in her voice. "It's eyes are red and inflamed. Dr. Howard, I'm alarmed. This epidemic—"

A vague uneasiness stirred in Harper. He listened intently as the physician spoke.

"Alicia," he said in fatherly tones, "all medical science is stumped. I've had a hundred calls for the same thing this morning. I can't possibly answer them all. And there really isn't a thing I can do for your baby. No medicine or treatment seems to have any effect. About all you can do is put the baby in a dark room and wash its eyes out with boric acid solution every hour. In fact, you should do the same for yourself—"

"Dr. Howard!" Alicia's voice was sharp. "Your own eyes are red, inflamed!"

The physician gave a short, harsh laugh, as though he had been unmasked in some negligence. If Harper could have seen, he would have noticed a haggard hopelessness in the man's face.

"That gives you some idea of the extent of the disease, and its virulence," said Dr. Howard. "Even we doctors can't do a thing for ourselves! Haven't you read the morning's paper? Or heard the news on the radio? The epidemic, if such it really is, has spread—"

His voice broke off abruptly, and old Harper knew, with the wiseness of the blind, that Alicia had stopped him. The girl took her warning finger from her lips.

"I'll do as you say, Doctor. But come and see the baby—"

The old scientist, left alone, struggled up from his chair. His brain felt stirred as it had not been for ten long years. They were trying to keep something from him, something vital and important! It was as though he were a child whose sensitive mind must not be shocked. Harper did not often concern himself with the events of the times; he lived mostly in a dark world of past images. Ordinarily he would have dozed off in the sun, dreamy and stoically content with his lot. But now —today—

Knowing the way so well that he had little use for his stick he made his way down the garden path of the large back plot, and entered the house by the rear door. He made his way to the living room door and stood rigid listening intently. Alicia was still outside, talking to the doctor. The maid was upstairs, cleaning. Harper went up to the radio, groped for its dials. It occurred to him now that Alicia had contrived to keep all news reports off the radio in the past few days.

He tuned the dials swiftly. Snatches of music and simpering announcements succeeded finally by the earnest voice of a news commentator. Harper stiffened at what he listened:

"Latest news flash! The mysterious eye-disease has reached the proportions of a universal epidemic! Since its reports in isolated cases two weeks ago among aged people and very young babies, it has spread with the rapidity of a Middle Age plague. Today, it seems that almost no one has been left untouched. Reports from India, Australia, Africa, Europe, South America — all the world! — indicate that the plague has struck everywhere at once.

"And most incredible of all, every animal has it too. Dogs, cats, cows, horses—all of them. What incredible, awful scourge is this that has gripped the Earth?

"The scientific world is aghast. Biologists and medical men of every degree admit their inability to diagnose the malady. It is completely and utterly unknown to science. But they are working indefatigably to solve the riddle. One thing they have found is that the irritation is less at night. Darkness seems to bring temporary relief—"

The speaker went on after a brief pause, with an ominous timber in his voice.

"Heretofore, the epidemic has been nothing more than an annoyance, symptomized by a redness and soreness of the eye and eyeball which is not worse than the common disease 'red-eye'. But scattered reports have come in last night and this morning that the earliest cases of the new disease have resulted in *total blindness!*

"Whether this blindness will be temporary or not is not known, but already the weakened eyes of hundreds of aged people and little babies have become dark and unseeing!"

Harper snapped off the radio. His ever active mind became furiously active, told him what the announcer had not dared say—the possibility that the strange disease would continue its cycle and strike all the world with blindness! Would there come a cheerless day when all humanity would be blind?

Thaddeus Harper's brain reeled. God forbid! He knew the helplessness, the crushing despair of blindness. Those weary, futile years of lightless, lifeless darkness. Man needed his eyes more than of any other of his senses; was only half a man without his eyesight. Thaddeus Harper knew that too well.

The threat of universal blindness lay over the world! And this was the stupendous thing they had tried to keep from him!

Something clicked in Thaddeus Harper's mind. Some inexplicable sequence of thoughts came to a startling conclusion. Like an amnesia victim awakened through a chance phrase or picture, he became suddenly aware under the driving impetus of this amazing, shocking thought. The Thaddeus Harper who left the radio was not the same old, broken scientist who had come to it. His physical blindness remained, but the blindness of the mind had vanished.

He stumbled in his eagerness to reach the door. Out in the garden, he stepped out under the sun and spread his arms to each side of him. They were bare to the elbow and the hot rays of the sun burned on his skin. He turned his face to the sunlight. Though no slightest ray of light pierced the midnight gloom of his sightless eyes, he could feel the powerful rays beating on them. He stood this way for a minute.

Then, he turned and made his way to the laboratory, which was housed in a separate brick building to the back, next to the garage. He opened the laboratory door without knocking and stepped in. He breathed deeply of the old familiar smells. It was like a heady wine, making him dizzy.

Alicia was with her young scientist husband and Harper, hearing her stifled sob, realized that she had been talking to him about the epidemic and the danger to their child.

Harper made his way between the familiar benches to where they stood. He could feel the heat of the cathode tube with which Chandler had been working.

"Why, father, what are you doing

here?" cried Alicia.

"I just heard the radio—the news," he said in a new assured voice so different from his former aimless mutterings. His shoulders were straighter. His chin was up and his face alive.

"You mustn't agitate yourself, dear. Come—" began Alicia.

"Listen to me, both of you!" Harper's voice rang through the laboratory, in the tones he had had years before. "You must do one thing immediately—get goggles with lead-glass lenses and wear them constantly in the daytime. You must do this right away, for the sake of your eyesight!"

"Father, you're not serious!" Alicia said.

"Just a minute," cut in Chandler, as he stared into the old scientist's face, his eyes suddenly thoughtful. "What do you mean, sir? Why should lead-glass goggles—"

"The sun! That's the answer!" shouted Harper. "It's not a disease that is sweeping the world and bringing blindness. It is the sun! Did you hear them on the radio—relief at night? That was the first clue. Animals have it, that was the second. Third, it struck all over Earth at once.

"Then, I stood out in the sunlight, felt it beat on my skin. A blind man's skin, a sense of feeling—my eyes. I could feel the new rays in the sunshine. The new and more powerful sunlight that is impregnated with a certain deadly radiation inimical to the delicate retina of the eye. It is sunlight, I tell you, not disease!"

The old scientist stopped, gasping for breath.

"By heaven, I think you're right!" exploded Chandler. "Oh, what a fool I've been not to see it myself. What fools all scientists have been—"

He turned to Alicia. "Hop in the car and go to the optician's. Buy a dozen lead-glass spectacles—the goggle kind with large, curving lenses. Hurry!"

When she had left, the young scientist said, "Sir, let's get to work. I didn't realize myself how serious the situation is till Alicia came in and told me what Dr. Howard had said, and showed me the morning's paper reporting thousands of cases of blindness. We must determine the exact type of harmful radiation, then inform the authorities so they can take steps to save the world's eyesight. I think a spectroscopic survey of sunlight—"

"We won't have to search for the harmful radiation," interposed Harper quietly. *"I know what it is!* It is the seventh octave of the electromagnetic scale above visible light. About the point where ultra-violet merges into the X-rays. The sun has suddenly begun to produce large amounts of this radiation, and it is beating against the human eye, the eyes of all living creatures, and they have no protection."

"The seventh octave! But how did you know?"

Harper reached up a hand and touched his useless eyes. "By these," he said sadly. "It is the same radiation that blinded me! I've never spoken to you about it, Burt, but I was working on atomic structure. I struck some vital clues. Perhaps I went further in my work than any present-day scientist.

"I worked with high temperatures and pressures, comparable to those of the sun. In fact, I had an almost microscopic bit of pseudo-sunlight in my apparatus. It gave off powerful energy—energy of the atom. I began to map out the complete evolution of atomic energy from matter, in successive waves. Eventually, my calculations were able to predict the final stages.

"I should have been warned," he sighed. "My figures showed the great burst of energy coming. Perhaps my apparatus was defective. I thought it would hold. There was an explosion and the radiation of the seventh octave produced sprang over to me, into my eyes—"

Harper made a gesture of resignation that made a lump come up in the younger man's throat. Then he went on:

"The shock of the accident did something to my mind, besides ruining my eyes. It put me in a mental fog. I destroyed all my notes, in a sort of insane determination that no one else should suffer the same fate, by the same experiment. There must be other, safer ways to release atomic en-

ergy, I told myself, other than by duplicating the fiery furnace of the Sun.

"The mental fog has lasted for ten years. But today it is lifted. Today I realized that the Sun had done exactly what my laboratory bit of Sun had done—passed through the next phase of its evolution, releasing a burst of new energy.

"There is an evolution of Suns, just as there is an evolution of life. A star is born from nebular condensation. The tremendous pressures light the atomic spark. A terrific conflagration starts which lasts for billions of years, till the star burns itself out. But in that time it passes through stages of increasing energy to a peak, and then decreasing stages to the final entropy of heat-death.

"Our Sun is in the increasing stages. It has had several jumps in its energy output. More than a million years ago it had the last one. Today—now—it has had its next, producing this radiation of the seventh octave, which is inundating Earth and burning out eyes never meant to withstand it—as my eyes were burned out."

"The seventh octave rays must have some of the penetrative power of X-rays, going through solid material," mused Chandler. "That accounts for the universal effect on the eyes. It gets to people whether inside buildings or out in the Sun."

Harper nodded. "But at the same time it is more in the order of a powerful ultra-violet radiation. Glass, especially lead-glass, in the usual thicknesses, will stop most of it."

"Sir, do you realize what it means?" exclaimed Chandler suddenly. "It means the human race will have to wear protective glasses for the future ages, from birth to death! Perhaps in time—hundreds of thousands of years from now—evolution will produce human offspring with eyes adjusted to the new radiation. But for the present, it means glasses for all humanity!"

"Better that than blindness," said the old scientist. His hands fumbled again to his sightless eyes, and Chandler caught in the gesture the ten years of utter futility in which the other had lived, lost in a dark, lightless world.

"Call the offices of the *Journal* of *Astrophysics,*" Harper went on. "Give them a short resume of the Solar phenomenon that has just occurred. Have them contact the authorities."

Chandler dashed to the phone, dialed swiftly.

A WORLD well-frightened by the menace that threatened to strike it with universal blindness heard the news the next day.

First, the editor of the *Journal of Astrophysics* received a phone call that he thought must be part of a hoax. But when, several hours later, he received a check-up message from Mt. Wilson Observatory, he acted like a madman. He called Chandler on the phone and offered him fifty thousand dollars to write an article on the subject. His jaw sagged when Chandler offered to write it for nothing.

Mt. Wilson, at the editor's suggestion, had immediately measured the diameter of the Sun, its Solar constant of average radiation, and the intensity of the seventh octave rays. The results created pandemonium.

The Secretary of State at Washington was contacted by Mt. Wilson authorities. An hour later a hasty conference of high officials, including the President, was called. Plans were made by these men—all red-eyed in common with the rest of the world—to equip all people with goggles.

Wealthy manufacturers were stunned on receiving very official looking documents from Washington which commanded them to manufacture as many goggles as they could, with expensive lead-glass, and to distribute them *free!* Department of Justice men delivered the orders and were firmly insistent when the manufacturers remonstrated.

The news broke for the newspapers and radio at noon. By two o'clock every conceivable type of protection for the eyes had been sold out. Factories began turning out specially designed lead-glass goggles by the carload.

Cables hummed and European people began to appear in a few days with

similar goggles. The hinterlands of the world were not so fortunate, having small facilities for manufacturing goggles. They would have to wait till the industrial nations had supplied their own peoples.

The world met its greatest emergency with its greatest effort, and for once in its turbulent history, all worked together, toward one goal. The tremendous industrial powers of civilization concentrated on one product and broke all records for speed. Such trivial things as cost of production, transportation expense, and retail value were forgotten.

In less than a week all the civilized world had been equipped with glasses. It took another week for the more outlying sections of the world to be equipped, even though every nation's air force had been volunteered for the project. Certain tribes in inaccessible parts of Africa were doomed to blindness, but brave missionaries planned trips to them, to save the sight of the unborn generations.

The world breathed a sigh of relief. Blindness, perhaps the most dreaded of afflictions, had been averted. A world of two billion blind would have been a shambles. As it was, all animal life was doomed to blindness, but that could not be helped.

THE world's acclaim fell about Harper's shoulders. He waited patiently till the furor had died away and he was left in peace again. Fame and honor meant little to him. His greatest satisfaction lay in the thought that he had once again regained his full mind. For ten years he had moved in a state of mental bewilderment. His keen mind had been cloaked in a shroud from the shell-shock of the accident that had blinded him and ended his career.

But now he was once again the scientist, helping his son-in-law in the laboratory, discussing with him every phase of his researches, advising, assisting.

Chandler's researches took on new life with Harper's assistance. He had been on the right track but advancing slowly. Atomic power lay within his grasp, though he did not know it. His approach was far different from that which Harper had used a decade before. Instead of breaking down matter, as in the processes of a younger star, he was building up matter, as in the older stars waning toward the state of entropy.

Chandler was discussing his progress with his father-in-law.

"In the formation of tritum—the isotope of hydrogen with atomic weight three—from hydrogen, there is a great release of energy, as the formation of helium from hydrogen," he said. "This follows the general rule that there is emission of energy in both the breaking down and building up of atoms. But, of course, my main problem is to increase the output of energy. So far my collisions of deuterons and protons are one in a million."

Chandler stared moodily through thick goggles of lead-glass at his projector of subatomic particles. "Still, when I started the rate was one in a billion. I've increased the efficiency a thousand times. But not till I get a percentage of one in a hundred at least will I have true atomic power."

"And that's what we'll do," said Harper with quiet conviction. "Just give me the daily results of bombardments under slightly altered conditions. There is some theoretical mean which will determine exactly how to achieve the maximum results. Once we have this formula, it will be easy."

Harper used a soft, greasy pencil for his calculations, so that he could run his sensitive finger-tips over the raised figures when he needed to recapitulate. Chandler's daily results went in as numbers and came out as condensed mathematical formulae.

A few months later the old scientist handed Chandler a tentative result. Chandler cried out like a wild Indian when he set his apparatus according to the formulae.

"You've done it, Father! Atomic energy and lots of it! And it comes out as nicely and quietly as you could want, like electricity from a battery."

Harper touched his eyes, thinking again of that other form of atomic en-

ergy, which had burst out like a supernal flame, and destroyed the eyes of its creator. This atomic energy came out like the current in a wire. His had come out like a lightning-bolt.

"I'm glad, Burt," he said simply.

All that day Harper was preoccupied. In the evening he faced the enthused young scientist with a serious mien.

"Burt," he began, "aside from the commercial possibilities of your process of atomic power, it has one other great possibility. With it we can perhaps eliminate the menace of blindness from the Sun entirely, so that the human race will not be doomed to wear protective glasses through the ages."

"But how would you do it?"

Harper's answer was indirect. "You know, of course, that the only thing that keeps most of the Sun's powerful ultra-violet radiation from toasting us to a crisp is the layer of ozonized air extending from about fifteen miles to twenty-five miles up. But if all the ozone itself were condensed, it would amount to no more than a sheet of tissue-paper thinness. Yet that is enough to filter out most of the ultra-violet. Now suppose there were a similar layer up there which absorbed most of the new radiation—the seventh octave rays inimical to human eyesight?"

"I see," nodded Chandler. "What substance will do it?"

"Tritium!" returned Harper, working his hands together eagerly. "The same material you form in your atomic energy process. It, like ozone, is composed of a triad of atoms. Ozone is the triad of oxygen. Tritium is the triad of hydrogen. And the latter will filter out the rays of the seventh octave, as ozone filters out those of the second and third, the ultra-violet."

"But think of the task!" Chandler was a bit dazed. "Even a tissue-paper thinness of it spread all over Earth's tremendous surface would amount to millions of tons of it!"

"The beauty of atomic power," continued the old scientist, "is that it is cheap and endless. There is a layer of hydrogen overlying the general atmosphere. It extends from the high stratosphere of fifty miles to the fringes of Earth's atmosphere, two hundred miles out. That is our raw material. We will convert some of this vast ocean of hydrogen to tritium. Our main problem will be to get rid of energy. But that, I think, will be simple enough. The atomic energy formed will radiate into space and into the lower atmosphere. The latter process will only heat it up some few degrees, temporarily."

Chandler was pacing the room in excitement. Then his face fell.

"But how can it be done? We would have to install a projector of high-speed protons up there in the hydrogen layer, to start off the process. No man-made object has ever been sent that high, a hundred miles or so!"

"Of course not," agreed Harper. "Our projector will stay right on Earth's surface. But its effects will be sent up to the height we want. Radio waves. You know that short radio waves are reflected by the Kennelly-Heaviside layer, which is about fifty miles up.

"Long waves go higher and are reflected by the Appleton layer, anywhere from one hundred to two hundred and fifty miles up. If we phase our static charges that produce high-speed protons into low-frequency radio waves, we can project them to the Appleton layer. Here, in the heart of the hydrogen belt, the formation of tritium will be started. The process will stop by itself when the concentration of tritium atoms has reached a certain point, which will easily be enough to form a thoroughly protective tritium-layer to absorb seventh octave rays."

Harper touched his eyes, involuntarily. "It is merely the extension of our laboratory method to the great laboratory of nature!" he concluded.

A YEAR later all their calculations and preparations had been made. Chandler had hired the necessary assistants to build the apparatus—a queer hybrid machine producing radio waves and power-charges capable of blasting out protons moving at half the

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Science Questions and Answers

THIS department is conducted for the benefit of readers who have pertinent queries on modern scientific facts. As space is limited, we cannot undertake to answer more than three questions for each letter. The flood of correspondence received makes it impractical, also, to promise an immediate answer in every case. However, questions of general interest will receive careful attention.

EARTHQUAKES

Editor, Science Questions and Answers:

I've always marveled over the fact that scientists watching a machine thousands of miles away from an earthquake can tell where the earthquake occurred and how intense it is. I understand this is determined by means of the seismograph. Can you tell me on what principle this instrument works?

B. E.,
Erie, Pa.

The principle of the seismograph is based on the familiar **inertia**. Inertia shows itself as a resistance to motion. If a body is at rest, it wants to stay at rest. If a body is in motion, it wants to stay in motion. Thus because of its inertia the seismograph stays still while the ground underneath it moves.

A seismograph is a pendulum with its tip resting on a sheet of paper covered with lampblack. This paper is wound on a drum which is kept revolving by clockwork under the pendulum. With the ground at rest the tip of the pendulum scratches out a white line in the lampblack on the paper as the drum moves continually forward under the pendulum.

If the earth quivered, that is, if an earthquake occurred, the drum, since it is attached to the earth, would also quiver and this quiver would be traced out in the lampblack as a sideways motion due to the sideways motion of the drum under the tip of the pendulum. The pendulum is so suspended that it can move only from side to side in one plane. If two such pendulums be placed, one facing north and south and the other east and west, they will between them pick any quiver from whatever direction it comes.

The motion of such a simple pendulum will, of course, be very slight—particularly if it is some distance from the scene of the quake. To magnify the motion so as to make it more visible, several devices have been introduced.

The better instruments use sensitized photographic paper. The pen is a tiny beam of light reflected from a mirror attached to the end of the pendulum—a motion of the mirror causing a motion of the beam of light over the photographic paper.

The most sensitive types of seismographs have a coil attached to the end of the pendulum. Two powerful magnets are set up on either side of the coil and each quiver of the coil in this magnetic field generates a current which moves the mirror of a galvanometer, the mirror in turn reflecting a light spot back and forth across the photographic paper to give us our record of the earth's motion magnified about 2,000 times.

When an earthquake occurs the whole earth quivers and this quivering can be detected by seismographs, utilizing the principle of inertia. But how can we tell from a record of this quivering just where the earth did quake?

When the earth quakes, it sends throughout the earth two distinct kinds of quiver—two distinct kinds of ripples which travel at different rates. One pushes or compresses the earth ahead of it and hence is called a compressional wave, and the other shakes the earth from side to side as it travels and hence is called a transverse wave.

These two earthquake waves travel at different rates—about five and three miles per second, respectively. For every second we can count between the compressional and transverse waves, the quake is a corresponding distance away. For example, in the last Utah quake, the number of seconds counted at Fordham University between the two quake waves was 293, amounting to a distance of 1,940 miles. The seismograph records the arrival of these waves, and the exact second at which each arrives is told by time marks placed automatically on the record by an accurate clock.

Now if we have three stations in communication, the matter of determining the direction is simple. If we describe three circles on a globe with each of the three stations as centers and the distances of the quakes from their respective stations as radii, the three circles can intersect only at one point, and that point is the center of the earthquake. —Ed.

NEON SIGNS

Editor, Science Questions and Answers:

In view of the fact that neon emits a RED light, how do you account for the fact that all gas tube lighting (yellow, green, blue, etc.) is called "neon lighting"? Isn't this inaccurate?

W. M.,
Chicago, Ill.