

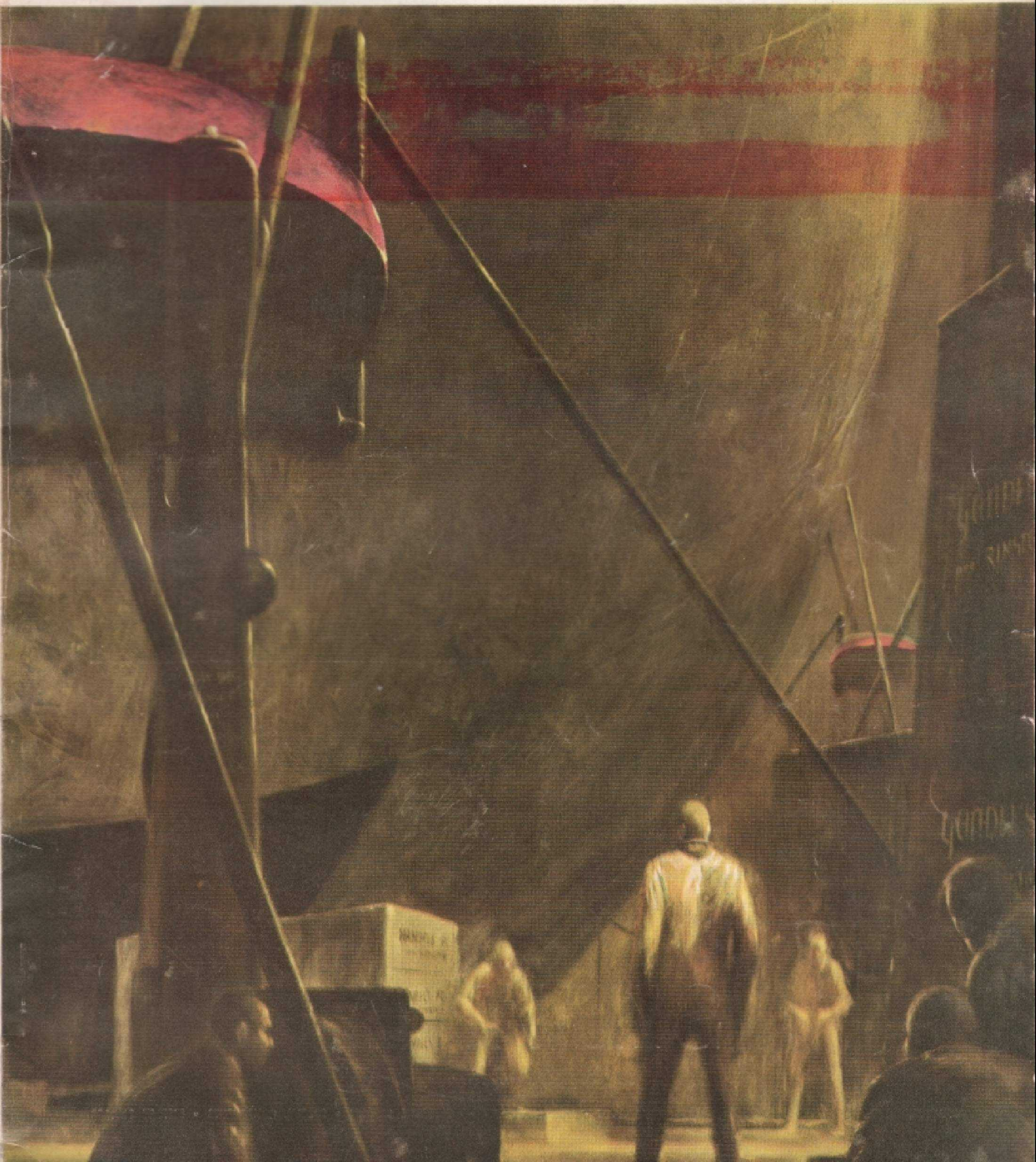
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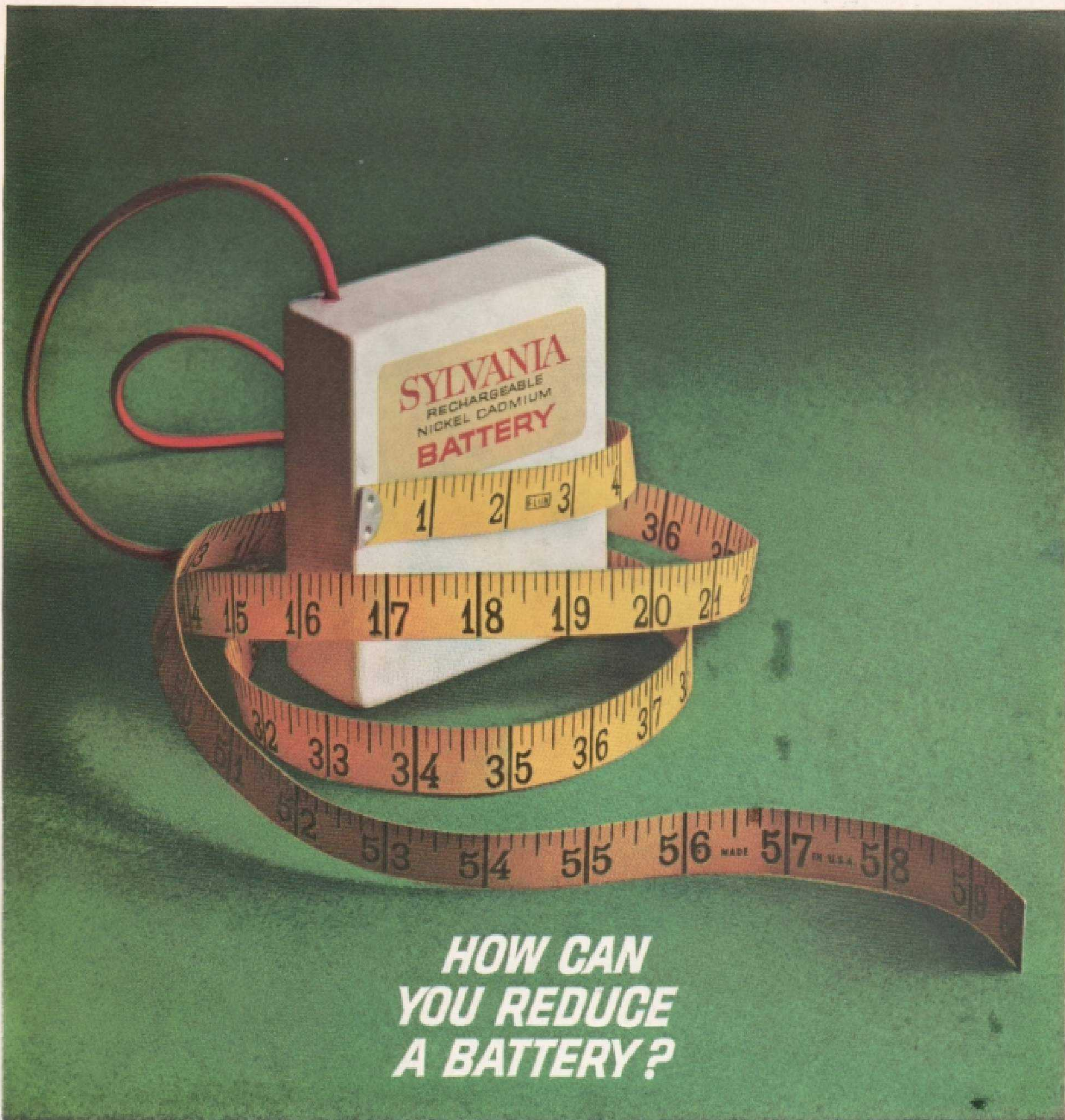
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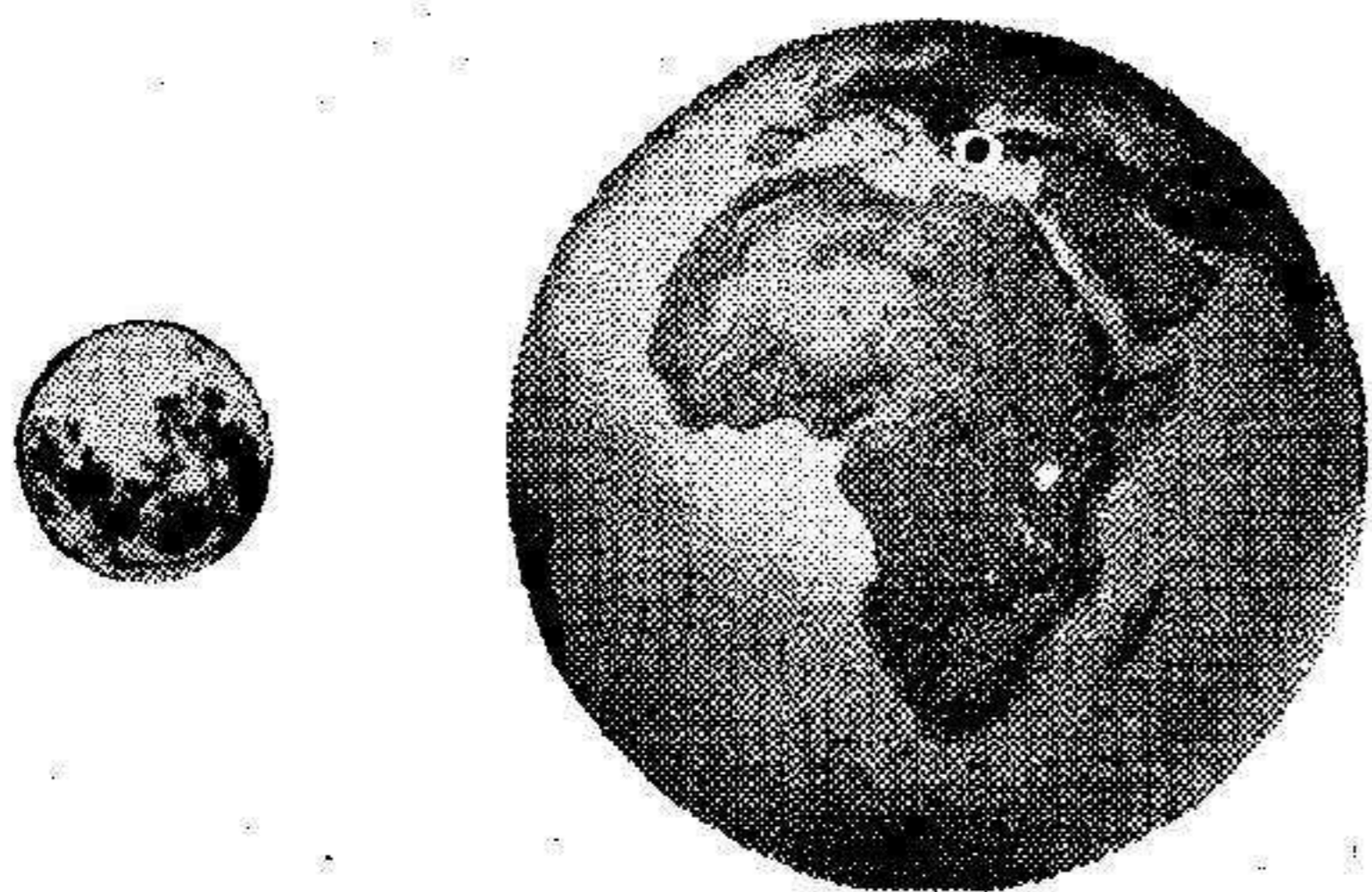
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Lunar and space missions such as Project Apollo seldom seem, in their far-out glamour role, to be closely related to that great fundamental...mankind. Yet one single aspect of the Apollo program—fuel cells—holds a vast amount of hope. Especially for under-developed nations.

Often referred to as "continuous batteries," fuel cells convert chemical energy directly to electrical. They are the newest power sources to emerge from scientific research into the realm of practical engines. The specific cell system aboard Apollo will be a Hydrox[®] unit, reacting hydrogen and oxygen, and is the result of research at Leeson Moos Laboratories, one of the first in America to undertake studies on fuel cells. Hydrox will supply electrical power for vehicle control, communications, and numerous other power needs aboard this lunar mission. Marking the first such use of these new power sources, the Hydrox installation will inaugurate a new age in the generation of electrical power. Final engineering and manufacture of the units for Project Apollo will be carried out by Pratt & Whitney Division of United Aircraft, under license from Leeson Corporation.

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The impact Carbox and Aminox can have on the emerging countries is

readily understandable. The development of a nation can almost be measured by its ability to produce and consume electrical power. In this mechanized world, virtually all industry waits on the availability of electricity. If an emergent economy must hold off its development until completion of large-scale hydroelectric projects, a distinct problem of time and expenditures arises. If, on the other hand, the nation had access to Carbox and Aminox type fuel cell systems, which could be tailored to the need and would operate on locally available fuels, the basic first step toward an industrialized economy and higher living standards would be achieved.

Leeson believes its efforts, plus the great additive capabilities of our United States and international partners, will soon result in working installations of the Carbox and Aminox systems to advance the standards of all mankind. Meanwhile, the sibling Hydrox system supplies power for a moon voyage. And research continues.

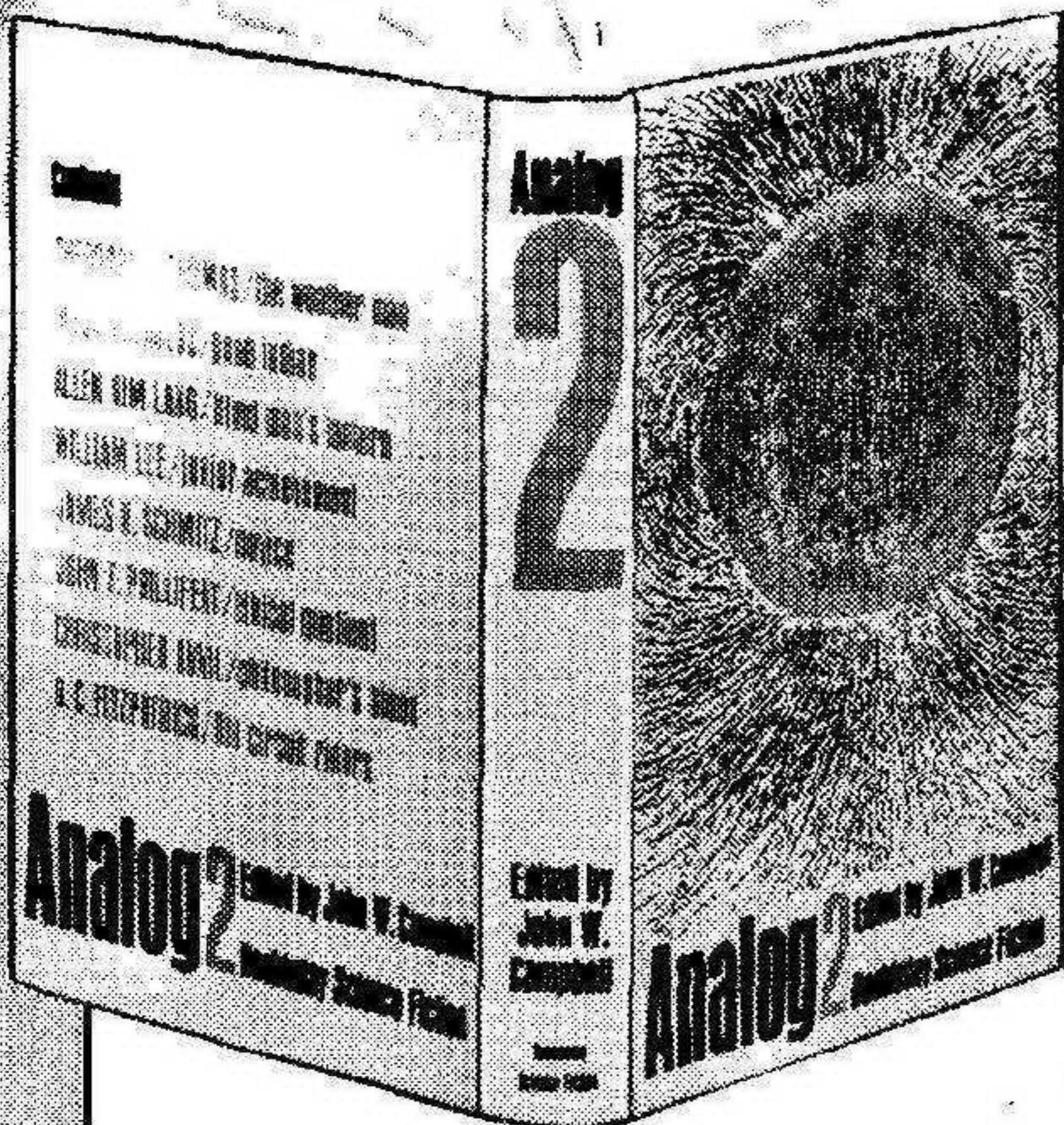
*Energy Conversion, Ltd., is a new corporation founded by four British companies: National Research and Development Corporation; British Petroleum Company, Ltd.; British Ropes, Ltd., leading manufacturer of rope and steel cable; and Guest, Keen, and Nettlefolds Group, major steel manufacturers.



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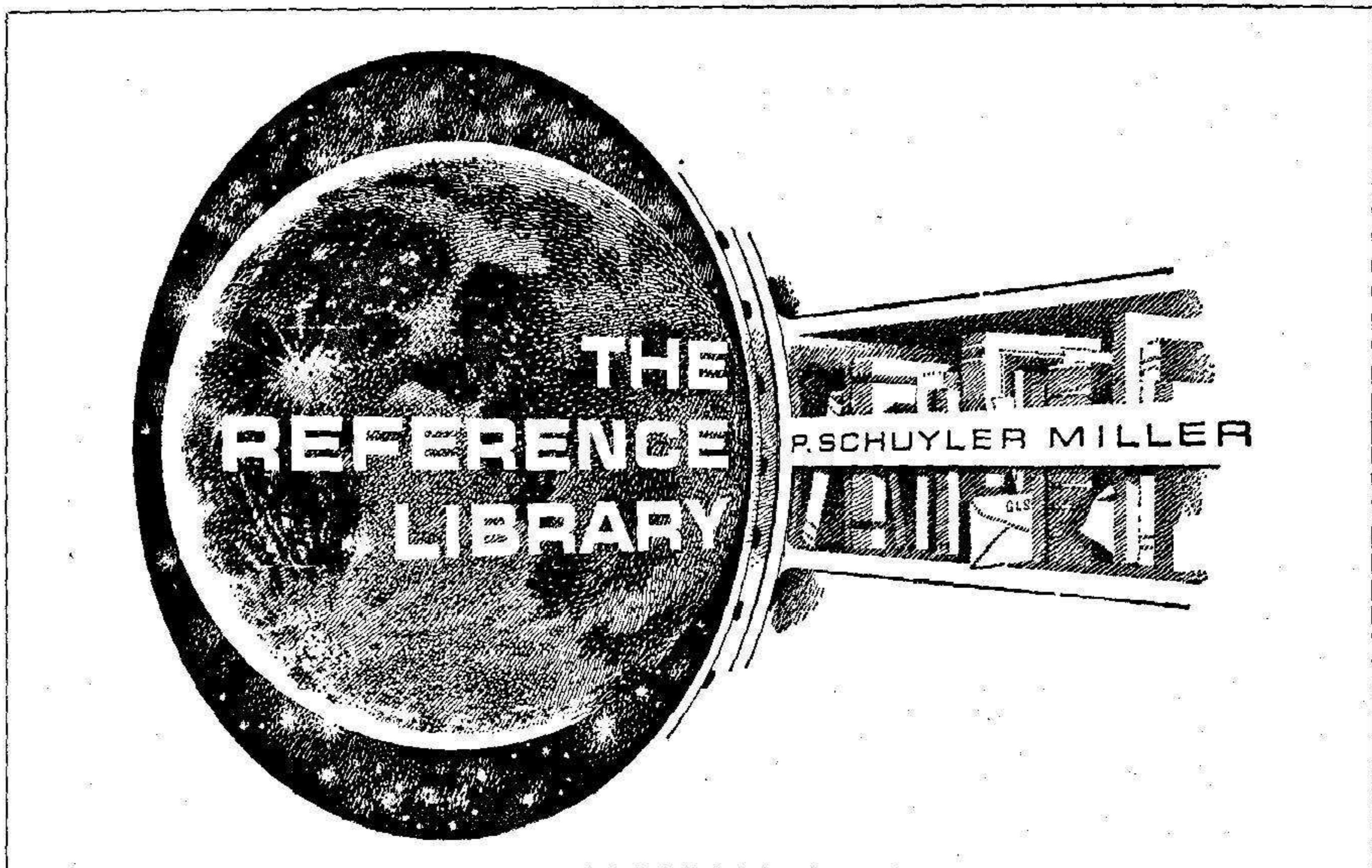
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THEY STILL FLY

UFOlogy—the “science” of unidentified flying objects—has long taken on many of the attributes of a revealed religion. Its saints, the “contactees,” are the chosen ones who have walked and talked with the saucer people, flown with them all around the universe, and brought back their messages of chiding and good will to an erring Mankind. Its prophets are legion, vociferous, and not always in strict agreement with each other. Its high priests diligently establish dogma, incorporating in it many of the revealed truths of older cults such as theosophy and Shaverism, and doing their level best to keep from being swallowed up instead.

The chosen among the faithful have been vouchsafed one or more sightings. The rest merely believe.

As in any religious movement, the great majority of followers and most of the teachers are entirely sincere and convinced of the truth of their teaching. There are hoaxers—though my charlatan may be my neighbor's patron saint. There are the deluded to whom a hallucination is a revelation. There are the *gurus* who speak in parables and miracles, the better to reinforce their messages that will save humanity from itself, and eventually believe the literalness of their own fables. One axiom they all accept: that UFO's cannot be explained except as the vehicles of superior extraterrestrial beings who employ materials and employ powers unknown—and per-

haps unknowable—to mundane, sinful beings other than themselves. Another is an article of creed to a majority: “the government” is engaged in a conspiracy to deny and conceal the truths that the saucerians, ET and earthborn, are trying to teach.

Bursting into this wonder-world is a book that will certainly be anathemized throughout UFOdom: “The World of Flying Saucers,” by Donald H. Menzel, Director of Harvard University Observatory, and Lyle G. Boyd, past Publications Editor of the Smithsonian Astrophysical Observatory and known to readers of this magazine as the feminine half of the “Boyd Ellanby” science fiction team. It is a Doubleday publication, which should guarantee it the kind of distribution that the works of Emanuel Velikovsky get, if not their sales. It costs \$4.50.

The enormity of what Dr. Menzel and Mrs. Boyd have done may become apparent when I say that the U.S. Air Force has given them full access to those restricted, “secret” files in which the “truth” about hundreds of saucer sightings is alleged to be concealed. I acknowledge the immediate and obvious retort that they did not see the “real” secret files that confirm the UFOsophists' doctrines—only doctored and perjured testimony. But to a materialist and a heretic this is a very satisfying book. It is reassuring to know that the three laws of thermodynamics are still functioning, and when I drop my pencil it will roll under the desk and not fly out the window.

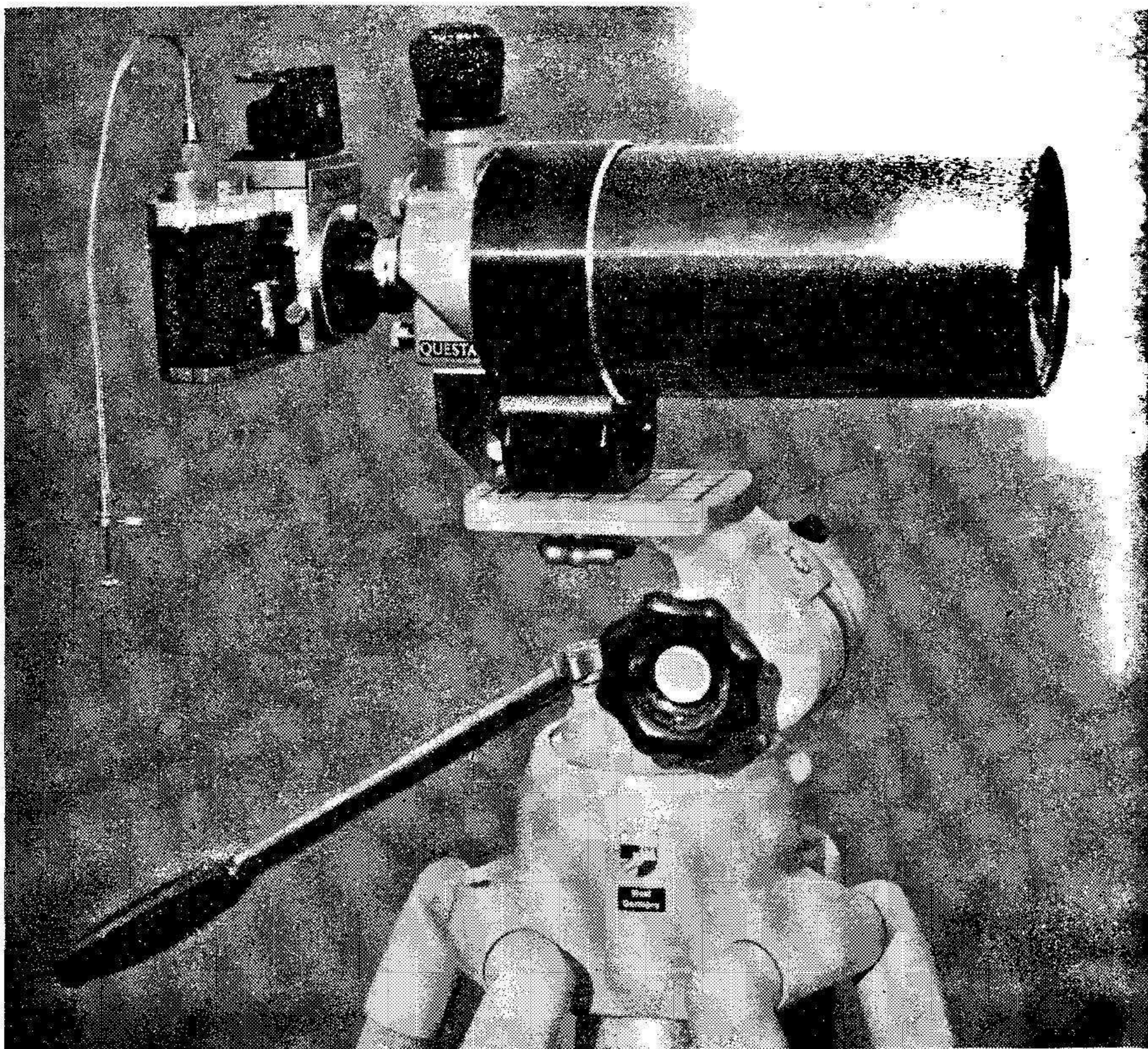
One of the most important parts of the book is its account of the part Raymond A. Palmer has played in the movement, first as editor of *Amazing Stories* and later as editor/publisher of his own magazines, including *Flying Saucers*. Both authors are to a degree "insiders" in the science-fiction movement and know it well. Without the hearing Palmer and *Amazing* gave to the first sighting by Kenneth Arnold, there probably never would have been a flying saucer cult. On the other hand, if the Shaver "mystery" had not about played itself out when Arnold reported his experience, Palmer might not have been so receptive to his story.

What the book does, primarily, is explore and explain the natural, conventional phenomena that sometimes give the appearance of flying objects, seemingly of great size and moving at great speeds and with impossible accelerations. Weather and radiosonde balloons . . . stars and planets . . . clouds . . . mirages . . . birds . . . spider silk . . . fireballs: they are all here. I don't see an explanation of the flying picket fence—rather, four-picket gate—that I saw one night about two years ago, but I don't doubt there is a rational one. It was headed for the Pittsburgh airport and probably landed there.

You will also find, for just about the first time, the real facts and the probable explanation of most of the "great" "unexplained" sightings. Captain Mantell was probably chasing a then-classified Skyhook balloon and ran out of oxygen: his plane did not "disintegrate," it crashed. Experienced pilots have tried to catch "saucers" that were actually the distorted images of bright stars or planets, or mirages of ground lights. Radar can—and does—"see" mirages, sometimes invisible ones. There are green fireballs (I've seen one of those, too—a daylight one).

There are, of course, still unexplained sightings. They are unexplained because no data have been provided to make an explanation possible "I saw a flying saucer" is un-

continued on page 89



This is the New Field Model Questar Telescope.

It weighs less than 3 pounds and costs only \$795. Included in the price are this 4-lb. case, one eyepiece, and an improved basic camera coupling set. There is room for cameras and other accessories.

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At this point he is challenged to capture on the sensitive emulsion what this superb telescope of 56 inches focal length is projecting to his film. He has seen it in Questar's eyepiece and in his reflex camera's groundglass. All that remains is to place the image in exact focus on the film and expose correctly with no vibration at all. And at long last we have the only camera able to do this, the Questar-modified Nikon F.

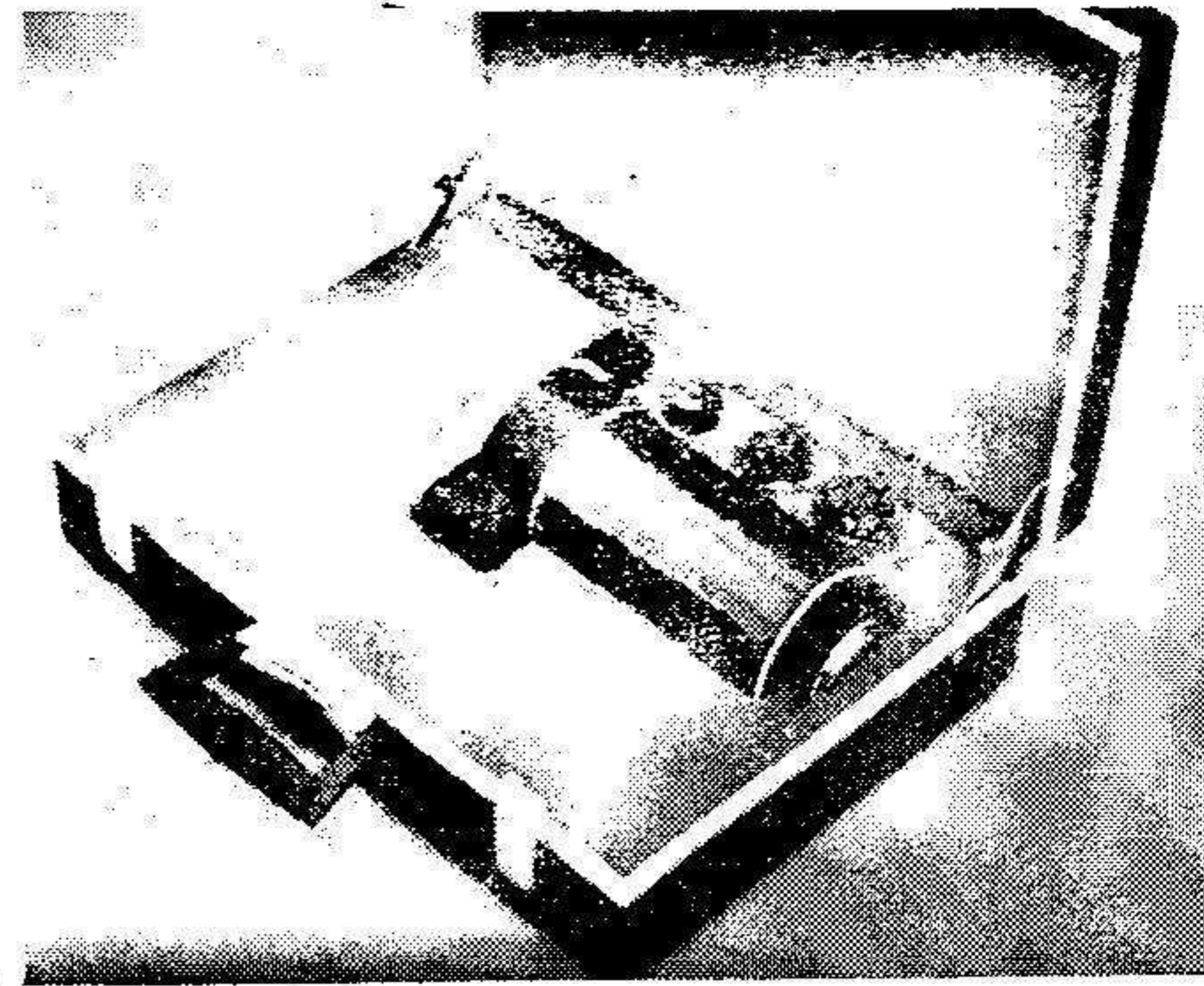
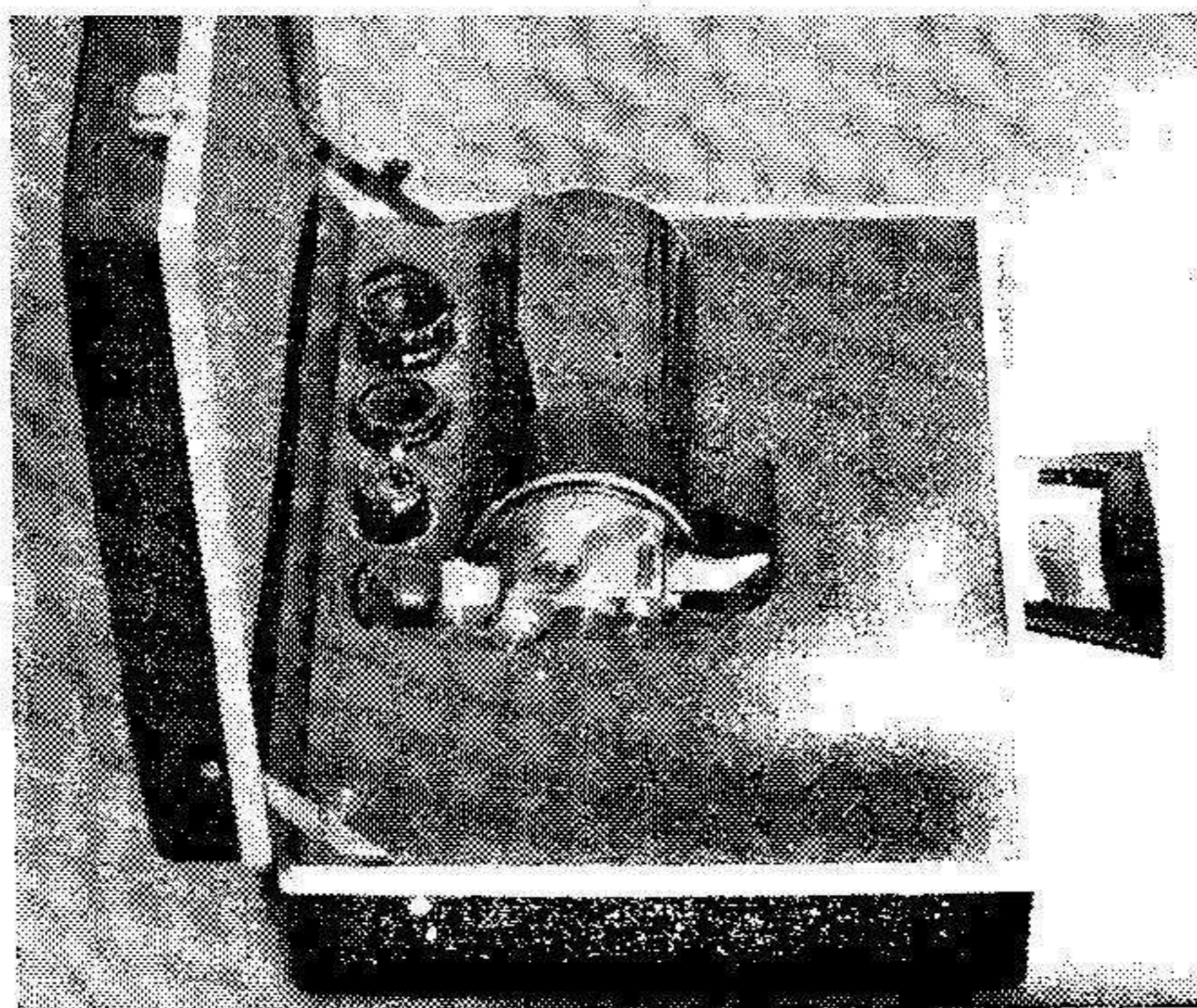
For the first time, then, Questar has a true photographic model, and a camera without mirror slap, shutter vibration, or too-dim focusing. Moreover, from now on we can measure the actual picture-taking light at the groundglass, and abandon inexact exposure calculations entirely, using the new cadmium sulfide meters.

With this new control of vibration, sharp focus, and correct exposure times, only one other factor remains to interfere with high resolution telescopic photography. We need quiet air for good seeing—which is no problem at 7 to 100 feet. But how can we get trembling air to stand still while we take sharp pictures at great distances? There are several things we can do to take advantage of nature's moods, and if you write for literature we will tell you more about it.

New Field Model, \$795 in case with basic couplings as shown. The 80-160X eyepiece, \$35. Questar-modified Nikon F bodies, from \$234.60. Complete outfit shown, with camera and tripod, \$1332, postpaid in U.S.

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THOUGHTS AFTER AN

assassination

"During the past one hundred twenty years there has been a twenty-year recurrence of a Jupiter-Saturn conjunction in one of the astrological "earth" signs. It is *coincidental* that each American president elected to the office at the time of these conjunctions either died in office or was assassinated before leaving the Presidency.

"William H. Harrison, elected in 1840, held office at the time of a Jupiter-Saturn conjunction in Capricorn and died of pneumonia in 1841.

"Abraham Lincoln, elected in 1860, held office during the following Jupiter-Saturn conjunction in Virgo, another "earth" sign. He won a second term in 1864, and was assassinated in 1865.

"James A. Garfield, elected in 1880, held office during a Jupiter-Saturn conjunction in Taurus and was assassinated in 1881.

"William H. McKinley won his second term in 1900 during a conjunction of Jupiter and Saturn in Capricorn. He was assassinated in 1901.

"Warren G. Harding, elected in 1920 at the following Jupiter-Saturn conjunction in Virgo, died in office in 1923.

"Franklin Delano Roosevelt elected to his third term in 1940 during a Jupiter-Saturn conjunction in Taurus, went on to win his fourth term in 1944, but died in office in 1945.

"John F. Kennedy was elected in 1960 at the time of a Jupiter and Saturn conjunction in Capricorn."

From "The First Science,"
by Joseph F. Goodavage,
Analog, September 1962

Several readers have already called my attention to that astrological prediction. I want to make something clear, however:

1. I do not myself see adequate evidence for *personal* or *individual* astrology. That, the evidence I've seen so far seems to indicate, is an area where astrology has gone into the over-hopeful, or crackpot division. For me, it seems a darned sight more probable that astrology might, eventually, succeed in working up statistical tables about like a life insurance company's actuarial tables. Those are extremely accurate in predicting how many men of age sixty-five, employed as salesmen, residing in New England, of Caucasian stock, will die in 1964—they're exceedingly accurate prophetic tables. But they won't tell any one of those men when *he* will die.

I've had fights with astrologers over that, incidentally, since we published "The First Science." (Which, like many another effort to examine the validity of a rejected thesis, made both sides mad; the astronomers because we pointed out that astrology was *not* "utter nonsense," the astrologers, because we didn't say it was The Great Truth they believe it to be.)

One of the things that annoys astrologers is my point that Dr. Rhine's work has indicated that ESP produces precognition occasionally, and uncontrollably. There definitely have been strongly documented instances of precognitive information. I know personally of an instance of

an individual who repeatedly gave personal, individual predictions of exact and specific detail—not the usual fuzzy comments that could, later, be interpreted, but naming exact names, and places and times. She used a crystal ball, tea leaves, cards, rune sticks, palmistry—apparently anything that happened to be handy served as a prop. Undoubtedly she could have used a horoscope, too.

Before personal astrology can be *proven*, someone is going to have to establish that ESP is not involved. One way to do that would be to research ESP so thoroughly as to have a complete, exact knowledge of what it can and cannot do. That seems a somewhat extensive project in itself.

The other is to devise an astrological program for an electronic computer such that an individual's astrological data can be fed to the computer, and it can start grinding out accurate personal information.

2. The prediction of President Kennedy's assassination, however, was *not* a matter of personal, or individual, astrology. The prediction was that he-who-was-elected-president would be assassinated, or die in office. John F. Kennedy was the man who died, because of the position he occupied.

One way to put it is this; the magnetic mines used during WWII did not attack human beings—they attacked only ships. Men were killed, of course, but only because of the ship they were in; if they'd been swimming, they wouldn't have been attacked.

It might be that some type of field-forces of which we are as yet ignorant are somehow focused by a Saturn-Jupiter conjunction, forces that cause people living in this area of the planet to be restless, tense and angry in a way that concentrates on the President. This could subject him to abnormal dangers.

continued on page 93

Clouds, Bubbles and Sparks

EDWARD G. WALTERSCHEID





The first gadget that could "see" an individual atom was made from a rubber bulb, a bottle of ink, and a chemist's flask. It made cloud-trails—we call 'em "contrails" when a jet plane traces them across the sky. Now atom-detectors are somewhat more "sophisticated". And, of course, expensive . . .

■ There was once a time, not so very long ago, when the atom was considered to be the smallest possible discrete particle of matter, indivisible and indestructible. In short, an atom was *the* elementary particle. Today, physicists classify some thirty-four particles as being elementary or fundamental in nature. Of these, several have had little experimental verification, but there is strong theoretical justification for believing that they exist.

Table I shows the manner in which twenty-two of the elementary particles were discovered and the means that were used to detect them. As can be seen, cosmic rays and particle accelerators are the primary sources of radiation which produce most of the elementary particles.

The reason for this is rather simple. Cosmic rays, which are composed primarily of protons, have a wide spectrum of energy ranging to as high as fifty billion billion electron volts. (An electron volt is defined as the energy acquired by a charged particle carrying a unit charge when it falls through a potential of one volt.) This fantastic energy is some 100 million times greater than that which can be produced by any man-made machine. Although cosmic-ray particles with energies this high are extremely rare, particles with energies that can be measured in terms of BeV—billion electron volts—are not uncommon. It is when particles with energies of 1

Clouds, Bubbles and Sparks

BeV or greater interact with matter that many of the elementary particles are produced.

In recent years a number of accelerators capable of accelerating particles to energies above 1 BeV have been constructed. At the present time there are two 30-BeV accelerators in existence. A 200-BeV accelerator is actively under consideration at the Lawrence Radiation Laboratory in Berkeley, California, and a 1,000-BeV accelerator is ultimately proposed for the Brookhaven National Laboratory on Long Island, New York. High-energy accelerators such as those now in existence—and particularly those in the planning stage—require something special in the way of nuclear particle detectors.

Which brings up the point of this article. Much has been written concerning the fundamental particles and the large accelerators, but very little recognition has been given to the nuclear particle detectors—without which the accelerators are nothing but elaborate and expensive pieces of useless equipment.

Particle detectors can be divided into two classes: (1) "tracking" devices in which tracks are formed which coincide with the actual path of the various charged particles, and (2) counting devices which give only an indication that particles have passed through the sensitive volume. Tracking or visual detectors include the expansion and diffusion cloud chambers, the bubble chamber, the spark chamber, and nuclear emulsions. Counting devices include the Geiger-Muller counter, the ionization chamber, the proportional counter, the scintillation counter, and the Cerenkov counter.

TABLE I • THE DISCOVERY OF ELEMENTARY PARTICLES*

	Particle	Source of radiation	Specific behavior or measurement	Instrument used for detection
ELECTRON,	e^-	Discharge tube	Ratio of e/m	Fluorescent screen
POSITRON,	e^+	Cosmic rays	Ratio of e/m	Wilson cloud chamber
NEUTRINO,	ν	Fission reactor	Detection of the products of the reaction $\bar{\nu} + p \rightarrow e^+ + n$	Counters
ANTINEUTRINO,	$\bar{\nu}$			
MU MESONS,	μ^+	Cosmic rays	Absence of radiation loss in passage through Pb. (Also decay at rest)	Wilson cloud chamber
	μ^-			
PI MESONS,	π^+	Cosmic rays	π - μ decay at rest	Nuclear emulsion
	π^-	Cosmic rays	Nuclear interaction at rest	Nuclear emulsion
	π^0	Accelerator	Decay into γ -rays	Counters
K MESONS,	K^+	Cosmic rays	K_{π^3} decay	Nuclear emulsion
	K^-	Cosmic rays	Nuclear interaction at rest	Nuclear emulsion
	K^0	Cosmic rays	Decay into $\pi^+ + \pi^-$ in flight	Wilson cloud chamber
NEUTRON,	n	Polonium plus beryllium	Mass determination from elastic collisions	Ionization chamber
ANTIPROTON,	\bar{p}	Accelerator	e/m measurement plus detection of annihilation	Counters
ANTINEUTRON,	\bar{n}	Accelerator	Detection of annihilation	Counters
LAMBDA,	Λ^0	Cosmic rays	Decay in flight into $p^+ + \pi^-$	Wilson cloud chamber
ANTILAMBDA,	$\bar{\Lambda}^0$	Accelerator	Decay in flight into $p + \pi^+$	Bubble chamber
SIGMAS,	Σ^+	Cosmic rays	Decay at rest	Nuclear emulsion
	Σ^-	Accelerator	Decay in flight into $\pi^- + n^0$	Diffusion chamber
	Σ^0	Accelerator	Decay in flight into $\Lambda^0 + \gamma$	Bubble chamber
XIS,	Ξ^-	Cosmic rays	Decay in flight into $\pi^- + \Lambda^0$	Wilson cloud chamber
	Ξ^0	Accelerators	Decay in flight into $\pi^0 + \Lambda^0$	Bubble chamber

*This table is based on one originally presented in *The Study of Elementary Particles by the Photographic Method* by C. F. Powell, P. H. Fowler, and D. H. Perkins (Pergamon Press, New York, 1959), p. xiv.

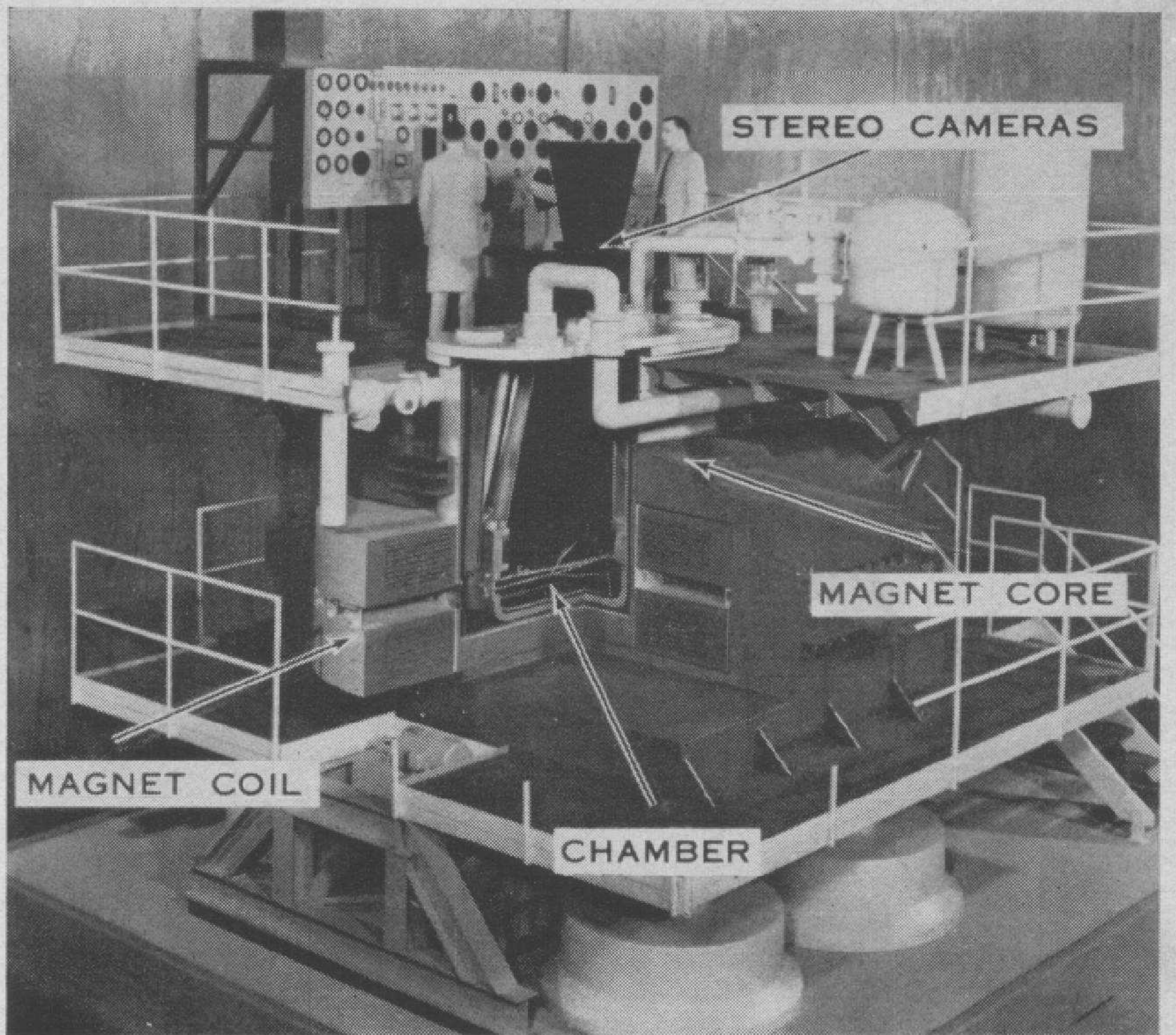
The recently developed scintillation chamber shares some of the virtues of both the visual and the counter-type detectors.

In so far as high-energy particle physics is concerned, the visual detectors are the most useful, although the Cerenkov counter and the scintillation counter both appear to have widespread application.

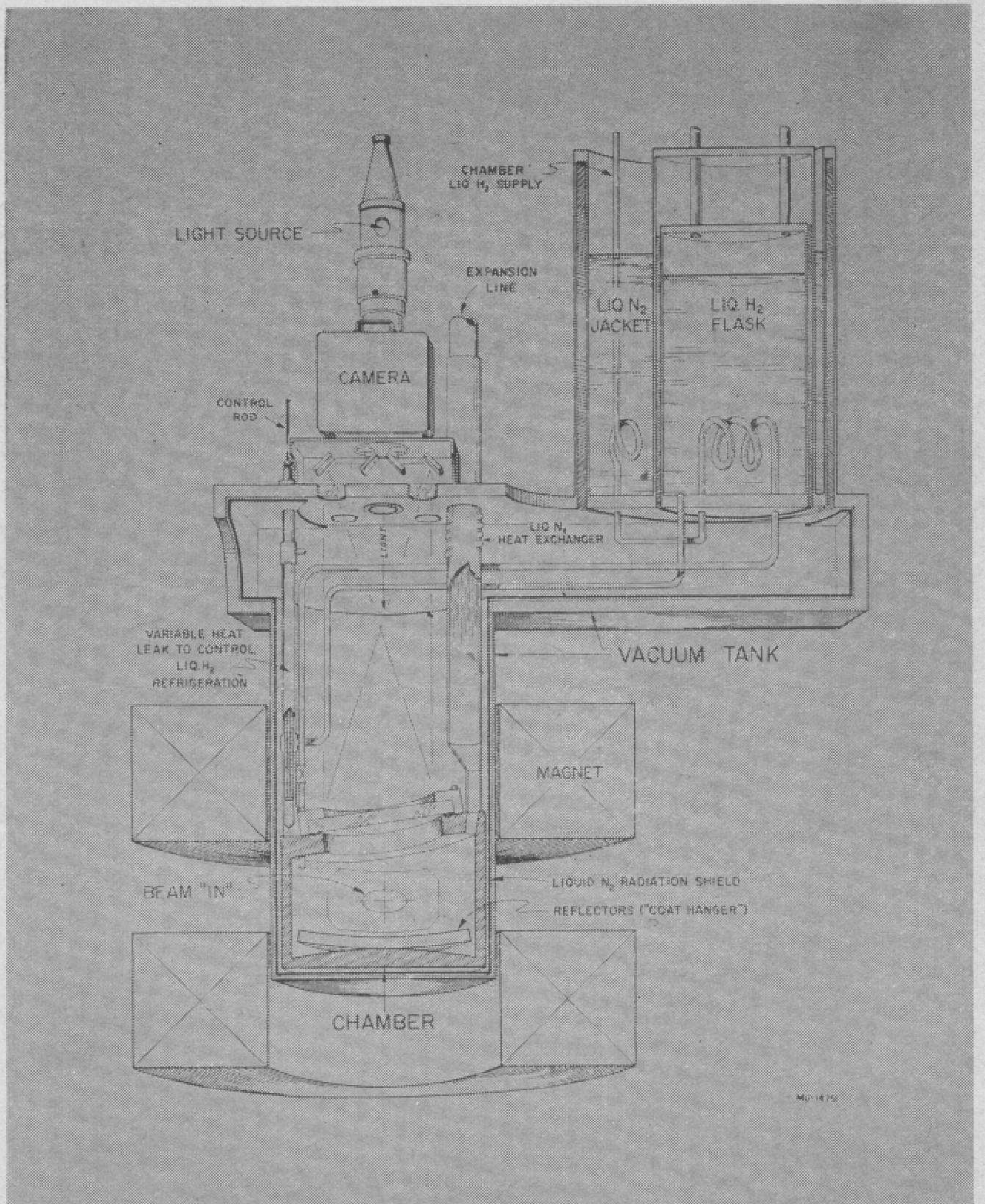
The oldest of the visual detectors is the expansion cloud chamber which was first constructed in 1911. This cloud chamber—often called the Wilson cloud chamber after its inventor, C. T. R. Wilson—has a unique place in the history of nuclear instrumentation. It was the first means by which the actual path of a charged particle could be followed. Never before could one say with certitude that he knew what had occurred to an individual nuclear particle.

The cloud chamber takes advantage of the fact that a charged particle traveling through air leaves a trail of positive and negative ions along its path. If the air is saturated with water vapor, the vapor tends to condense on the ions left by the passage of the charged particle. By supersaturating the air with vapor at the time the particle passes through the chamber, condensation becomes pronounced and an easily visible fog track shows the path of the particle.

An expansion cloud chamber operates by the sudden expansion of the saturated air within the chamber. This expansion cools the air, thus super-



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(Above) Model of the 72-inch bubble chamber. (Below) Cutaway view of the 72-inch liquid-hydrogen bubble chamber.

Clouds, Bubbles and Sparks

saturating it with vapor. If no dust is present, a temporary equilibrium is established and condensation occurs only along the paths of any charged particles which may enter the chamber at this time. Since the supersaturated state is a basically unstable condition—in scientific terms, a thermodynamic instability—within a short time a fog or cloud forms in the chamber as the vapor condenses out of the air. Hence the name cloud chamber.

The idea is to take stereoscopic photographs of any tracks that form during the time between the sudden expansion of the air and the general cloud formation. When such photographs are viewed in a special viewing machine, a three-dimensional effect is obtained, and the tracks can be studied at leisure.

While expansion cloud chambers have been operated with a wide variety of gases, air—which was the gas first used—is still the most common one in use. On the other hand, the water vapor originally used by Wilson has been largely supplanted by ethyl or propyl alcohol or a mixture of water and alcohol.

Often cloud chambers are fitted with plates of solid material through the expansion area so that the nature and types of products produced by the interaction of high-energy particles with matter can be observed. A wide variety of gas pressures, ranging from below atmospheric to three hundred atmospheres, have also been used. The very-high-pressure chambers were developed in an attempt to increase the probability of observing an interesting collision of a fast particle with a nucleus of an atom of the operating gas.

Some chambers are fitted with magnetic fields so that the effects of such fields on the charged particles which

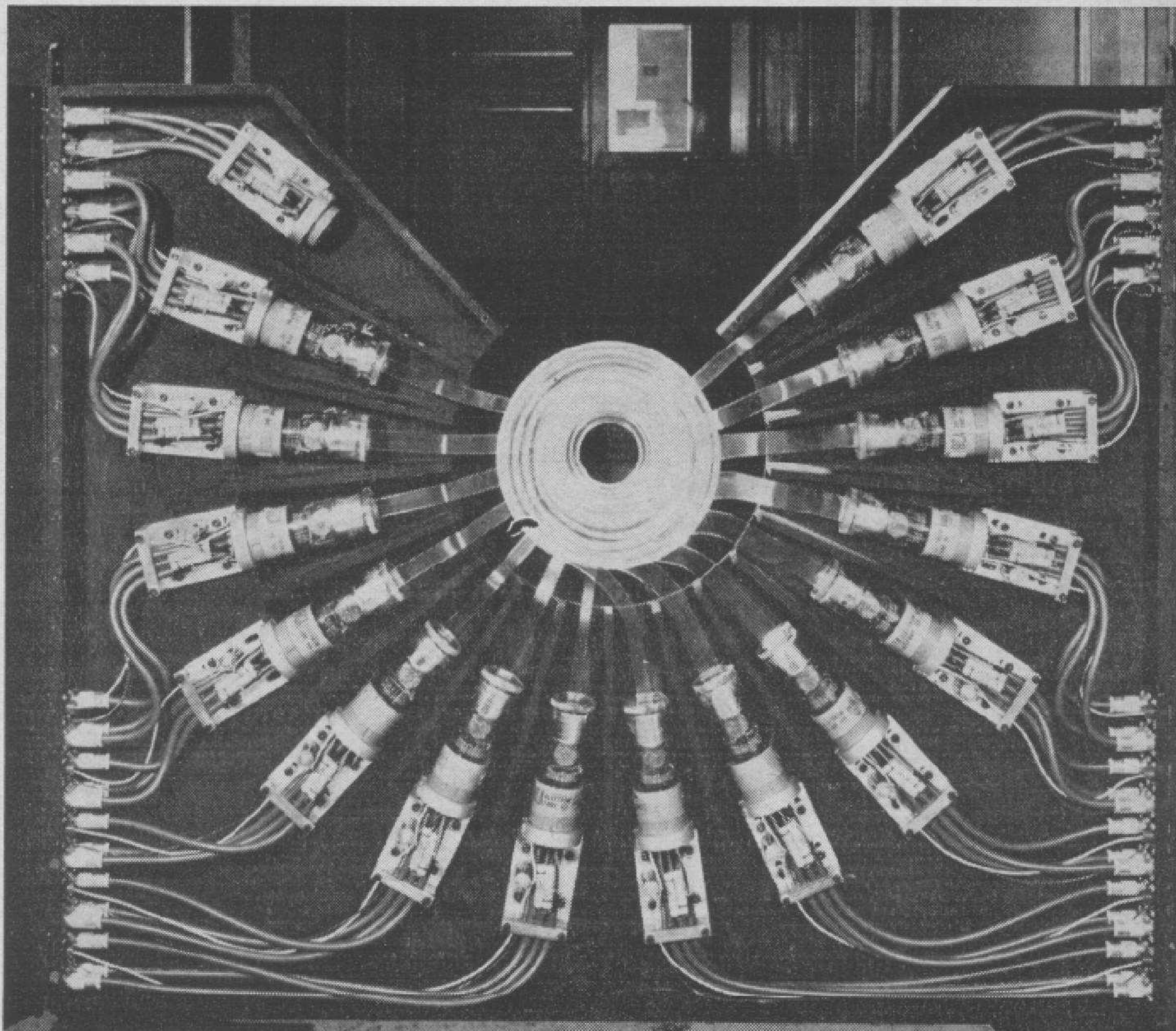
enter the chamber can be observed. It was by the use of such a field that the elementary particle called the positron was discovered.

In 1932, C. D. Anderson at the California Institute of Technology had constructed a cloud chamber for use in studying cosmic rays. His cloud chamber was fitted with a very strong magnetic field, since the amount of curvature and the direction of curvature of a charged particle in such a field enables physicists to obtain a considerable amount of information about the particle.

Of the numerous photographs of tracks he obtained, there were several which had all the earmarks of being photographs of electrons whose paths had been considerably curved by the magnetic field. Except for one disconcerting fact, everything about the tracks suggested that they were the

A scintillation counter arrangement used to determine the angular momentum of nuclear particles. A series of plastic scintillators in the middle of the counter are connected by Lucite light pipes to 15 photomultipliers.

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paths of electrons. But that one fact was most disconcerting. The tracks curved in exactly the opposite direction than electrons would—indicating that the particles were positively rather than negatively charged.

To quote Anderson, "The photographs of these positively charged particles could be understood only if the particles were assumed to have a mass approximately equal to that of the ordinary electron of negative electric charge, and thus the first evidence for the existence of positive electrons . . . was obtained." Anderson's particle, which he named the positron, was direct confirmation of the existence of the at-that-time hypothesized antiparticles.

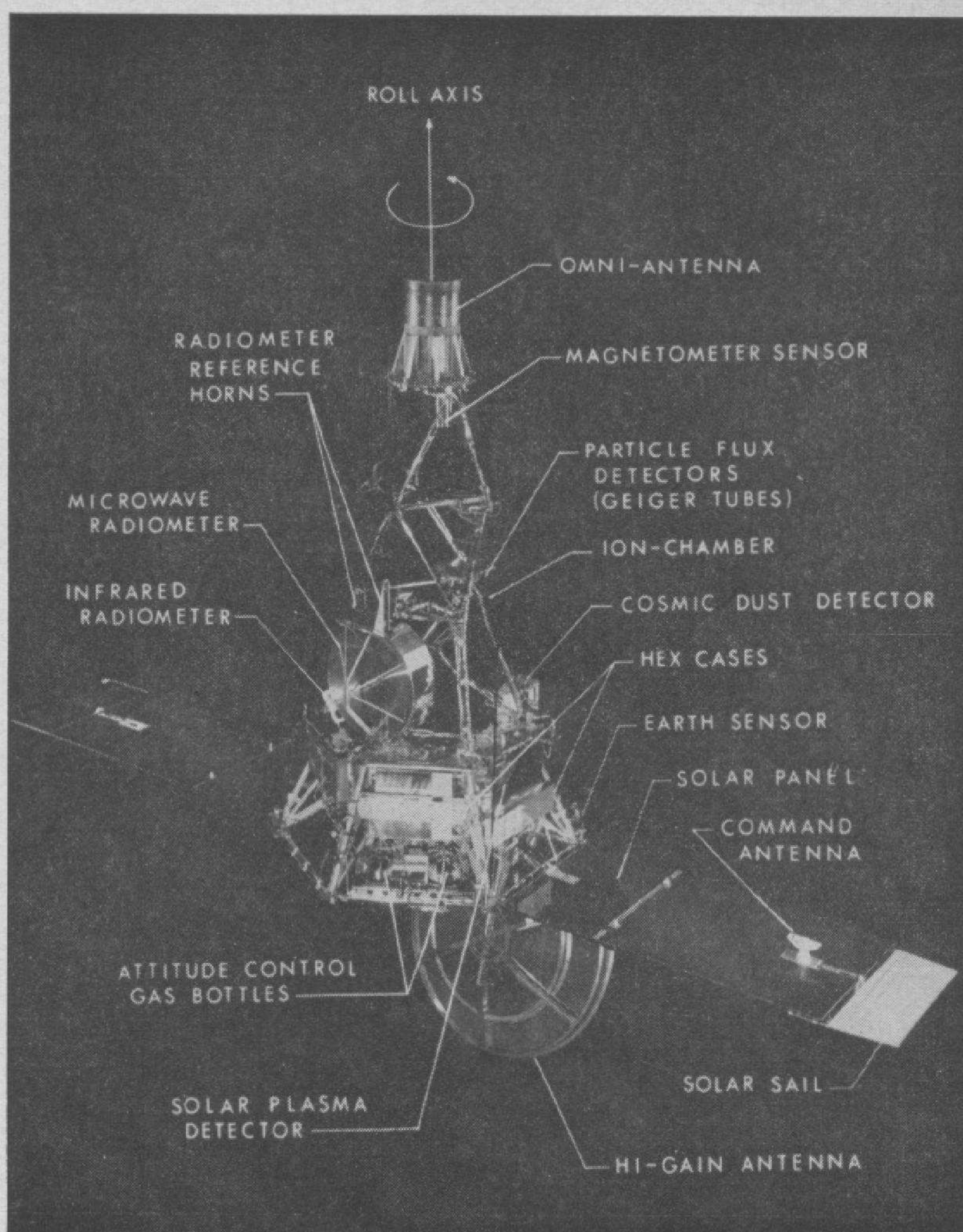
Cloud chambers have been used extensively to study cosmic rays. For this purpose some ingenious attachments have been used. One of the most useful has been the Geiger-Muller counter. Cosmic rays are quite irregular in their appearance and there is no way to tell in advance when they will penetrate into the atmosphere. In the early days of cosmic-ray study, a very large



A closeup view of the Mariner II radiation detectors. The three Geiger tubes are shown just beneath the sign while the ion chamber is the ball beneath the tubes. (At right) The major components of the Mariner II spacecraft. The radiation detectors (Geiger tubes and ion chamber) are called out on the upper right-hand side of the framework.

number of photographs were taken at regular intervals in the hope of catching on film some tracks caused by the cosmic-ray particles and their interactions with matter. This was wasteful—both in terms of film and the time involved in checking through the photographs.

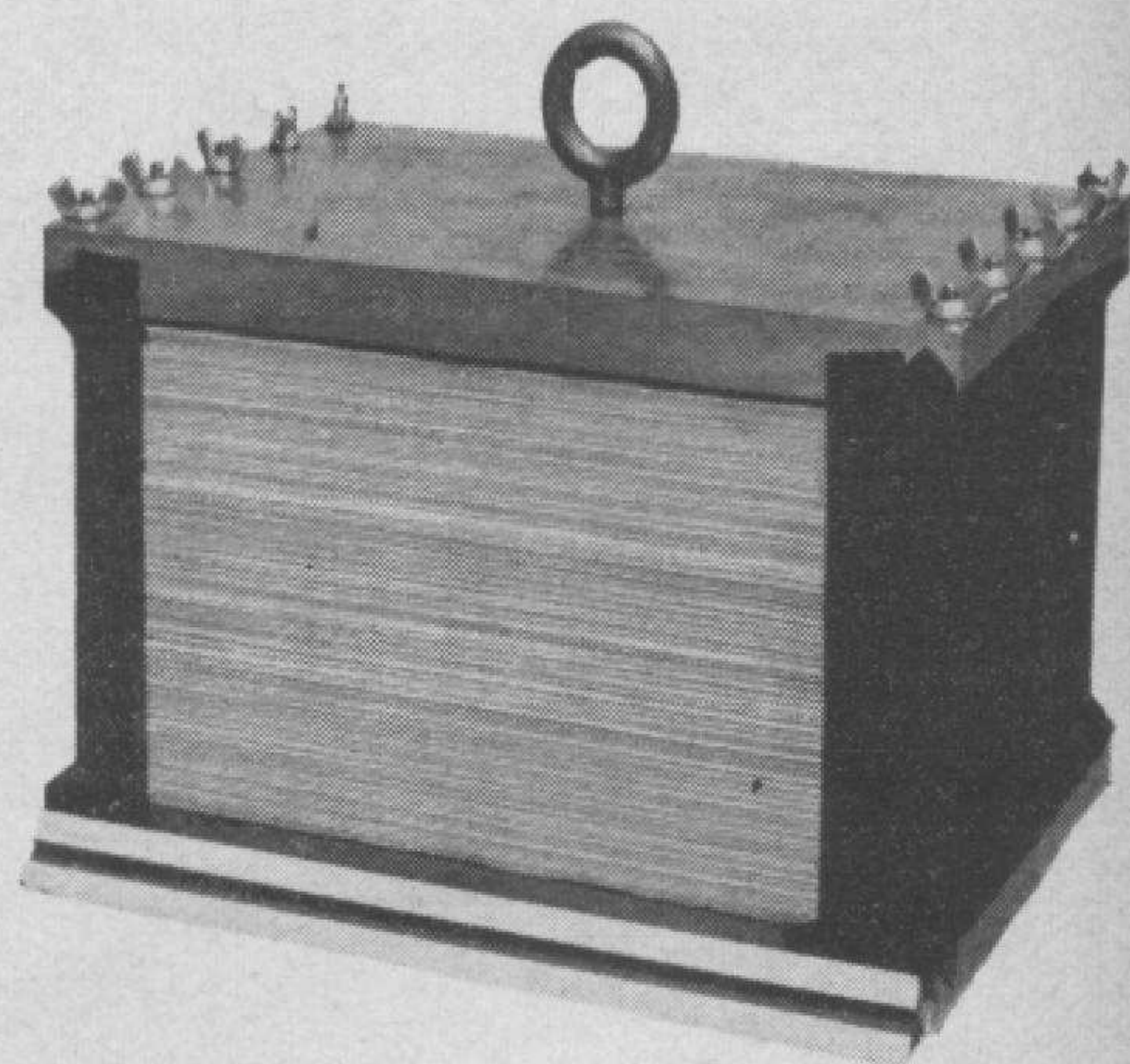
The Geiger counter—about which more will be said—provides a simple solution. The counter and the cloud chamber are arranged in such a manner that any incoming particles will first register on the counter before en-



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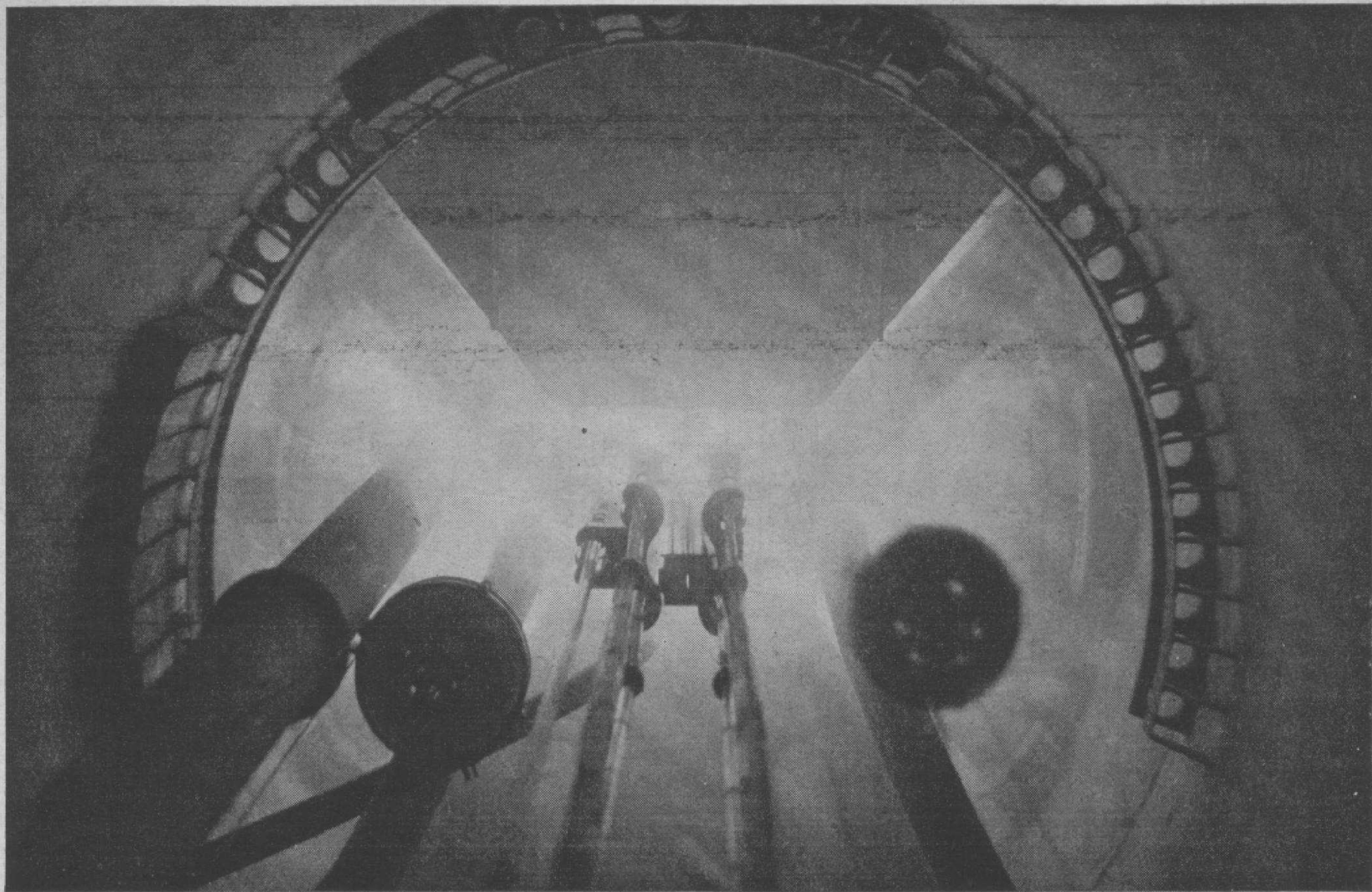
tering the cloud chamber. The action of the Geiger counter triggers both the camera and the expansion mechanism of the chamber so that the chamber operates and photographs are taken only when particles are passing through the sensitive area of the chamber. Thus the physicist is assured that almost all photographs will show tracks.

The expansion cloud chamber has one serious drawback in that it does not operate continuously but must be cycled. While small low-pressure chambers may be cycled as often as once a minute, the high-pressure chambers require fifteen to twenty minutes depending on their size. Since the chambers are sensitive, i.e., tracks can be formed, for only a short portion of the cycle, a great many interesting events may be missed altogether while the chamber is completing the insensitive portion of its cycle. High-energy accelerators, however, can produce



Nuclear emulsion stack used in high-energy particle physics experiments. Individual pellicles are easily seen in the stack. The eyebolt is attached for lifting purposes since this particular stack weighs well over a hundred pounds.

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This is the view looking down through 18 feet of water at fuel elements of the Lawrence Radiation Laboratory's Livermore Pool-Type Reactor. The glow is the Cerenkov effect.

pulses of particles at a fairly rapid rate—approximately every five seconds for the 6.2-BeV Bevatron at the Lawrence Radiation Laboratory). As a consequence, expansion cloud chambers have found only limited application in accelerator experiments.

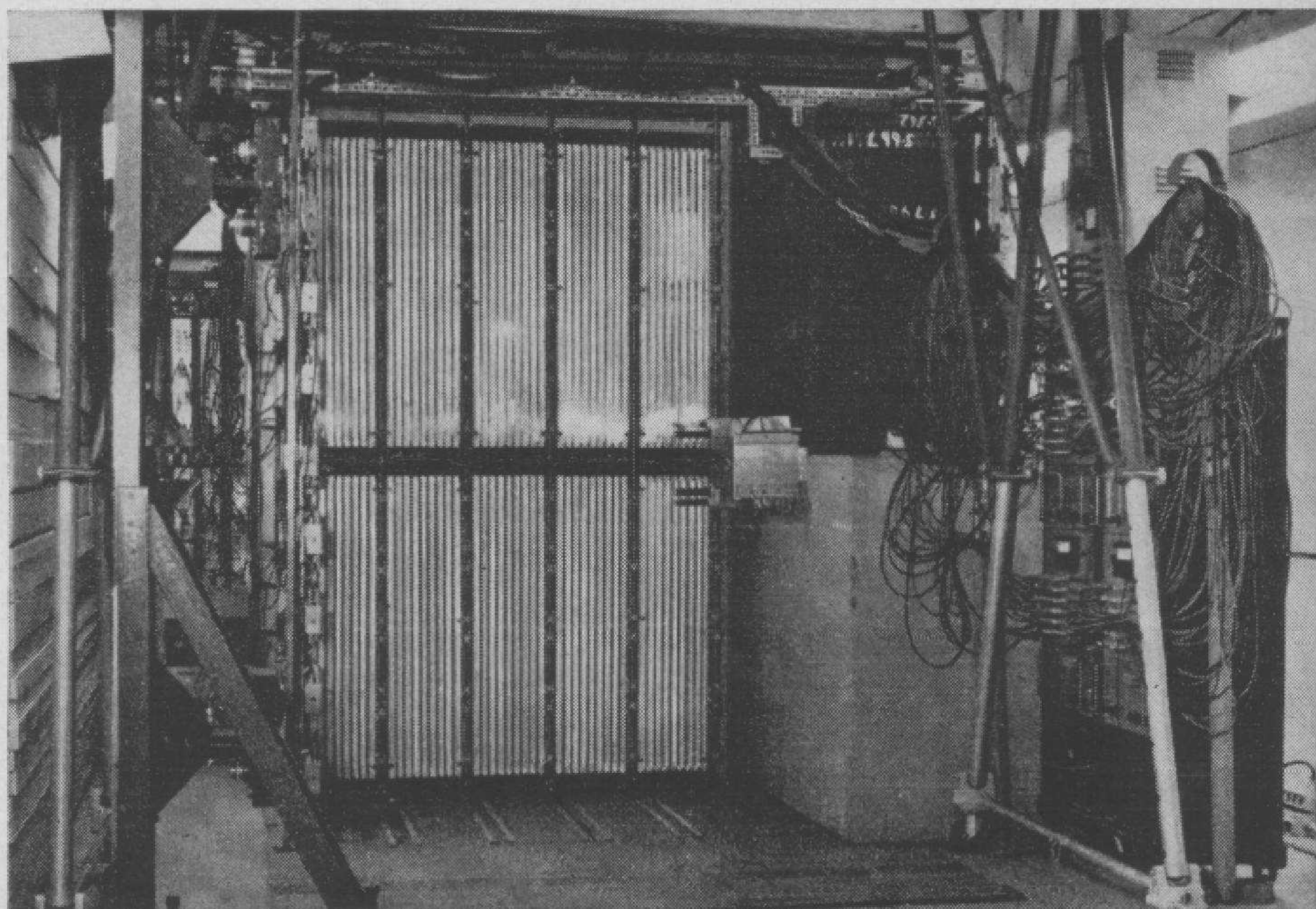
The diffusion cloud chamber circumvents this drawback. Essentially, the diffusion chamber consists of a vessel, containing air or other gas, which is kept warm at the top and cold at the bottom, with a supply of a volatile liquid available near the top. The liquid vaporizes in the warm region at the top of the chamber, where the vapor pressure is high, and continuously diffuses to the cold region at the

Columbia University 10-ton aluminum spark chamber installed at the Brookhaven National Laboratory's 33-BeV Alternating Gradient Synchrotron particle accelerator.

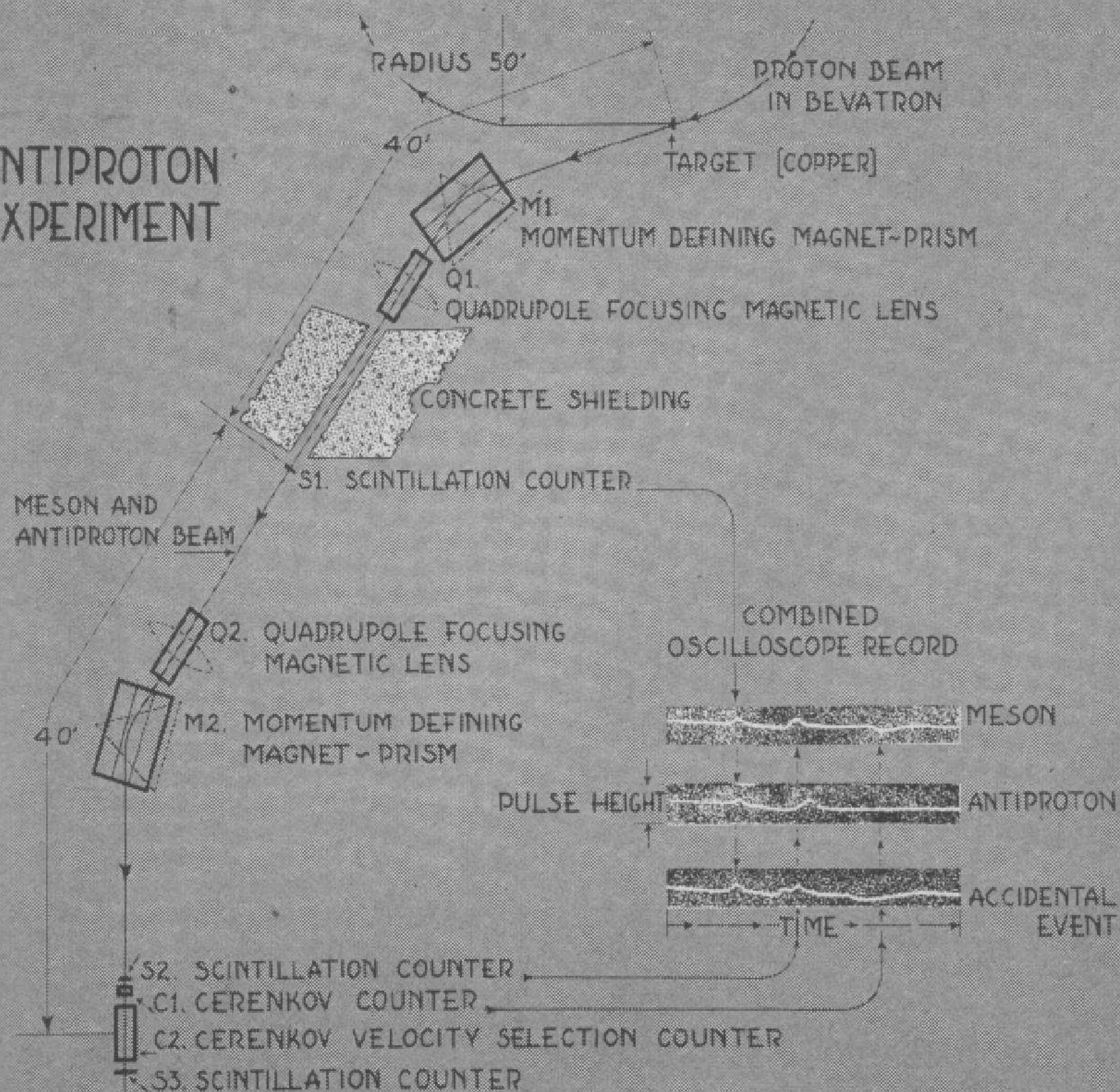
bottom, where vapor pressure is low and condensation occurs. Somewhere in between the air is supersaturated with vapor and conditions are right for track formation, just as in the case immediately after the expansion in a Wilson cloud chamber. As long as the volatile liquid holds out, the diffusion cloud chamber remains continuously

sensitive to charged particles.

Although various types of diffusion cloud chambers have been built, the most useful have been high-pressure hydrogen-filled chambers that operate at pressures up to thirty-five atmospheres. Ethyl and methyl alcohol are both good volatile liquids for use in this type of cloud chamber.



ANTI-PROTON EXPERIMENT



Unfortunately, the diffusion cloud chamber has a drawback of its own. At best, the sensitive region is perhaps three inches deep, so that only very rarely are all facets of an interesting interaction recorded. Nonetheless, diffusion cloud chambers have been used quite effectively in the study of high-energy particles obtained in the

The experimental setup used in the discovery of the antiproton. The Cerenkov velocity selection counter played a key role in differentiating the antiproton from a beam of particles consisting almost entirely of mesons.

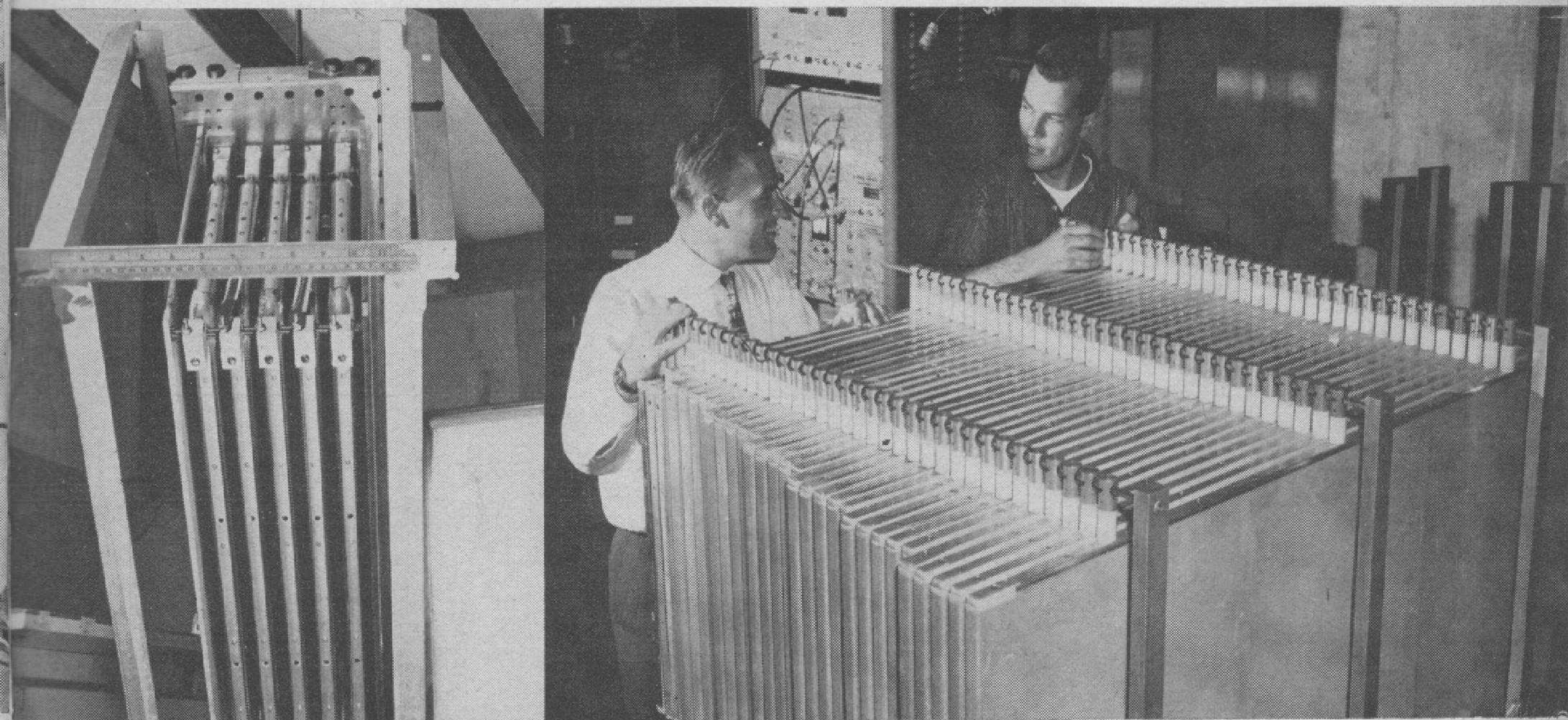
A four-gap aluminum-plate and a carbon plate spark chamber.

laboratory. High-pressure diffusion chambers have been extensively used with the 3-BeV Cosmotron accelerator at the Brookhaven National Laboratory.

It can almost be said that the expansion and the diffusion cloud chambers were invented for use with particular radiation sources in mind. The expansion cloud chamber is particularly suited to the study of cosmic rays but has only limited use with accelerators. On the other hand, the diffusion chamber can only be used in a horizontal position, thus restricting its use in cosmic ray work; but it is quite applicable for use with high-energy accelerators.

While observing the interactions of high-energy particles by means of cloud chambers, physicists have discovered all sorts of interesting phenomena—including the formation of new elementary particles (seven of them, to be exact). However, the very basic disadvantage of using cloud

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chambers as detectors is that, due to the relatively low density of the gas even at high pressures, significant phenomena are not very frequent. Until 1952 though, cloud chambers were the best track detectors available for the study of high-energy particles.

In 1952, D. A. Glaser at the University of Michigan invented a new particle detector—the bubble chamber—that was considerably better than the cloud chamber. It was so much better in fact that he received the 1960 Nobel prize in physics for having thought it up. Scientific folklore has it that he conceived the idea of the bubble chamber while watching bubbles form in a glass of beer—which can be construed as a strong argument in favor of beer.

The bubble chamber was, in reality, a highly successful attempt to overcome some of the shortcomings of nuclear emulsions and cloud chambers—which were then the only available track detectors—while retaining as much as possible their better features. In the same manner that a cloud chamber utilizes the thermodynamic instability inherent in a supersaturated gas, the bubble chamber depends on the thermodynamic instability of a superheated liquid.

In its simplest form, the bubble chamber consists of a closed vessel containing a liquid at a temperature above its normal boiling point but under sufficient pressure to prevent boiling. When the pressure is suddenly released, there is a fraction of a second before boiling starts. If charged particles pass through the chamber during the brief interval before boiling begins, a string of bubbles forms in the wake of each particle, leaving a visible track. The tracks are photographed and the liquid is then recompressed, squeezing the bubbles out of

existence. This cycle may be repeated every few seconds.

The first successful bubble chamber was made entirely of glass and was one inch long and one half inch in diameter. The working fluid was diethyl ether heated to 140°C and pressurized to twenty atmospheres to prevent boiling. A wide variety of bubble chambers have since been developed, with perhaps the strongest emphasis placed on those using liquid hydrogen as the working fluid.

Liquid hydrogen is an ideal target substance for the study of elementary particles. Because hydrogen nuclei consist only of protons—assuming the absence of the deuterium or tritium isotopes of hydrogen—nuclear events can be interpreted more easily than if complex nuclei are present—a disadvantage of nuclear emulsions. Liquid hydrogen is also dense enough to make interactions occur frequently, yet not so dense as to rule out the magnetic-deflection method of particle identification.

One of the very useful features of a cloud chamber is its large volume. For a time it was thought that bubble chambers could never approach the volume of the cloud chambers because of the apparent necessity for a clean, smooth-walled vessel containing no sharp edges, scratches, contaminants, et cetera, which might induce spontaneous boiling and destroy any particle tracks. It was later found, however, that “clean” chambers were not required for satisfactory particle tracks, provided the particles arrive from 10 to 20 milliseconds after the pressure on the chamber is released. The fact that dirty chambers would provide adequate tracks meant that large bubble chambers could be fabricated from metal and still contain a window through which tracks could be photographed. Enlarging the sensitive volume immediately made the bubble chamber an excellent track detector for use with high-energy accelerators.

One of the largest bubble chambers yet built is the 72-inch liquid-hydrogen chamber used in conjunction with the Bevatron. In addition to being 72

inches long, this chamber is 20 inches wide and 15 inches deep and contains approximately 520 liters of liquid hydrogen. The dimensions of this detector were largely set by the nature and the energy of the interactions to be studied. The Bevatron is used extensively for investigating strange particles and their interactions. (The strange particles are a family of sixteen elementary particles arising from high-energy nuclear collisions. The first of the strange particles was discovered in 1947.) Some of the reaction products of these interactions are neutral particles which leave no tracks in the chamber. However, they are highly unstable and decay quickly into charged particles which are again visible in the chamber. They are also generally quite energetic and may travel a considerable distance before decaying. It is essential that the volume of the bubble chamber be sufficiently large to show the tracks of the decay products as well as the tracks of the original charged particles. By analyzing both sets of tracks, physicists can determine not only the path of the neutral particles but frequently precisely what they are.

The 72-inch chamber is adequate to detect almost all interactions produced by particles accelerated in the 6.2-BeV Bevatron; however, it would not be adequate for particles interacting with energies of 20 or 30 BeV.

Like the expansion cloud chamber, the bubble chamber is not continuously sensitive. The insensitive portion of its cycle, however, is normally considerably shorter than that of the expansion cloud chamber. Bubble chambers are most commonly used with very-high-energy accelerators such as the Bevatron or the Cosmotron. These accelerators also operate only intermittently, producing short bursts of particles at regular intervals. The cycle of the bubble chamber can be timed to correspond to that of the accelerator so that each time a burst of particles is produced, the chamber is sensitive.

As an example, the Bevatron has a maximum pulse rate of twelve pulses per minute while the 72-inch bubble

continued on page 81

SPACEMAN

Murray Leinster



First of Two Parts. It started out as a somewhat odd voyage—the crew intended it to be. They planned mutiny. The captain intended it to be. He had plans, too . . . which also involved death by violence. The TV company intended it to be . . . but not THAT odd!

Illustrated by John Schoenherr

I

He wasn't quite six feet tall, though he looked more than that. Perhaps it was because he was a merchant-space officer of some experience. Perhaps it was because he'd been born and raised on a planet where the gravity was 1.7 normal and he felt light and springy where other people drooped. Or it may have been because he'd been on many ships and many worlds and knew his way about. In any case he was eating a steak in a warehouse-district restaurant when he heard about the *Rim Star*. It sounded good, but he made sure it was straight before he acted on it.

It checked, so he headed for the spaceport, though it was well after midnight at the time. His name was Braden and his papers certified that he should be of great value to any ship which secured his services. He didn't put much faith in documents, himself, and maybe this skipper wouldn't, either. But papers were necessary.

He ignored other theoretic matters—the best thought on getting a berth, for example. It was said that approaching a skipper at an inconvenient time was unwise. The very best thought said that no skipper would take on a new mate if approached when he was busy loading ship, or asleep, or otherwise fully occupied. But there were angles. For example, unless a ship is going to be aground for a long time its officers and crew will keep to ship-time regardless of local customs. They may sleep while the world around them bustles in bright sunshine. They may breakfast at sundown, or have supper at what the spaceport clocks say is noon. It saves trouble. So the fact that the spaceport was dark and desolate at this hour needn't

mean that it was a bad time to hit the skipper for the vacant mate's berth.

Braden showed his papers at the spaceport gate and went in. He didn't have to ask directions. The *Rim Star* was the biggest ship in several star-clusters, and he could spot her enormous, clumsy bulk in the starlight, half a mile away across the tarmac. In between there was a medium-sized freighter and a toy-sized yacht and a pile of stacked crates and boxes that had been unloaded but not warehoused from a ship now gone away. There was a huddle of loading cranes, with their long booms seeming to droop mournfully in the darkness. There was that general atmosphere of gloom that a spaceport displays on a slow night when nothing is happening.

Braden went briskly toward the ship. Behind him there was a faint, low rumbling sound. That was the spaceport city. Even in the small hours a city rumbles to itself. Its inhabitants don't notice, but it is startling to a spaceman to hear murmurings and rumbles and noises which have no meaning. In space, every sound inside a ship has its significance, and there are no outside sounds at all.

The piled-up cargo cases loomed high. They mounted to a peak in one place, and they were heaped on each other in what seemed pure confusion at others. There were boxes with starlight on them bright enough for their markings to be read, but also there were caverns and places of daunting darkness around the base of the ship-load of freight.

As Braden drew near it, two men came out from hiding among the cases. They stood before him, waiting. Simultaneously, three other men came from other hiding-places and moved to positions behind him. They didn't speak. They simply moved quietly to encircle him—those ahead waited for him and those behind moved to overtake him. This was not an action of the spaceport police. It looked like a holdup, and yet not entirely. Five men were too many for a holdup. One with a blaster was enough. This looked like something else; a cold-blooded intention to do harm; a purpose which was implacable and settled in advance.

Braden took note of the facts. He didn't look for an explanation now. That could come later. But he estimated the situation. On his home planet the acceleration of gravity was fifty-four feet the first second instead of thirty-two. Anybody who grew up there acquired reflexes keyed to a high-speed environment. So Braden had an advantage in both mental and physical reaction-time. Also, he knew that if trouble is bound to come, the advantage lies with the man who starts it.

So he went on, his footsteps audible and confident. He moved briskly toward the distant *Rim Star*. The two men before him closed in. Those behind closed up. Their actions should have been frightening, but Braden's footsteps did not change tempo. He went onward as if not noticing. Then, just before the two men before him crouched for a rush—he rushed first. Not at the two of them, of course.

He leaped at the man to his left with a ruthless and calculated ferocity. His full weight knocked that man off-balance and he brought up his fist with the strength of all his shoulder-muscles behind it. Those muscles had been developed on a heavy planet. The blow landed accurately on the point of the other man's jaw.

Braden didn't wait for him to fall. Keyed to fast action, to himself he seemed to float almost in slow motion as he leaped again, upon the righthand man this time and before any of the others could realize just what was happening. This was no time for sportsmanship. Braden grabbed the second man, kneed him ferociously, and then swung and slung him—part missile and part shield—against the remaining three. The gasping man took the blow one of his companions aimed at Braden. He blocked for an instant the attack of a second. And Braden, coming around from the side in a specific flank-attack, used his peculiar gifts in self-defense as such gifts have to be used—offensively.

There was no word spoken. The whole thing happened too fast. The five had intended to do their work with blackjacks or something similar. They'd assumed the initiative was theirs. The last three were ready to attack, from the rear, someone already attacked from the front. But they were attacked, instead. Braden took them from the side, one after another, with only fractions of seconds in between. He was not gentle. His tactics were murderous.

The last man went down and starlight glinted on a knife. Braden kicked, twice. The knife went clanging away from the first kick. The man wailed after the second.

Then it was all over. Braden's attackers were victims of that technical device known as surprise, and he surveyed them in the starlight. He breathed hard, but he'd worked scientifically on men who were shocked and surprised by being attacked instead of attacking.

"What is this all about?" demanded Braden savagely.

A voice mumbled, feebly and despairingly:

"It ain't him!"

There was a pause. Then Braden said annoyedly:

"Oh. It was a mistake. I suppose that makes it all right."

He turned and went toward the *Rim Star*. It was not exactly the behavior the authorities would have advised, perhaps. Maybe he should have called the spaceport police and turned his victims over to them, with the distinctly improbable statement that they'd seemed about to attack him, so he subdued the lot. The police would be dubious. He, Braden, would waste time arguing with them. Ultimately the five would be dismissed for lack of evidence.

So he went his way. He passed the toy-sized yacht where a light burned outside the air lock to guide a skimmer-driver bring the yacht's owner back to his ship. Braden went on past the freighter, resting quietly on the tarmac with a pool of blackest shadow underneath it. The truly enormous bulk of the *Rim Star* loomed ahead.

A light showed briefly. It was an exit-port on the huge

vessel. The light was partly obscured, then brightened, and then went out again as the exit port closed. A man had come out. Presently Braden heard footsteps. They were heading for the spaceport gate from which Braden had just come. The other man would pass close by. Braden called:

"You from the *Rim Star*!"

The other man hesitated, and then slowed and stopped. He was a dim figure in the starlight. His voice sounded suspicious:

"What do you want?"

"I had some trouble," said Braden, "with some characters hiding in that pile of frieght. They're still there. If you want to avoid trouble, I suggest that you steer wide of it. That's all."

A pause. The other man said:

"Thanks." Another pause. "You're heading for the *Rim Star*?"

"Yes," agreed Braden. "There's talk she's short-handed. I just heard it."

"She is," said the dim figure. "I just left her."

Braden said:

"'Sign on?"

"No," said the figure. He sounded amused. "I'm her owner. I was talking to the skipper."

"How about the stuff that's going around?" asked Braden. "The story is that she's going to Handel's Planet with the girders for a grid among other cargo, and she'll have to land on rockets. No grid there to let her down. Right?"

"That's right," said the dim figure in the darkness. "And they say it can't be done." Then his tone went ironic. "The story also says that she'll crash and I'll collect insurance on her. Did you hear that?"

"Sure!" said Braden. "I hear she's shy a mate, too. The last one's in the hospital. Somebody beat him up. I've papers for a mate's berth."

"She's waiting for a mate to get clearance," said the other figure. "Satisfy the skipper and you're set."

"Thanks," said Braden. "I'll try to satisfy him."

He moved to go on toward the hulking mass of the *Rim Star*. The other man said curtly:

"Tell me something. About the story that the *Rim Star* will crash for the insurance. Do people really believe that yarn?"

"Some," said Braden. "I mean, parts of it. You believe stuff about people being crooks when you're down on your luck. You say you're honest and they aren't and that's why you're broke. It's your alibi."

"True enough," said the figure in the starlight. He paused again. "The skipper's my father-in-law. I wouldn't be likely to send him off to be killed for insurance. He says the ship can land. On rockets. He should be right. If you satisfy him, you've got the mate's job. But that's his business, not mine."

"Naturally," agreed Braden. "Remember those characters by the pile of frieght. They could be nasty. They

were waiting for somebody special. I wasn't him. You might be."

The figure off in the starlight said dryly:

"I've got a blaster in my pocket."

He moved on toward the spaceport gate. Braden went on toward the big ship. As he drew nearer, her monstrous size became evident. She was fifteen hundred feet long from her blunt bow to her rounded stern. She was two-hundred-odd feet in diameter—as thick as a twenty-story building is tall. Beneath her there was utter and absolute darkness. No glimmer of light came from anywhere upon her hull. She was wholly without grace of line or structure. There is nothing in the galaxy that looks more improbable than a spaceship, either aground or in space. The *Rim Star* was preposterous. She looked clumsy. There was no beauty in her anywhere.

Braden found the exit port—not a cargo door, but a small opening. He signaled his presence. Half a minute later something clicked and a voice came out of a speaker over his head.

"Well?"

"My name's Braden," said Braden. "I was mate on the *Cerebrus* and others. Paid off a month ago. My certificate's in order. I hear you're shy a mate."

The voice from the speaker rumbled inarticulately for a moment. Then it said:

"Wait. I'll have the steward let you in."

There was a click, and silence. Braden waited in the total obscurity beneath the *Rim Star's* monstrous shape. He looked out at the stars. They were unfamiliar, but unfamiliar constellations are matters of course to a space officer. Forty light-years of distance changes any pattern of nearby stars to the point where no pattern any longer exists. But there is the Milky Way, and certain bright clusters, and more notably those dark nebulae which blot out the star-systems behind them. Braden could have used such sky-markers and by eye located this world of Nelm within a reasonable number of light-centuries. It occurred to him that somebody scanning a sky of strange and unnamed stars might very well come to believe in the fabled Other Side of Nowhere, because anything seemed possible when the sky was new. But it was, of course, pure superstition. It essayed to explain the occasional inexplicable disappearance of ships in emptiness. But Braden didn't believe in it. It was mainly a tall tale. It was absurd.

The port door opened. A man with straw-colored hair peered out. His skin seemed flabby until one looked closely, and then it was normal enough. He might have tried a rejuv job and it hadn't worked. He looked at Braden.

"Braden?"

"That's right," said Braden.

"I'll take you to the captain."

Braden stepped inside. The door closed behind him. He saw that the straw-colored man was the ship's steward. He led the way up a short flight of stairs and through an

opening into a corridor that led both ways. He went on. The floor of the corridor became a ramp. Presently there were steps, then more ramp, then more steps. There was no sign of life anywhere. They moved through a long, curving, rising tunnel which went round and round without apparent used doors or other openings. There were, of course, hinged plates here and there in the corridor wall. Naturally! There were monitor-boxes, too. But the corridor obviously circled the huge emptiness which was the cargo space of the ship. Such items were normal. The *Rim Star* was a bulk-cargo carrier, and its cavernous holds occupied almost all the interior of its structure.

They climbed and climbed. Once they passed the marked doorway to a lifeboat blister, and once they passed a double door on the corridor's inboard side. It would allow the removal and replacement of the units combining to form the ship's Lawlor drive, if inspection aground called for substitution. Otherwise there were no openings. The hinged plates, of course, gave access to catwalks among the ship's framing-members. There were no portholes, obviously. And there was no life.

The *Rim Star* was a group of enormous cargo spaces enclosed in a double skin, with all controls in the bow. The parts of the ship to be used by humans were minute compared to the volume available for freight. She'd been built to carry grain in bulk to the twin worlds Themis and Thetis when it was impossible to grow grain there for the human population. But some years back a mutant wheat had been developed which thrived on the previously inhospitable planets. It actually pushed back the native vegetation. Wheat was now sown on both worlds to crowd out the useless native plants and clear ground for human-use crops. In consequence there was no longer any need for the big ship and she couldn't pay her way. In fact, the *Rim Star* appeared to have no longer any reason for being.

All this was no secret. But the ship did exist. She was designed to be handled by no more than six crewmen plus steward and skipper and mate. There had seemed no possible present use for her, until her skipper invented one. It looked promising to some people, and dubious to others. But Braden hadn't yet reached the point of considering disasters as rather more than likely to happen. The *Rim Star* needed a mate. She would be heading toward a part of space where he'd never been. He didn't think about abstract probabilities or the dangers of trying new things. He'd come to try to get a berth.

The steward opened a door and said:

"The captain's in there."

He closed the door behind Braden, who found himself in a room empty of everything but ordinary furniture. There was another door ahead. Braden went through it. Still another door. A voice rumbled:

"This way."

Braden went through a third door. An enormously fat man sat in a huge upholstered chair. There was a glass on the table beside him. He put down a book—by its title

and cover an historical novel about cowboys, laid centuries ago on Earth. He looked at Braden through fat-puffed eyes.

"Certificate," he rumbled. He held out a hand.

Braden handed over his papers. The skipper looked at them.

"The *Cerberus*, from Canberra to Nelm," he rumbled. "Skipper, Holden. How does he swear?"

Rather surprisedly, Braden mentioned the *Cerberus*' skipper's most adhesive profane expression. The *Rim Star*'s skipper grunted. He looked at another discharge.

"The *Ganymede*, Honda to Canberra," he rumbled again. "I know her skipper. What's he like?"

Braden grew interested. He said:

"Scar under his chin, Sandy hair. About six . . ."

A rumble. The *Rim Star*'s skipper grunted again.

"One more. The *Hansford*. In the control room there's a pinup. Remember it?"

Braden considered. These were not usual questions for a skipper to ask a candidate for a mate's job on his ship.

"It's a vision-screen girl," he said after a moment. The name is"—he hesitated and then said—"Derr Carmody."

The skipper handed back the papers.

"You'll do," he rumbled. "Pay is scale. Report on board tomorrow morning. Ten local time. Fetch the crew with you."

He pushed a button. Then he said almost genially:

"Are you ducking something? Your coat's slit. Looks like a knife did it. Sharp edges. Happened lately."

Braden looked down. There was a fresh knife-slash in his coat. It had happened, obviously, over by the freight-heap when five men came out of hiding to take some undesirable action against him.

"I didn't notice," he said, annoyed. "Just now, on my way here, some characters tried to jump me. It must have happened then."

The skipper blinked at him.

"Well?"

"I jumped first," said Braden. "They weren't very good. One of them said afterward that I was the wrong man. I don't know of anybody who'd want to jump me, so I suppose it was true."

The skipper blinked again, and then he chuckled. He shook with his chuckling. A door opened and the steward appeared. The skipper said genially:

"This is the steward." He waved a fat hand. To the steward he said: "Let him out. He's the new mate." He chuckled yet again and looked approvingly at Braden. "You may meet those characters again before you think. I don't like popular officers. A popular officer is a poor one. You'll do!"

He waved his hand in dismissal. He hadn't stirred from the huge upholstered chair. But he was still chuckling as Braden followed the almost-white-haired steward from the room.

They went down the slanting corridor with alternating sloped floor and sets of steps. Halfway down, the steward said:

"Beg pardon, sir, but—what made the skipper choose you? I'm curious."

"I'm trying to figure it out myself," said Braden. "But I got the job."

"Yes, sir," said the steward. It was not customary for the steward on a cargo ship to practice such extreme deference. "I was wondering, sir, because he's interviewed a good many others and only chose one who's since—been taken ill, sir. But he turned down a great many. Some of them were very steady men, married, sir, and with excellent reputations. And some of the younger ones he didn't even consider. He turned them down after one glance at them. But he chose you at once. It's strange, sir."

Braden said nothing.

"Very strange," repeated the steward. "Even the crew were chosen on a system I don't understand. I consider the men he chose very dubious characters, sir. In fact . . ."

"What?"

"It's quite possible, sir, that the men who tried to jump you were the men the skipper has signed on for his crew. I said the last chosen mate was taken ill. He was beaten up, sir. He's in a hospital now."

Braden was silent for a moment. Then he said detachedly:

"I told the skipper, not you, that men had tried to work me over. Does he know that you eavesdrop on him?"

"In case of trouble, sir," said the steward earnestly. "Only in case of trouble! A precaution, sir. I wouldn't presume—"

"Don't" said Braden. "If I'm the mate, don't eavesdrop on me. I don't like it. I won't like it."

"Yes, sir," said the steward.

"And when you tell the skipper about this conversation," added Braden, frowning, "don't forget to add that I also don't like tricks to find out if I'm loose-tongued and ready to discuss my or his private business. I don't like such tricks!"

"Oh, yes, sir!" said the steward. He added: "I'm sure the skipper will be pleased, sir. Very pleased!" He paused a moment. "Considering a certain part of the cargo, sir, in particular."

They reached the bottom of the circular ramp-and-stair combination. Braden asked no questions about a certain part of the ship's cargo. It was not his affair. Especially, he would not ask questions of a steward who would probably report every question to the skipper.

Here was the exit port at the bottom of a special set of steps. Braden opened it for himself.

"Ten o'clock, sir, local time," said the steward. "The skipper will be expecting to lift off by noon, sir. The passengers will be notified."

"Passengers?" demanded Braden. He stopped short.

"Yes, sir. Quite unexpected, sir. The shipping agent only notified the skipper this past afternoon that there

would be passengers. We've accommodations for a few, sir. Very few. Six cabins and a saloon, sir. Often there are people bound for a planet with infrequent ship-service and they make their trip by freighter. It's often a quicker way to travel."

Braden shrugged. It was not surprising that even a bulk-cargo carrier like the *Rim Star* should have accommodations for passengers. The big fast liners that went singing through the void did not like to make small way-stops. They were moving hotels, with decks upon decks of passenger-cabins and amusement areas. It was costly for crack liners to break their runs to put off a very few passengers. There were many worlds it was most practical to reach by finding a freighter bound for them.

"Very well," said Braden curtly. "I'll be back at ten."

"Yes, sir," said the steward respectfully.

He closed the passenger port behind Braden, and Braden was in the abysmally black shadow of the *Rim Star*. He frowned as he headed back toward the spaceport gate. It is not the business of a ship's officer to investigate everything out of the ordinary in a ship he's just joining. His obligation is to do his ship-duty well and honorably, and nothing more. If this skipper chose a mate because he he could answer questions about other skippers and their ships, it was his business only. If he preferred unpopular officers to amiable ones, it was again only his affair. But, if he chose and knowingly kept on crewmen who lay in wait for prospective other crewmembers heading for the *Rim Star*—

Braden's frown became a scowl. He moved out from the *Rim Star's* shadow and headed for the spaceport gate.

There were a number of unorthodox things about the *Rim Star* besides her destination and purpose. But he'd learned that a man can go unscathed through undesirable and annoying and even unjust experiences if he keeps his self-respect. And a man keeps his self-respect largely by being competent in his work.

So it did not occur to him to back out because the coming journey would have some unusual features. He'd asked for the job. He'd gotten it. Now he would do his work. That was his entire obligation. If the *Rim Star's* skipper chose his crew from among probable criminals and selected a mate for his knowledge of pin-ups and probable unpopularity—Braden considered, from a professional viewpoint, that if he did his work competently such things wouldn't matter.

In most cases he would have been right.

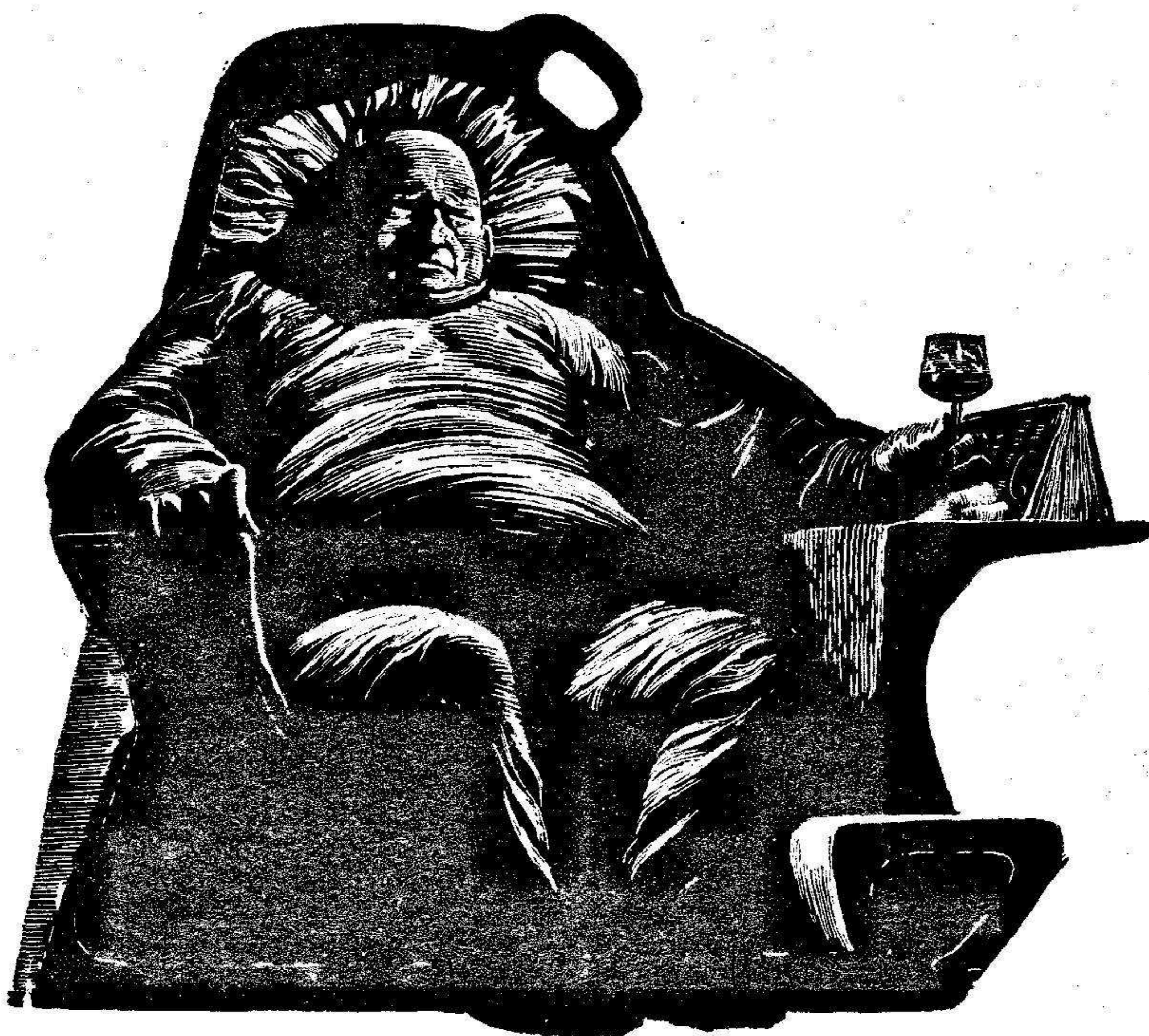
He passed the heap of freight cases. He kept his eyes and ears open as he went by. It was this extra alertness that made him hear a very faint noise of arresting quality. It was a bubbling sound that should not come from a human throat, but couldn't come from anywhere else.

Braden hesitated for a long moment, and then went to see. Thirty yards from the heap of freight, he found a feebly moving figure on the ground. It had been jumped and beaten, and it twitched and made suffering noises. It had been horribly and brutally pounded. It made meaningless sounds. It writhed.

Braden coldly made sure that movement wouldn't add to the figure's injuries. Then he picked up the man and carried him to the spaceport gate. He laid his burden on a bench the gate guards used for lounging.

"Get an ambulance," he commanded. "This man's been worked over. I found him on the ground back yonder."

The guards looked, and moved fast. One called for an



ambulance while another did what first aid he could. A third said in a hushed voice:

"He came through the gate less than half an hour ago. He was signed on the *Rim Star*. Space crewman first-class. Had his papers, too."

Braden's nostrils widened a little. Five men had tried to jump him, maybe an hour ago. That had been a mistake. He wasn't the man they were after. This man probably was—at least he belonged on the *Rim Star* and was headed back to the ship when things happened to him.

"He'll probably tell you," said Braden, "that he was jumped by five men. That many came after me earlier, but I wasn't the man they wanted. He must have been."

He turned and went away. He was still within earshot when the ambulance arrived at the gate, but he went about his business. It was common sense to do so. He was mate of a ship, to which his first duty was due. He couldn't have described the five men who'd tried to manhandle him, or prove that they'd worked over this man. And it was time for him to get his own affairs lined up. By now it was at least half-past three in the morning. He had to get ready for duty on the *Rim Star*. When he'd left his room, earlier, he'd had no departure in mind. He'd have to register at the Space Shipping Office as mate of the big ship. He'd have to round up the crewmen still ashore. For obvious reasons it ought to be simple, if he started early enough.

He went to his room and packed—including the pocket blaster which nobody was supposed to take to space on a merchant ship, but which no prudent officer would fail to have available. When he had his possessions in order there were no more than five hours before he was due for ship-duty. He slept two of them, having the fine ability to wake up when he chose.

Waked, he went to the Shipping Office. The *Rim Star's* skipper hadn't reported his hiring as mate. He had to be raised by communicator to verify the appointment. He did. But somebody else was also listed as mate.

"He's in a hospital somewhere," said Braden. "I'd guess he was jumped and beaten up."

The Shipping Office used the communicator again. They found the first accepted candidate for mate on the *Rim Star*. He profanely admitted that he would not sail on the *Rim Star*.

"And any man is a fool who does!" he rasped.

Braden's name was substituted for his on the official records. The Shipping Office was meticulous about such matters. Space traffic had to be watched closely. History told of piracies and worse before modern strict regulations went into effect. Braden got the list of the *Rim Star's* signed-on crew. There were six names listed. Five gave the same spaceport boarding house as the place where they could be reached when wanted. Braden put his finger on the sixth name.

"I think this man is in a hospital, too," he observed. "It happened last night or early this morning. Which will mean overtime pay for the men who have to do his work."

Again the Shipping Office checked. Again it took time. Yes. The sixth man had been brought to a public hospital from the spaceport gate about four A.M. He'd been badly beaten. There were two fractures. So the Shipping Office noted that the *Rim Star* would take off one crewmember short, and, therefore, the pay of the rest would be raised by so much. It was all recorded, and any discrepancy would eventually be noted and follow the *Rim Star* implacably wherever she went.

Braden went to pick up his crew. They were gone. Their boarding-house keeper stolidly insisted he knew nothing. Braden began to search spaceport restaurants and dives of various kinds. Two and a half hours to duty-time. He drew blanks and more blanks. Two hours left. He went down the long line of joints toward the spaceport gate. When there was one hour left, he found a message waiting for him in a particularly greasy eating-place. If the *Rim Star's* mate came in looking for his crew, he should call the ship.

He did, and the steward answered.

"About the crew, sir," said his voice respectfully, when Braden curtly asked what the call was about. "It occurred to me, sir, that you might have trouble finding them, so I took the liberty of hunting them up. They're waiting for you at the spaceport gate, sir."

"Very well," said Braden. "Hereafter, though, I'll do my own work, if you please!"

He hung up and fumed. There are many ways to undermine an officer's position on board ship. One is to do his work for him. It seemed to Braden that there would be much more than the usual amount of friction before things settled down on the *Rim Star*. For valid psychological reasons it is wisest to sign a crew on for one voyage only, and get a fresh crew for the next. Long, tedious weeks and months in space have the same effect as time spent in close confinement in a jail. With nothing to see and only routine duties to do in space, most men who go aground want only never to see their shipmates again. When they begin another voyage, they bristle in anticipation of coming to similar new hatreds. So an officer has to establish himself at the beginning and watch out for anything that could appear weakness. Men on the verge of going ship-happy from confinement can be unbelievably petty, and have to be ridden hard. It isn't wise to let anybody take over any part of an officer's duties.

He took a skimmer to the spaceport. There were five men waiting for him at the gate. They looked very much like other space crewmen. They regarded him with the painstakingly blank eyes of men being sized up. It was a familiar experience to Braden. There was a man with scarred and battered features, but no new signs of conflict. A hard-faced man with a new small cut on his chin. A man with a purple bruise on his cheekbone. A lean man with sharp eyes. A chubby man with an expression of insistent innocence. Braden made up his mind that he'd met them by the freight-pile the previous night. He

suspected that the sixth crewmember had proved himself uncongenial to them and was in a hospital as a result. They looked like that kind of crew.

"I think," said Braden deliberately, "that there's no use in speeches. You'll find out about me aboard ship, and what I don't know about you I'll find out after we lift off. You've got your ship bags. Come along!"

He led the way. The loading cranes had moved, now, and the very tallest of them seemed to be topping off the *Rim Star's* cargo with the largest single piece of fabricated steel that Braden had ever seen. It would be, at a guess, a bottom-tier girder for a landing grid. It would form part of a gigantic steel framework, not less than half a mile in diameter and nearly as high, which would be one of those structures which made space-commerce possible. One such structure rimmed the spaceport here, and ships came sedately down from the sky cradled in the force fields it generated. Later they would rise skyward again, thrust out to emptiness by the same powerful force fields.

Before landing grids were invented, ships could lift required enormous amounts of fuel to get them out to space, and more fuel to carry that fuel, and more still to carry that. Lift-offs or landings on space-drive meant such ferocious turbulence in the atmosphere—such fierce local hurricanes—that no structure could stand within miles of a heavy ship's lift-off point, and clouds of dust blanketed growing things over half a hundred square leagues. Single exploring voyages could be handled in that way, but without landing grids real space-commerce would have been impossible.

Obviously, no newly colonized planet could be considered complete without a grid. Supplies and materials for a beginning colony had to be hauled by drone ships which were towed to position and then landed on rockets. All this was inordinately costly, and there were accidents. But if the *Rim Star* could land under control, it could carry in one voyage nearly all the requirements for a colony's beginning, including the grid. If it could do that, then the huge ship would cease to be a white elephant and become once more a profitable vessel to own and operate. But the landing had to be tried once before it could be counted on.

The small group of crewmen followed Braden toward the ship. The toy-sized yacht had gone away, now, and the medium-sized freighter was discharging cargo. A meat ship from the llano planet Chagan seemed to smoke faintly, with hoarfrost on its plating and icicles forming on its lower parts. It had made a very good breakout from overdrive and come to ground before even unshielded sunshine could warm it above the freezing point of water.

Two skimmers came in the gate. They went floating swiftly across the tarmac. Four inches of clear space showed between their bottom ducts and the floor of the spaceport. They sped past the walking men with the

smooth celerity of frictionless things. They reached the *Rim Star* and settled to the ground.

Figures got out. They watched as baggage was put aboard the ship. They went inside. The port closed. The skimmers went away. Nothing of any marked importance seemed to have happened. But two of the distant figures had been women. Their faces could not be seen, but the figures were lithe and young.

Braden muttered under his breath. Then he heard strange noises. The five members of the *Rim Star's* crew were laughing. There was nothing to laugh at, but they laughed. They looked at the now-closed port, and at each other, and they laughed uproariously at something exquisitely humorous that only they knew about. If they laughed because there were women among the *Rim Star's* passengers, it did not promise an orderly and a peaceful voyage. But there was nothing that Braden could do about it. He might change his mind and not go on the voyage. He could stay behind. But somebody else would serve as mate—perhaps someone the crew might approve, as they hadn't the skipper's first choice. For him to back out would do no good. The five unpleasantly laughing crewmen would go. And the passengers.

And the *Rim Star* was Braden's ship now. He'd taken the berth as mate.

He ground his teeth. There was a lot out of the ordinary in this coming voyage. He began to suspect a number of things. But she was his ship, and the first and fundamental duty of a merchant-space officer is to his ship.

II

The steward with straw-colored hair let them into the *Rim Star's* personnel lock. Braden regarded him without approval. He said curtly:

"Take these men to their quarters, Steward, and impress on them that, though you may be the steward of this ship, I'm the mate. It might be a good idea to remind yourself, too!"

"Yes, sir," said the steward deferentially. "I will, sir. I'm sorry that in trying to be helpful I offended you, sir."

Braden scowled. He went up the circling succession of ramps and stairways to the top of the ship. On the way, now, he took more careful note of the long ascent. This time he particularly noticed the hinged panels which would open upon catwalks between the numerous holds of the ship. He observed the monitor boxes in detail. They would faithfully report to panels in the control room the physical conditions where they were, and each of them could be used as an intercom in case of need. The catwalks behind the hinged panels would allow any part of the ship's skin to be reached from inside.

The ship was truly gigantic, though she carried a crew of only six men. Now there'd be only five, plus two officers and the steward. On duty, every man would be remote from his fellows. There was, of course, no engine-room

crew, because Lawlor space-drives had no moving parts to be tended. A ship's drive was inspected by highly-trained technicians at spaceports, and that was that.

Out in space, the ship would have the feel of a silent, lonely, tremendous prison, moving through emptiness on some errand of its own. It would seem incredible that so huge a structure could be controlled by so small a number of human beings. A tour of duty would be a period of isolation, and there should be no sound or movement anywhere in ninety-nine per cent of its volume. Its corridors should be echoingly empty. Its guidance would be the concern only of computers and integrators and other devices sealed safely away, never to be touched save in port and by specialists. Men on board so vast a piece of mechanism would tend to feel insignificant.

As Braden went frowning to report himself on board, however, he was not thinking of such matters. He was reporting according to orders, two hours before lift-off. He had no time to familiarize himself with all the minor points which made this ship an individual and which a mate should know much better than the palm of his own hand. The skipper was responsible to the owner for the management of the *Rim Star*, but Braden was responsible for all matters by which the managing was done.

He reached the upper corridor—straight where the ascending route was curved; better-lighted, with glow lamps everywhere instead of thirty feet apart in the center of a corridor's ceiling. He came to the officers' area, and saw a cabin door with "*Mate*" painted on it. He opened the door and dropped his ship bag in it. He went on and tapped at the outermost of the three doors he'd passed through to reach the skipper the night before.

The skipper's voice rumbled.

"Braden, sir," said Braden stiffly. "Reporting aboard."

The rumbling again.

"Any special orders, sir?" asked Braden.

The skipper did not tell him to come in, but Braden heard him rise. He opened the door of his cabin. He was a huge figure.

"What special orders do you expect, Mister?" He blinked at Braden, through eyes almost closed by fat. "Don't you know your work?"

"I do, sir," said Braden, "but it's less than two hours to take-off. That's when I was ordered to report. If I'm to assign duty to the crewmen and make the regular check in the control room, I won't have time to go over the ship as I should. So I'm asking for orders."

The skipper rumbled deep in his throat. He growled:

"The steward can assign duty to the crew. And he's checked the ship. I told him to. He's perfectly capable, Mr. Braden! Been with me on two long voyages. You check the control room. That's your special order!"

Braden flushed angrily. The skipper added sardonically:

"You can put it in the log, Mr. Braden! Put it in the log!"

He closed the door and Braden's hands clenched. The checking of the controls was most necessary of all the duties of a mate before a ship lifted off. But everything was necessary! A spaceship is practically a gigantic robot and inspections and tests are the price of its proper operation. It can be designed to respond to an extremely large number of stimuli on the "if-this-happens-do-that" order, but it can only respond to happenings that can be predicted. In an emergency that has not been foreseen, any automatic device is helpless. But Braden's anger was over the steward's having done work that belonged solely to him as mate.

He went to the control room. He encountered nobody. Naturally! In a ship nearly a quarter of a mile long, a crew of six men—or five—is spread thin. Passengers do not count. They stay in their cabins. The steward sees that they are fed. So far as the mate is concerned they can be ignored.

The control-room walls were almost solid banks of instruments. They ranged from hull-temperature repeaters to CO₂ readers from every compartment, from the extraordinarily complex communication system which was completely useless in overdrive, to the screens which out of overdrive showed the stars of the galaxy in their places. There were the controls for the ship's emergency rockets, which had never been fired since the builders delivered the ship, but were to land the ship on Handel's planet at the end of this voyage. There were levers for lights and pumps and fire fighting in case of need, and there were dials and rows and rows of tiny lights which glowed green when the matters they reported on were as they should be, but would flare crimson if their specialties went wrong.

Braden began a conscientious, infinitely painstaking verification of the ship's condition as shown by its instrument banks. Some things could be corrected in space if they went wrong. An improperly sealed cargo door could be sealed, or an air leak stopped. Even malfunction of the air-renewal apparatus could be handled easily enough. But if meteor-detection equipment went wrong during lift-off not much could be done off-ground. A jammed scanner could be serious before the ship went into overdrive. The most infinitesimal precession of a direction-gyro could be tragic after. The ship's drive, though, was in duplicate and sealed against meddling, with only one unit used at a time. That had been inspected by the airport specialists, and Braden checked the certification.

It took the best part of the two hours at his disposal to complete the whole job. At the end he pressed the log button and dictated the results of his inspection, giving the exact readings of some hundreds of dials, with check-readings under simulated changed conditions, the certifications of space-stowage by the spaceport crew, the read-off mass of ship and cargo together, and an enormous mass of deadly-dull but required information which had to be recorded before lift-off. When he finished he pressed

the port-recorder button and the log to date was transmitted by microwave to the spaceport record-file in a matter of seconds. The skipper's order to omit part of the inspection outside the control room—also normally required to be made by the mate—was added at the end.

There was no glamour in such work. It was routine. But the taking of some thousands of tons of cargo two light-centuries and more, and its delivery at the end of the journey is bound to involve routine. The unexpected and the unprepared-for is highly unpopular in space. The Space Patrol disapproves, too. The Patrol insists that fore-castle tales about the other side of nowhere do not explain the absolute vanishing of well-found ships in space. The Patrol blames such disappearances on the omission of detailed and meticulous inspections before ships lift off. The evidence is on the side of the Patrol.

The log tape rewound. It stopped. Braden threw off the switch. The skipper came into the control room.

"Checkup complete, sir," said Braden.

The skipper rumbled acknowledgment. He glanced around at the serried rows of instruments. He flicked on the vision screens. (There were no ports to see through, of course. Cameras are better than human eyes.) The spaceport looked strange from this height. The landing grid itself was higher, but the other ships on the tarmac looked small and toylike. The trains of cargo trucks winding here and there—empty ones to be filled again, and filled ones to be emptied—looked like children's playthings.

"Five minutes to lift, Mr. Braden," rumbled the skipper. "Cargo doors checked. The crew's at lift-off stations. If you want to call someone aground to bid them a fond farewell—"

"There's no one, sir," said Braden. "Maybe the passengers should be told, though."

"Tell them if you like," growled the skipper. "I'll have nothing to do with them. Didn't want them. Groundlings should stay aground!"

Braden pushed the general-communicator button.

"Passengers, attention!" he said curtly. "The ship is about to lift off. You can watch through the vision screens in your quarters, if you like. That is all." He lifted his thumb. "Yes, sir. Anything else?"

The skipper rumbled. It appeared that he rumbled as a necessary preliminary to speech; that he made sounds first and then formed them into words.

"I don't know you, Mr. Braden," he said sardonically. "I never saw you before or ever heard of you. But this I say: you'll find this like no voyage you ever made before!"

"So I understand, sir," said Braden. "We're carrying the biggest weight ever lifted in one ship and we're to land that biggest weight by rocket. So I'm told."

The skipper grunted.

"I didn't have that in mind. You're plainly a very conscientious young officer, Mr. Braden. If you didn't bring a blaster aboard—against all rules and regulations of the

Space Patrol—I shall think it remarkable. And if you did—"

"Yes, sir?"

"Officially, I shall deplore it. I warn you, Mr. Braden, I run this ship my own way!"

Braden said matter-of-factly:

"That's your privilege, sir. Meanwhile—"

"Not disturbed, eh? Sure of yourself, eh?"

"Not necessarily, sir," said Braden. "You're right about the blaster, though. I do have one."

The skipper made a sound that Braden could not interpret.

"In that case, Mr. Braden," he grunted. "I advise you to carry it."

The sound came again. It was oddly like a chuckle. But then the field-detector buzzer made a humming noise. The force fields of the spaceport grid were closing about the ship. The hull-temperature indicators flickered as the fields touched and shifted. Eddy currents formed and warmed individual plates, and moved to other ones. The fields at first were small—hundred-kilowatt energies and upward. But the *Rim Star's* mass became centered in the complicated, intangible power fields. The ship was enveloped by an invisible web of energy. Somewhere over at the edge of the spaceport, men with control levers in their hands watched instruments and fed power to the grid coils. The input to the grid went up from ten thousand—twenty thousand kilowatts to fifty thousand. Then multiples of megawatts. The ship stirred. It wavered.

It lifted.

Slowly at first, it rose to the half mile height of the circular steel structure which enclosed the spaceport—which actually was the spaceport. The irregular ring of bare steel girders drifted downward. There was suddenly a horizon. The *Rim Star* had risen above the grid. It was possible to look for miles beyond the city's roofs. There were forests, very far away. There were hills. A river, unseeable from the spaceport, flowed in unreasonable curves across the suddenly visible landscape. The ship continued to ascend. The city beneath it shrank. The river dwindled. The hills diminished and flowed beneath the rising ship.

It went up and up. Presently the sky darkened and then the horizon was not flat but curved, and a little later the planet's surface was not bowl-shaped but visibly the near side of a tremendous globe. And the sky became darker, and infinitesimal sparkles of light began to appear in it.

Now the ship rose at an ever-increasing rate. There was the tiniest possible jog when the ship's own gravity came on at lowest intensity. It would adjust as the ship went ever farther out, and no more than a similar sensation would be felt when the grid fields cut off.

The skipper rumbled to himself. Then he said:

"Very good, Mr. Braden. I've taken over here. Now you can check the work the steward did for you. I'm sure it's completely done, but you can make certain. With your blaster available!"

His air was definitely sardonic. Braden said, "Very well, sir," and left the control room. Outside, he found himself scowling. He hesitated for a moment and went to the cabin in which he'd dumped his ship bag. He was annoyed with himself. On the face of it, it was absurd to anticipate trouble before the ship was even in clear space. If trouble started—and on a long voyage trouble was always possible—the proper course was always to bring it to a head before the trouble-makers were ready for it. In such a case the sight of a bulge of a certain shape in an officer's pocket very often quieted the most nerve-wracked and ship-happy of crewmen. But at the beginning—

Braden scowled as he loosed the draw-cord of his bag and put his hand inside.

Within a minute, he had the bag empty. His garments were as neatly folded as when he'd put them in. There was

check of items left to the steward against all reason. He must act as if he did not know about the blaster's theft until he acted violently to recover it.

He ground his teeth as he repacked the ship bag. He placed it where it had been before. As he went out of the cabin, he found his hands clenched into fists.

He went about the check-over that should have been made while the ship was still aground. Outside, the planet just left would be distinctly a ball, with seas and continents and polar ice caps. It would hang unsupported in space, which was unbelievable even to a man who watched from a departing ship. It dwindled and dwindled, which would seem equally improbable. It was no less unconvincing than the fact that the *Rim Star* had lifted and was lifting from it on fields of force projected from a spaceport which was not even a speck on the now-minute world.



only one sign that his possessions had been touched.

His blaster was gone.

His jaw clamped and he became coldly angry. He could report the theft to the skipper, and it was a distinctly ominous happening. The actual purpose of the voyage included the taking of a risk that had never deliberately been taken before, but the skipper was apparently welcoming trouble in addition. He was no ordinary merchant-ship skipper. Braden had been challenged by his manner. To report within half an hour after lift-off that his blaster had been stolen would probably amuse him.

There was, plainly, only one thing to do, and it was not to ask official aid. A blaster in the forecabin would have called for action under any circumstances. Braden must simply take that action before it could be expected. Meanwhile the ship rose and rose. Braden should make the

Outside, of course, the huge ship did not even look like a thing made by men. It was bulbous. It was ungraceful. Floating in emptiness, it seemed a preposterous shape in preposterous motion.

Presently it swung. It aimed itself and moved visibly in a new direction. From close by, at this time, its meteor-detectors could have been seen to twinkle, scanning arcs of emptiness before it. Its drive produced no external effect—no wake, no plume of rocket smoke. It was driven by those Lawlor units which are not used for lift-off from a planet because of the monstrous winds they create. But they'd been used to cross interplanetary distances in the first solar system. When overdrive was developed, and a ship could be enclosed in a force field which changed the physical constants of interstellar space, the same conservative Lawlor drives continued to operate. But the speed

attainable in overdrive went up beyond imagining.

It was not wise, though, to go into overdrive in the ecliptic plane of a solar system. One had to get well away from the most probable orbit of celestial trash before building up to so high a velocity.

The *Rim Star* drove on and on and on. Since it had aimed itself to leave the plane populated by comets and celestial debris, it seemed to be imbued with purpose. It still did not look like anything men had created. It seemed a monster creature swimming abstractedly toward some destination of its own choosing.

It was two hours out from lift-off before Braden had completed the check of those last items that he should have seen to before leaving ground. He'd found each member of the crew at his post. He regarded each one with a bristling disapproval which was expected. Each one answered such questions as Braden put with precision and apparent respect, but the feel of things was wrong. The five blank-faced crewmen said nothing and did nothing that he could cavil at, but they shared an air as of hidden amusement, of secret laughter. Braden suspected that they knew of the theft of his blaster, but didn't know he knew it yet.

He'd left the last of them and was on the way to the passengers' quarters when he realized the really basic wrongness about the way the crew acted. A ship's crew scatters when the ship ends its voyage. Men do not sign on together for long voyages out of friendship. When a ship leaves port, the members of its crew are commonly strangers, bringing neither personal hatreds or personal loyalties to their joint imprisonment in a spaceship's metal hull.

But these men were different. If they were the same ones who'd jumped him in the spaceport, they formed a unit; organized and tested and confident of each other. Their solidarity did not come from membership in the same ship's crew. They'd waylaid Braden by mistake—it was almost certain—and then waylaid another man not by mistake after him. That man was now in a hospital instead of aboard the *Rim Star*. Somebody, too, had jumped the man who'd been mate before Braden. Probably these same men.

By the time Braden went into the passengers' quarters he'd added things up and he looked like a thundercloud. The passengers weren't yet settled down. The yellow-haired steward smiled brightly at Braden when he walked in.

"Ah, Mr. Braden!" he said warmly. "The passengers want to talk to you, sir! I told them my authority was limited to doing things to make them comfortable. But you can pass on their idea, sir."

Braden said unpleasantly:

"What is their idea?"

"Just a moment, sir. You'll want to talk to—. Ah! Here he is! Mr. Duckworth, this is Mr. Braden, mate of our ship. Second in command, you might say. He'll hear your

request, Mr. Duckworth, and at the least take it up with the captain."

The man called Duckworth was small and bustling and with an air of fretful impatience. He gave Braden a sort of professional nod.

"We want to shoot pictures on the *Rim Star*, Mr. Braden," he said crisply. "Some straight stuff, and some special-effect and process shots about a ship in the Other Side of Nowhere. We're a production unit going on location to Handel's Planet. We'll take jungle shots and new-colony backgrounds there, but we want the *Rim Star* for straight sets and trick shots in the meantime. Miss Derr Carmody is the star of the tape. Mr. Fortescue plays opposite her, and the *Rim Star's* a good set. With her interiors straight, and then with special-effect variations, we'll have a good lot of footage all wrapped up when we get to Handel's Planet. I asked the steward to explain to the captain and arrange for me to look over the ship and plan my shots. I might want members of the crew—off-duty time, of course—to act as extras. Possibly we could work you and the skipper in."

His manner was assured; confident. There was a stirring, and one of the two women passengers came out of a cabin. Braden recognized her. There'd been a pin-up of her long ago in the *Hansford's* control room. But that was a picture of her when she was young. Now, Braden knew detachedly that she'd had a rejuvenation job and probably persuaded herself that nobody guessed it. It wouldn't show under tape make-up, though.

"Derr," said Duckworth confidently, "meet Mr. Braden. He's first officer of the ship. He'll arrange for us to shoot the scenes we need on the ship. Mr. Braden, Miss Carmody."

Braden nodded acknowledgment. Derr Carmody gave him a warm and luminous and completely professional smile.

"Oh, yes!" she said. She tended to coo. "It's so good of you, Mr. Braden!"

Another passenger popped into view; a middle-aged man with a harried look and disconsolate expression. Still another, young man with the expression of someone who knows he will take a good picture if somebody aims a camera at him. Then a girl; quiet, not happy, not glamorous. At another time Braden would have excepted her from the category of women he'd rather not bother to talk to. At this time, though, he had a lot on his mind. He nodded curtly when introduced to the disconsolate middle-aged man, a cameraman named Hardy. He nodded again, impatiently, when the young man with the actor's expression was introduced. His name was Fortescue. The girl's name was Diane. She wasn't an actress, but a cameraman like the harried Hardy, and Duckworth explained proudly that both of them were special-effect specialists and could fake any sort of action-picture pack-ground in a rehearsal hall instead of expensive constructed scenery. They did have to use locations for jungle shots, though, and the way a new colony looked. But the

shots they would take on the *Rim Star* you'd swear—
“I don't think,” said Braden ungraciously, “that you'd better count on picture-making for the present. This isn't a passenger ship. Passenger activities aren't encouraged. Without the skipper's special permission you may not leave these quarters.”

The director said indignantly:

“But we need to! The traffic agent assured us we'd have the run of the ship within reason! We've scheduled this production! We've a deadline to meet! We've got to do some shooting aboard ship!”

Braden shrugged his shoulders and went out. The steward followed him. Braden swore when the door to the passenger cabins closed behind him.

“See that they stay put!” he said angrily to the steward. “We can't have them roaming everywhere!”

“Indeed not, sir,” said the steward anxiously. “I'm very much concerned, sir. I'm terribly afraid the captain was indiscreet about choosing the crew, sir! I don't like them!”

Braden looked at him. Hard.

“It's their manner, sir,” insisted the steward. “You expect newly signed-on men to the truculent, sir, when they first come aboard. They try to browbeat each other as if they wanted to establish who's to be boss of the forecabin right away. But these men are tranquil, sir! Right at once! They act as if they know each other and don't have to settle anything like that. I don't like it, sir! In fact—”

He hesitated, and Braden said coldly:

“Go on!”

“It . . . wouldn't surprise me, sir,” said the steward in a lowered tone, as if he didn't want to be overheard, “I wouldn't be surprised if there were . . . were . . . I hate to say it, sir, but there might be . . . knives aboard.”

“It would surprise me,” said Braden coldly, “if there weren't. Arms in space are quite illegal, but I've never known a ship yet in which the officers didn't have arms to use in case of need, nor a forecabin in which there wasn't some sort of a weapon. It's the possibility of weapons—law or no law—that keeps forecabins from becoming animal cages when nerves get tense.”

He turned away. There was a clicking, and the door to the passengers' quarters opened. This was, of course, immediately after Braden had insisted that the passengers must never come out of it. He turned angrily. Fortescue had come out. His face brightened when he saw Braden.

“Mr. Braden!” he said anxiously. “May I speak to you a moment? I hoped I'd catch you before you'd gotten too far away!”

“I just told you,” said Braden formidably, “that passengers are supposed to stay absolutely in their quarters!”

“But it's important!” insisted Fortescue anxiously. His face had lost its expression of being ready to be photographed at any instant. He looked genuinely uneasy.

“All right,” said Braden. He nodded dismissal to the

steward. When the yellow-haired man was gone he said, “What is it?”

“I want to argue a bit, Mr. Braden. You seem to think we won't be able to use the *Rim Star* for shooting the picture we're slated to make. If I may explain—”

“The skipper will decide,” said Braden rather impatiently.

“But we took passage on the *Rim Star* so we could make the ship-scenes the script calls for!” protested Fortescue. “Our cameramen are sharp on special effects and they'll get Other-Side-of-Nowhere effects to curl your hair! With these, and the new-planet location stuff, we'll be ready for a spaceboat to lift us to a drone mother-ship off Handel's Planet, and we'll be through. But we have to shoot the ship scenes! It's important!”

“It's also important,” said Braden, “for you to stay right here.”

“But Miss Carmody's career!” protested the actor. “There's never been a tape about the Other Side of Nowhere! Everybody's heard of it and it could even be true! But nobody's shot it! And if Miss Carmody makes the picture—she needs such a chance to make a comeback! It's her chance! And mine too, of course, because I play opposite her. I'm explaining this so you can make the captain see how important it is!”

“There are things,” said Braden grimly, “that are a lot more important than that to me, just now!”

He turned away. Fortescue said bitterly:

“I should have known it! I should have known!”

Braden went away. As a matter of routine he ought to report the condition of the ship to the skipper. He was angrily aware that the skipper didn't care whether he reported or not. But the removal of a blaster from his ship bag was a matter that the skipper should know. It was important. As a merchant-space officer it would be dereliction of duty if he didn't warn the skipper of so undesirable an event.

The control-room door was shut. He tapped on it, saying:

“Braden, sir!”

“Come in!”

He entered. The skipper was seated at the tape-coder, tapping the dots and symbols which would be instructions for the ship's astrogation apparatus. At the moment the ship drove herself on the preliminary course that would take it beyond that abstract plane surface on which the sun's satellites should have their orbits. Scanners now watched for meteoric masses. They would give warning in plenty of time for avoidance, if avoidance became necessary. Once in really clear space, the skipper would aim the ship with infinite precision and turn over the controls to the astrogation unit. It would handle the ship from then on. Everything in the ship was a machine, which did what it was expected to do, barring accidents. Only the tape-coder was a tool which men used to make the ship—as a machine—carry out their wishes.

"I've a report on the state of the ship, sir," said Braden formally.

The skipper flipped the log switch. The tape began to move.

"All hull and interior equipment is functioning normally," said Braden. "The crewmen are at their posts and on the alert. The ship, as such, is operating perfectly."

He paused, and the skipper flipped the switch to Off.

"By your look," he rumbled, "there's something else and it's tricky. I'll have you tell me off the log before we decide whether it goes on record. What is it?"

"Somebody," said Braden grimly, "went into my cabin and took my blaster out of my ship bag."

The skipper blinked, and then chuckled. He shook all over with his amusement.

"The steward," said Braden grimly, "overheard every word we exchanged last night. Taking me down to the exit port, he asked me questions . . . oh, with great deference! . . . that showed he'd been eavesdropping. I charged him with it and he admitted it." He paused. "I told you that I had a blaster aboard. I told you! Nobody else! But twenty minutes later I went to get it and it was gone. I lay it to the steward."

The skipper shook, rumbling laughter. Braden found himself raging.

"Mr. Braden," said the skipper genially, "luckily your mishap isn't in the log. It would be a serious matter to have on your record the admission that you broke the law by bringing a blaster aboard! It would be taken very seriously if we made port! So I shall ignore it officially. You can, of course, try to get your blaster back. That is your affair. But there is one thing! You will not bother the steward! He has shipped with me on two voyages before this one! I value him! Your dealings with the crew are your business. I will not interfere. But you will leave the steward alone!"

He chuckled. He rocked back and forth in the coder chair, which was so inadequate for a man of his bulk.

"Go get your blaster back, Mr. Braden, if you can do so without disturbing the steward. But I specifically order you to leave him alone!"

He turned back to the coder, pecking out the taped orders that would send the *Rim Star* more than two hundred light-years to the near neighborhood of Handel's Planet, with not less than two breakouts from overdrive on the way. He copied the symbols, using one finger, squinting wisely at the typed sheet from the spaceport course room.

"The ship's operating perfectly, sir," said Braden. "I'd like to speak with all the crewmen at once. When can I call them from duty posts?"

The skipper turned. Then he swung about in his chair. He considered, chuckling again.

"I give you ten minutes now, Mr. Braden," he rumbled. "Ten full minutes. I will stay valiantly on debris-watch while you impress our sturdy crewmen with the idea that you are not to be trifled with!"

He watched with a sort of genial malice while Braden pushed the general-communication button and said:

"All hands attention. All fore-castle hands to the fore-castle at once. Repeat; all fore-castle hands to the fore-castle at once." Then he said: "I'll see what can be done, sir!"

He went out, bitterly angry inside. The situation was much more serious than one blaster pilfered, though that was serious enough. There was trouble ahead. And the best way to handle trouble is to bring it to a head before the troublemakers expect it. Even better, in a fashion they won't anticipate.

He headed for the crew's quarters. On a ship as large as the *Rim Star*, the difference between the design of a spaceship and a sea-going vessel is enormously accentuated. A ship designed to travel on an ocean ignores the weight of its fabric, but everything is cramped to make for the smallest possible object to be pushed through a resisting sea. A spaceship subordinates physical size to mass. If landing grids worked efficiently on spheres, spaceships would all be simple globes because the largest possible object with a given mass is a sphere. There is no need to economize on size, in a spacecraft, and interstellar ships are roomy beyond the imagination of a groundling. One consequence is that a man can be very lonely on a fully manned freighter. He is a very small pea in a very large pod.

Braden was alone, with a long curved corridor stretching out before him. His footsteps were completely silent. There was absolute stillness all around him. He regarded the situation with extreme aversion. He was the mate of the *Rim Star*. The skipper's behavior was anomalous. Instead of the suspicion with which a normal ship captain views every deviation from the usual, he had thrown discipline out the air lock even before lift-off. He'd allowed the ship's steward to perform the duties a mate is most jealous of. He was amused that his crew had tried to prevent Braden from joining the ship. He'd been indifferent when a previous mate was sent to the hospital—very probably by his crew—and was followed—almost certainly through the same individuals—by the man who should have been sixth of the unrated members of the ship's company. The skipper was amused that a blaster was loose on the ship. He'd ordered Braden not to interfere with the steward when it was absolutely certain that the steward eavesdropped on him. He —.

Braden broke stride when something came into his mind. After an instant, though, he went on. No. It couldn't be that the skipper believed the control room was fitted up with a listening device, and had spoken as he did because he believed he was overheard! That would be unthinkable! No skipper could possibly allow such a thing. No skipper—.

Braden went to the group of roomy separate cabins required by law and common sense alike. Considering the monotony and the long, long journeys involved, men

simply couldn't take enforced continuous close contact with their fellows.

He turned in to the crew's quarters.

All five of the signed-on hands were there, waiting for him. They looked at him with blank expressions, but there was the feel of laughter in the air. By their very expressionlessness the five men mocked him. They'd come and dumped their ship bags as he'd done. They'd been on duty ever since. They were no more settled than he was, except that past all question they had a common purpose and a very clear idea of how they were going to accomplish it.

"I called you men here," said Braden without preliminary, "because I don't like a lot of things about the way this ship has been set up for a long and dangerous voyage."

He didn't mention his missing blaster. They expected him to demand it ferociously. So he ignored it.

"The five of you tried to jump me last night," he said acidly. "And I was a little bit too gentle with you and you were still able to jump another man—the man you'd thought I was—a half hour later. I think you've got ideas. I don't like the ideas I think you've got. I think you've been cherishing them too long. I want to change them."

He looked from one to another. There was a man with scarred and battered features but no recent signs of conflict. A hard-faced man with a new cut on his chin. A lean man with sharp eyes. A man with a purple bruise on his cheekbone. A chubby man with an expression of insistent innocence.

Braden rated them in his mind. Men who are isolated for long periods form themselves into groups according to certain patterns only. There is an automatic assignment of roles. One man is always the leader. One is the docile butt of jokes. One does what the others tell him. Then there are second-leaders and third-leaders, and so on. The man with the battered features had gotten that way by being told to do the fist-fighting for the rest. The chubby man would be the squirming, flattered victim of their jests.

Braden pointed his finger at the lean man with the bright eyes.

"Empty your ship bag," he ordered curtly.

The sharp-eyed man stared at him, astounded.

"Empty it," repeated Braden.

"What's this?" demanded the sharp-eyed man. "I've been on plenty of ships, an' nobody ever —"

Braden hit him. The four other men visibly started. It is strictly contrary to law for a merchant-ship officer to strike a crewman. The sharp-eyed man went down and Braden turned to the chubby man with the innocent expression.

"Empty your ship bag," he said coldly. "Now!"

The chubby man stared. His mouth dropped open. He looked helplessly at the others.

Braden hit him. And then he pointed at another man. But the one with the battered face roared and charged. The other two plunged in—

But Braden had the strictly personal advantage of having been raised on a heavy-gravity planet, with a correspondingly high-speed muscular reaction. A small boy has to move faster to catch a ball in 1.7 gravity than in Earth-normal weight conditions. Braden had played ball as a boy. He moved faster than average when he needed to.

So he did not need to fight in conventional fashion. He snatched up a ship bag and used it as a flail, knocking the man with the battered face halfway across the cabin to crashing contact with the wall. The ship bag burst. He snatched for another bag as he saw a blaster come tumbling out of the spilled contents of the first. Braden heaved the second bag at the legs of another man and jumped the last with ruthlessly battering fists. In these activities he followed the sound rule that one should never do the expected in barroom style combat. He'd hit without warning, twice. He'd used a ship bag—not a daunting weapon in itself—to crack a man's head against a wall. He'd tripped a fourth man, who certainly expected almost anything else, with a second bag, and employed strictly orthodox fighting methods for the last of his antagonists because that man had just dimly perceived that Braden didn't fight in any standard fashion.

The tripped man was crawling toward the spilled-out blaster when Braden put his heel on the outstretched hand. The man howled.

Braden picked up the blaster. He lifted his heel.

"Pick out your ship bag," he said gently, "and empty it. On the floor. Now."

He had the blaster bearing, but he spoke without fury. The crawling man cursed. The blaster moved. The crawling man emptied his ship bag. Braden picked up a blaster and a knife. He chose another man, and matter-of-factly ordered him to dump his ship bag. He obeyed. The fighting being over, Braden seemed to dismiss it as of no importance. He simply made each man dump his possessions on the floor of the oddly misnamed forecastle. He pocketed the three blasters and four knives a cursory inspection of their contents revealed.

"Think over what I told you," he said coldly. "I think you've had ideas I don't like. Change them to ideas I do like, and we'll probably get along. That's all."

When he closed the forecastle door behind him and walked away, he still hadn't mentioned his own missing blaster. But none of the crewmen had it. Besides, consideration of the overall situation implied a pause. But Braden had done all the pausing he intended to do. From now on he proposed to practice very active officerlike behavior.

III

In the corridor outside the forecastle, Braden stopped. The skipper had strictly forbidden him to bother the steward, even though there were good grounds for believing that he'd taken Braden's blaster within minutes after

overhearing that he had one. But it was not a good idea to leave a blaster loose on a ship heading out on a journey of two hundred and some-odd light-years. It was especially undesirable when the new crew of that ship acted like a tightly-knit unit with a definite purpose in mind. It became again more undesirable when there were passengers aboard. When two of them were women, it simply couldn't be permitted. So something had to be done about it. Legally, if Braden took action the skipper disapproved the skipper could do nothing but charge him with insubordination when the ship reached port—in practice, at any rate. And it seemed to Braden that worse things could happen, so far as the passengers were concerned.

He reached a cabin door marked "Steward." He did not knock. He opened it quickly and as quickly went inside. He was prepared for very nearly anything, but he found—nothing. The steward's cabin was empty. It was a very comfortable snugery. Stewards usually do themselves well and they are apt to stay with the same ship for voyage after voyage, unlike other crewmen. So they tend to accumulate more possessions than will go into a ship bag.

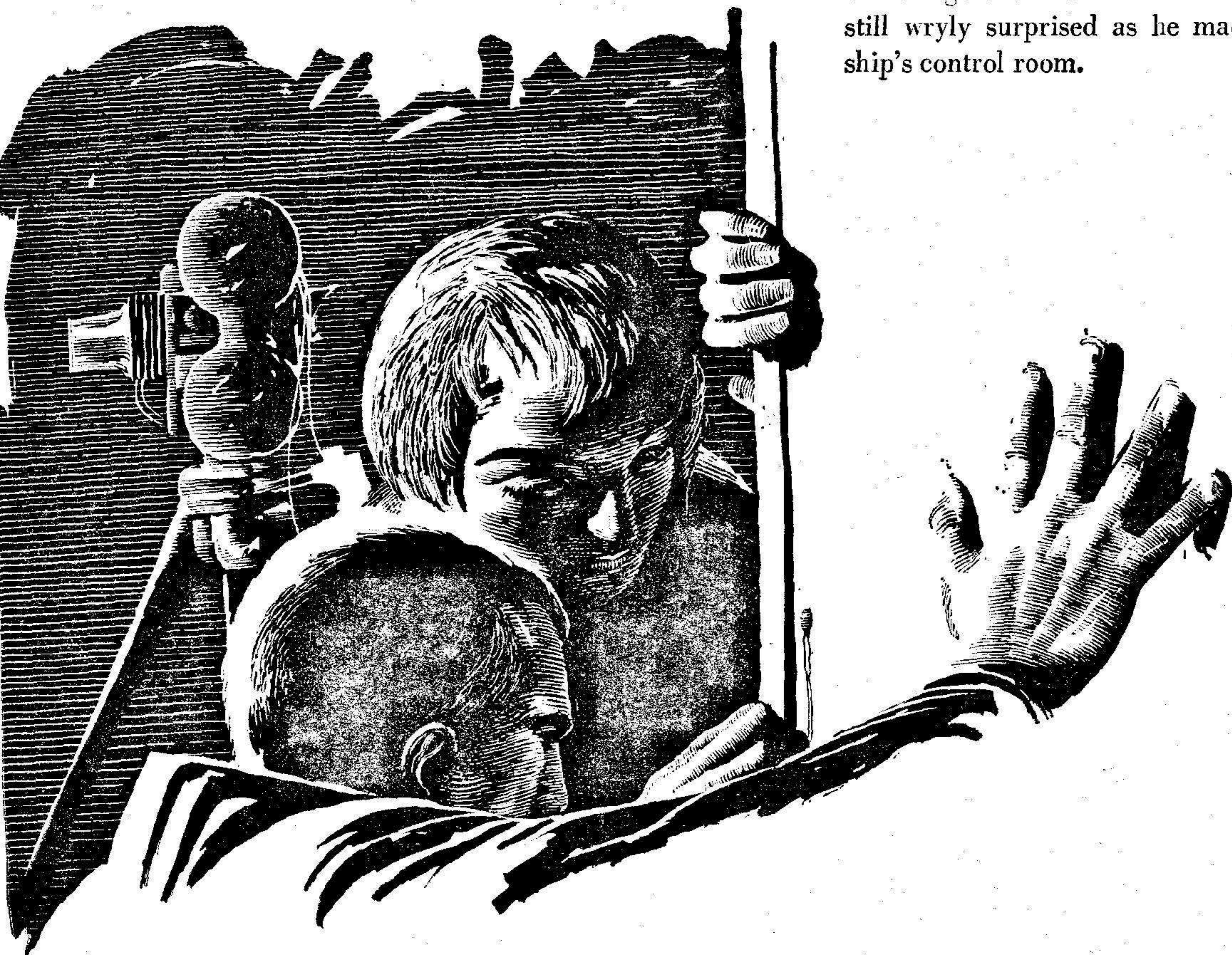
There were a few books. Braden knew some of them by their bindings. They were ones a man might accumulate

if he hoped some day to command a spaceship. On the other hand they were also such books as a man might pick up out of curiosity about the operations of his ship, in which he had no normal part. There was a "Practical Astrogator." There was a fourth-sector "Space Directory." There were books on freight stowage and spaceport regulations and other matters covering areas of activity the steward would not really need to know. The assortment looked innocent enough, and even admirable.

But Braden had a prejudice against the steward. He stood just inside the door, surveying the cabin. The bunk was neatly made up, with its pillow deftly fluffed and in place. The tidily emptied ashtray was conspicuous. Uniforms were hung carefully on hangers instead of pegs. Everything indicated that the steward was a man with a steward's soul—tidy and meticulous and bookish.

It might be true, but Braden didn't believe it. His eyes narrowed as he stood looking, thinking hard. If this exaggerated precision were a fake, to convince the skipper, nevertheless the steward would have developed the habit of it in two long voyages. And where would a tidy-minded man hide a blaster he'd just abstracted from another man's ship bag—which he'd delicately repacked—when he needed to hurry somewhere else in the ship for an alibi? To the passengers' quarters, for example?

Braden took three steps and reached under the utterly neat pillow on the utterly neat bunk. With gratified astonishment, he pulled out his blaster. He put it in his pocket. He restored the pillow to its old-maidish precision of arrangement. He went out. He closed the door. He was still wryly surprised as he made his way back to the ship's control room.



The door stood open and the skipper was in the act of putting the trip-tape in the instrument which would pass on the astrogational instructions to the astrogating unit itself. The operation of the ship would then become practically automatic as between solar systems. The skipper turned his head when Braden entered.

"I said I'd give you ten minutes, Mr. Braden!" he rumbled severely. "You've taken twelve!"

"Yes, sir," said Braden. "I've another report for the log, sir."

The skipper turned his whole body. He blinked at Braden.

"What's that? Let's hear it."

"I found," said Braden curtly, "three blasters and four knives in the crew's ship bags, sir."

The skipper blinked again.

"Come, come!" he rumbled genially. "You disappoint me, Mr. Braden! I'd no idea you'd go about searching other people's possessions! It's most illegal! Only by my orders, given for good cause, should you invade the privacy of the crew! And you should have had my order in writing before searching a man's ship bag or his locker!"

"I didn't search them, sir," said Braden grimly. "The men emptied them themselves—all but one. That broke open."

"Ah!" said the skipper, somehow waggishly, "I wouldn't mind betting, Mr. Braden, that you applied pressure to make our gallant crewmen do that! It was still probably most illegal!"

"I asked them to, sir," said Braden. "And they did it. All but the one bag was opened and emptied by its owner, and the owner was responsible for the exception. He got in the way of it, sir."

The skipper's mood suddenly changed. He regarded Braden almost with hostility.

"Now I'm sorry that I signed you on for this voyage, Mr. Braden! You're interfering with a series of events I've looked forward to!"

Braden shrugged.

"I should like to put in the log, sir," he said politely, "that I've informed you that the crewmen had forbidden arms in their possession and that, considering our passengers, in my opinion it is extremely dangerous to proceed with the voyage with the present crew aboard."

"You'd like that in the log, eh?" said the skipper. "And your advice about the action I should take?"

"I advise, sir," said Braden, "that the *Rim Star* return to port and turn over the crew to the local authorities, and then sign on a new crew without previous plans for . . . perhaps I should say insubordination. That's my formal opinion, given you because you asked for it. I'd like to put it in the log."

The skipper glowered at him. Then he turned. He pushed a button. Braden made an involuntary movement. He scowled.

A harsh, rasping sound came from a speaker in the ceiling of the control room. Through the door came

resonant repetitions of the din. They seemed like echoes, but they were actually replicas of the original voice, emitted simultaneously by loud-speakers in every corridor and compartment of the ship. The effect was sepulchral.

"Attention!" boomed the speakers. "Prepare for overdrive. Overdrive coming in five seconds. Five . . . four . . . three . . . two . . . one —"

The universe seemed to reel. The images on the vision screens vanished utterly. Braden felt the familiar, intolerable combination of nausea and dizziness and the sensation of falling in a contracting spiral which is the sensation of going into overdrive.

He swore. In overdrive, of course, a ship is effectively relieved of many of the hindrances affecting ships in normal space. In an overdrive field the physical constants of space are changed. The change is exactly the opposite of that made by the interatomic, intermolecular force fields between the particles of transparent substances. In unstressed space, the speed of light is roughly 186,000 miles per second. In the positively-stressed space between the atoms and molecules of glass, the speed of light is roughly only 120,000 miles per second. That is why lenses do what they do. In the highly-positively-stressed space between the atoms of crystallized carbon—diamond—the speed of light is only 75,000 miles per second. But an overdrive field stresses space in what might be called the opposite direction. In negatively stressed space—in overdrive—the speed of light increases. It goes up to incredible figures. In negatively stressed space, mass does not increase with velocity. It diminishes. Therefore, the limitation of space-travel to light-speed or less does not apply.

As a consequence, in the first second of overdrive the *Rim Star* enclosed itself in a cocoon of negatively stressed space and traveled as far as starlight does in five minutes. As its mass decreased its speed went up. In the first minute it traveled as far as light in five days. From there on, increase of field-strength had a lesser effect, but on long, straight, uninterrupted runs a full-powered ship could hurtle across the galaxy at the averaged-out rate of a light-year of distance for each ninety minutes on the ship's clocks. The skipper had put the *Rim Star* into overdrive. Now he rumbled formidably.

"As you see, Mr. Braden, I do not take your advice. It may be excellent, but I do not take it. You may complain of my refusal when we reach port. But I suspect you doubt we'll reach port if I am stubborn. Eh?"

Braden shrugged. The skipper did not ask if he'd recovered his own blaster. He didn't ask what had been done with the others he'd reported. But he pressed another question.

"Has the cat got your tongue, Mr. Braden? Do you think we won't reach port? Dear me! Do you know why I chose you to be mate of this ship?"

He glowered at Braden. Braden said:

"No sir, I don't."

"I chose you," the skipper told him, "because your papers list no next-of-kin to be notified should any accident happen to you! If I'd known you were so zealous a second-in-command, I'd have ignored that admirable fact and continued to look for a mate with the qualities I prefer! And the qualities I prefer, Mr. Braden, include an entire absence of zeal! I said no zeal, Mr. Braden! No energy applied to change matters I prefer to have go on as usual! No interference with the normal and comfortable operation of this ship!"

Braden said stiffly:

"How about the passengers?"

The skipper had seemed sardonic enough, before, but now he flared into anger.

"To the devil with the passengers! I've nothing to do with them! I haven't seen them! I won't see them! What happens to the passengers is their business! They took passage on this ship! I knew nothing about it! I am not responsible for their being here, and I will not be responsible for them now that they are here!"

"Two of them," said Braden, "are women."

The skipper crimsoned with fury.

"That's their bad luck!" snapped the skipper. "And I'm on watch now, Mr. Braden, and you are not! I suggest that you go to the devil out of this control room!"

"Very well, sir," said Braden.

He turned and went out of the control room. He liked the way things shaped up less and less. It is the first duty of a merchant-space officer to consider the safety of his ship, which includes getting it to its destination. He is expected also to take great pains for the welfare of the passengers who may be on board. He is expected to be solicitous of the crew. And in all these special concerns he is required to maintain strict discipline and a proper respect for his superiors in authority.

Braden headed aft—downward—with four blasters and four very wicked sheath knives about his person. One of the blasters was his own. He hadn't reported its recovery because the skipper had ordered him to leave the steward alone. He had but he hadn't left the steward's cabin alone. He'd simply taken his blaster from under the steward's pillow.

He passed the galley, which was entirely unlike the food-readying arrangements of surface transportation. Here there were no stoves, no succulent odors of cooking things, no dishwashers. Almost, there was no refrigerator. Instead, there were precooked meals in nested plastic containers, stored behind glass doors and designed to look appetizing. The readying of a meal consisted of putting this container and that in warming cabinets, the other container into a chilling unit, and perhaps the dessert into a quick-freezer. The kitchen was odorless and put no burden on the air-freshening system of the ship. Readied meals would be served by a quick snip of sealed plastic covers and the placing of the food on the table.

The steward was busy in the galley, preparing to serve

the passengers. As Braden went past, he looked up and smiled brightly. He went back to his task with a fine air of absorption.

Braden stopped and went back to the door.

"Steward," he said coldly, "you were right about the crew carrying arms."

The steward looked up from his work and shook his head sorrowfully.

"I'm very apprehensive, sir," he said. "Things look bad, sir. I can't imagine how the word got out!" When Braden only waited, he explained: "About the money, sir. For Handel's Planet. The men aground there were getting restless. It's not a lively business, unloading drone ships that come down by rocket, with every pound weight costing a fortune. There's no recreation. So they fretted. And it was decided to pay them off in cash. With money in his pocket a man can always amuse himself, sir. So we're not only carrying the grid and other equipment, sir, we're carrying money for the men to jingle in their pockets. There'll be some very fancy gambling after working-hours when that money's in circulation! The men will get action for their money. They'll have reason to go on working. But the news that we're carrying some millions of credit to start it off with shouldn't have been allowed to leak out. That's bad, sir! Very bad!"

Braden said: "Oh."

He went on toward the passengers' quarters. He was much more than suspicious of the steward, but this statement might be true. He hadn't heard it rumored before he signed on, but it might have been common knowledge. If so, it was excellent reason for five men of a certain type to sign on the *Rim Star* to get to Handel's Planet. But such an explanation was not consoling. Quite the contrary!

Braden found himself wondering skeptically if the steward would have been quite as chatty if he'd known of Braden's recovery of his blaster, and where it had been recovered from.

He went into the passengers' quarters. Fortescue was fumbling with the vision-screen controls, trying to get an image. One doesn't see outside, in overdrive. There's nothing to see. The ship is surrounded by a shell of negatively stressed space which lets nothing come through. A ship in overdrive is practically in a private cosmos the size of its overdrive field.

"I hate to say it, Mr. Braden," said the actor amiably, "but something has happened to the vision screens. They're off."

"They'll come on again," Braden told him, "when we get where we're going. Not until then." He looked about. "Where's Duckworth?"

It appeared that Duckworth was checking the cameras as Hardy and Diane unpacked them. When Braden would have gone Fortescue said amiably:

"Comforting man, that steward of yours! I had the quivers—this is my first trip in space, you know—and he

stopped them. He said a trip in overdrive is like a term in jail. Is that right?"

"When you're lucky, yes," said Braden.

"I can't imagine anything more consoling," said Fortescue with a grin. "I took this job because I needed it—and, of course, if Derr makes a comeback I'll have a break. But . . . did you ever hear of an accident-prone, Mr. Braden? A man who's always in accidents? That happen around him all the time in defiance of probability?"

"They used to call them Jonahs," said Braden.

"I'm not an accident-prone," said Fortescue cheerfully. "Accidents don't happen around me more than around other people. But I'm excitement-prone. If I take a walk down the street, there's a hold-up or a suicide or a manic-depressive switches cycles and starts to walk through crowded traffic on his hands. Or maybe a man catches his wife out with somebody else and tries to kill him, or a woman catches her husband out with somebody else and tries to kill her. You've no idea how wearing it is, Mr. Braden!"

"No doubt," said Braden. "But —"

"I'm a tranquil person," said Fortescue amiably. "I like to smell flowers and read poetry. When in a mood for thrills, I may take a cup of especially strong tea. Last week I had a really bad day! There was a zoo-scene being taped and I was looking on—I'd nothing to do with it—and a Tralian wombat broke loose. Nobody got hurt, but it was a near thing. Enough to give anybody a heart condition. So after they caught the beast I left, and I was walking down the street, still feeling shaky, when suddenly everybody began to yell at me. Somebody was lowering something heavy from a high-up window, right over my head. And the rope had snapped one strand and they were trying to get it down to the ground before the other strands snapped. And they did snap, about five feet above the ground and where I'd been just two seconds before! I scuttled for my hotel. I wanted no more excitement! So I settled down resolutely to have a quiet evening—and smoke began to come rolling into my room and there were loud screams of 'Fire!'"

He paused dramatically, and then, grinned again.

"It was a waste basket. A cupful of water put it out. But that was a wearing day! Almost typical, though. So you can imagine how relieved I was when the steward said that there's never any excitement in space. When he assured me that our journey would have all the thrills of a term in jail I loved him like a brother!"

"We'll try," said Braden, grimly, "not to disappoint you."

He went into the cabin where Duckworth, the director, fussily supervised the unpacking of tape-cameras from their cases, to be set up on tripods. The cameraman with the harassed expression—Hardy—and the girl Diane seemed to be getting the equipment ready in spite of his help. Duckworth turned when Braden went in.

"Ah, Mr. Braden! I suppose it's all right about making

those shots. We'll want to putter around a bit and find a good light-balance—"

"It's not all right," said Braden. "Will you come with me for a moment?"

Duckworth stared. But then he followed. Derr Carmody came out of her cabin. She smiled regally at Braden.

He led Duckworth out into the corridor outside the passenger space. The skipper's rooms might have a hidden microphone in them, and so might the control room, but all the ship couldn't be bugged. There was too much of it.

"What's the matter?" demanded Duckworth. "Don't tell me the captain isn't willing for us to shoot these scenes!"

"I didn't ask him," said Braden. "Something much more serious has turned up. It's developed that the crew signed on for this voyage with something more than wages in prospect. There's treasure aboard and it looks like they hoped to seize the ship. They're disarmed at the moment—so it seems—but it's not likely that they'll stay so. I came to ask what weapons you've got. Can you defend yourselves if the skipper and I manage to hold the rest of the ship? I mean, defend yourself against attack?"

Duckworth gasped. He turned white. He explained agitatedly that his was a tape-drama production unit, not seeking adventure. They'd come on the *Rim Star* to shoot the ship-scene sequences for a play about an area somewhere in space where all physical laws were reversed. They were prepared to make special-effect shots.

"How about defending yourselves?" asked Braden. "It seems that the skipper and I can only depend on each other. If we have to look after you too, it won't be easy!"

Duckworth made unhappy gestures. He was a producer and director, he protested. He staged adventure-dramas. And he and his associates were passengers! They were theatrical people! They'd secured passage on the *Rim Star* with the implied guarantee—

"Subject," said Braden harshly, "to the hazards of space. Ship officers have the right to demand help even from passengers in time of emergency. One's coming up. How much help can you give?"

Duckworth swallowed.

"Any weapons?" demanded Braden. "They're flourishing in most of the tape-plays I've seen! What have you got?"

Duckworth stammered. It was not wholly fright. It was shock. Groundlings on ultra-civilized planets go in for melodrama as a pleasurable spectacle. They don't imagine being in danger themselves. Duckworth had to change the whole course of his thought to be able to answer. He'd never considered facing real danger. It was almost impossible for him to readjust and think in terms of possible conflict with criminals who were not playing dramatic roles.

But he managed to find an answer eventually. Yes, they had weapons for their tape-drama production. They had blast-rifles and blast-pistols. But they were theatrical weapons. They looked like real blasters, and sounded like

them. When they were fired, very convincing blaster-bolts shot out of their muzzles. But they were only pretty fireworks instead of deadly small vortexes of ball-lightning. In short, the tape-camera production unit was completely unarmed.

"I've a few pocketblasters for you," said Braden dourly. "You'll have to do the best you can. Who'll have the nerve to use them?"

Duckworth winced. He'd never fired even a theatrical weapon. Fortescue had played dramatic parts. He could probably handle a weapon, more or less. Hardy, perhaps. Maybe.

"If I . . . really had to count on somebody," said Duckworth rather desperately, "it would be Diane. If you've just one pistol to pass out, give it to her. She won't use it unless she has to. She's a very fine girl. Worth two men like Fortescue—or me."

Braden growled. When a man admits that a woman is a better man than he is, he may be honest but he should be ashamed.

"Call her out here," he commanded. "And Fortescue."

He paced up and down the corridor while Duckworth went into and came out of the passengers' quarters again with the actor and the girl. Braden grimly told them what he'd told Duckworth. Fortescue looked pained. Diane looked steadily at Braden until he'd finished.

"We'll get out the theatrical blasters," she said quietly. "If there's need, real ones and theatrical ones going off together ought to be almost as effective as all real ones, because they'll be surprising."

Duckworth said unhappily: "But I'm afraid of Derr. When she hears about this —."

"We won't let her," said Diane decisively. "She'd make a production out of the whole business. Everybody else, yes. But not her."

"Here are three blasters," said Braden. "Keep them handy. Maybe nothing will happen for days. Maybe we can stall off the whole business. We'll try. But —."

He explained, curtly and with precision, how the emergency light system could be turned on. Where there were emergency supplies of food and water. How the passenger compartment could be isolated from within with even its own air-supply. He found that he was giving the explanation to Diane.

"Nothing may happen for days," he repeated, "and it's possible nothing will happen at all. But there's one item . . ." He hesitated, and then said angrily, "I've profound doubts of the steward. Don't take his word for anything. Especially no message that you can start shooting pictures. Especially no message from the skipper or me that would make you leave your quarters or be separated. If I've a message for you, I'll bring it. If the skipper has one, demand that he give it in person. Understand?"

Then he said urgently:

"I can't possibly have any designs that wouldn't be countered by the instructions I've given you. Stay to-

gether. Stay armed. Keep watch. You can't be anything but safer that way! And stay in your quarters!"

Later, he puzzled over his own urgency to make them—but it was especially Diane—believe in what he told them. It wasn't his usual habit to reason with anybody. As the mate of the *Rim Star* his duty was to get the ship to her destination. He'd tried to have the skipper return and get a fresh crew, simply to make that arrival at Handel's Planet more likely. He'd fought the five crewmen in the forecabin to try to prevent any chance of a mutiny. But right now—

Fortescue said wryly:

"I told you, Mr. Braden, that I'm an excitement-prone. Exciting things do happen all around me. And I'd been looking forward to the sort of quiet life one has in jail!"

"Maybe," said Braden, "we can still arrange it."

But he didn't expect to. He went away. He passed the steward in the corridor, partway up toward the bow, heading for the passengers' section with meals for five persons on a rolling cart. The steward gave him a flashing, cordial smile and went on.

Braden went to his cabin. In substance, the skipper's order to leave the control room meant that he was to stay out of it until his time on-watch arrived. But once the ship was in overdrive there should be nothing to do but contemplate the instruments. Their readings were automatically recorded on the log-tape every so often. In between, any registration even fractionally off normal would set off a signal to call attention—even wake a dozing man in the control room. If that went unheeded, there'd be a general alarm audible all over the ship. A vessel the *Rim Star's* size actually required no larger a crew than the smallest of yachts. The minimum crew for any sized spacecraft was the smallest number of persons who could endure uneventfulness and each other's society for a long time.

Braden surveyed his own cabin. He had a blaster in his pocket, after partly arming the passengers. He wasn't welcome in the control room. He'd done all that could be done for the moment about the crew and the intentions its members cherished. Now he had nothing to do.

He unpacked his ship bag and put its contents in the lockers and cupboards provided for the purpose. He could, of course, take a nap. A talent for sleeping is useful, in space. It passes the time. Reading is also a valuable habit. But Braden was in no mood for either.

It occurred to him that since the skipper's quarters were—with high probability—to be considered wired for eavesdropping, and since the control room might be, it was conceivable that even the mate's cabin might be bugged. At least it would be useful to know.

He began to search. It was an activity out of all reason. Ships aren't wired in that fashion. There's no sense in it. There can be no purpose in it. But the skipper's private quarters almost certainly were bugged. So, though it was irrational, Braden made a search.

He found thread-thin wires coming out of the corner of

a shoe locker near the floor. They were almost invisible. He traced them. They had been painted over, and he actually saw less than an inch of paired unpainted wires in one locker at floor level. But once he'd found those, it was possible to trace them.

He had the miniature microphone in his hand when the door of his cabin opened. He jerked his head about. The skipper stood there, frowning portentously. But he saw the thing in Braden's hand. He opened his mouth to speak, and closed it, his eyes fixed on the tiny object.

Braden held it for him to see clearly. Braden's own expression was ironic. The skipper made a preliminary rumbling noise and then stopped. He made a gesture. Braden shrugged. He turned his eyes back to the thing he'd found.

He examined it in detail while the skipper stood absolutely silent, watching. In a matter of minutes Braden had made the instrument inoperative. He did not cut the wires. Any test of the circuit would show it as working. But the microphone would no longer transmit any sounds from the cabin. One who listened in would guess, most likely, either that the cabin was empty, or that something accidentally pressed upon the microphone and kept it from transmitting.

The skipper nodded and waited until Braden had put everything back as before. Then he rumbled:

"Very smart, Mr. Braden! Very smart! If you'd asked me, I'd have advised exactly that! You mentioned that I was overheard in my own quarters, which I knew, and you may have guessed at the control room. If so, you were right. I was about to ask you to take a walk with me, for a confidential talk. But now we can talk here."

Braden stood up from the floor where he'd disabled the microphone.

"Glad to have you, sir. Will you take a chair?"

The skipper grimaced. He sat down gingerly, like a man who has learned that not all chairs are to be entrusted with his weight.

"It won't take long, Mr. Braden. I begin to think well of you. I have written out an order which is completely useless, for you to carry out in case of emergency."

"Yes, sir," said Braden.

The skipper effortfully removed a many-times-folded bit of paper from a pocket. He handed it to Braden.

"You will be careful, Mr. Braden, not to let anyone know of this order. Keep it carefully—not that it will do any good! Its substance is that if I should die or be disabled in any way from active control of the ship, you are immediately to get the passengers into a spaceboat, smash all controls in the other boats and the ship—if possible, of course—and abandon ship."

Braden stiffened. An officer's first duty is to his ship. He should not abandon it except in ultimate disaster—which it is his business to prevent.

"That," rumbled the skipper sardonically, "is charity on my part. I take a great risk in giving it—and I do not

like to take risks. So I will explain the situation aboard the *Rim Star*."

He looked at the door. Braden went to it and examined the corridor outside. It was empty. He did not like this order. It ran counter to every instinct and every rule and all the traditions of space. He came back.

"Very good!" said the skipper. "It is more important than you may dream, Mr. Braden, that I should not be overheard. I take this risk for your sake and that of the passengers—whom I have not seen, and whom I fervently hope I will not see! The reason is that it is almost inconceivable that the *Rim Star* should ever reach Handel's Planet. I have arranged matters that way for good and sufficient reason."

Braden stiffened. This violated everything he believed in as a merchant-space officer. It was unbelievable that a ship captain would do such a thing. But there'd been enough of the extraordinary on the *Rim Star* already, to make it believable if it explained what had happened up to now.

"This ship," said the skipper sardonically, "belongs to my son-in-law. He has suffered losses and the *Rim Star* is nearly all he has left. But it is insured. If it is lost, so long as I am lost with it he will really lose very little—and I will be dead if the ship is lost! He will have money to re-establish himself with, instead of owning only a white elephant like this. You have to understand this to understand the rest. I would not willingly injure my daughter, and my son-in-law does not know what I plan."

Braden nodded, not to indicate understanding or agreement, but for the skipper to go on.

"My purpose," said the skipper flatly, "is to destroy the crew. Not the ship. If I can, I will complete the voyage—I hope with your assistance, Mr. Braden! But I shall destroy the crew! Have you ever heard of the *Melpomene*, Mr. Braden?"

Braden considered, and shook his head. He was deeply suspicious. He was angered that he was involved in what might be the wrecking of a ship for the insurance.

"She vanished in space five years ago, Mr. Braden," said the skipper evenly. "There were the usual rumors that she had blundered into the Other Side of Nowhere—which does not exist. But the fact was that she was the victim of pirates." He paused. "I have a married daughter now. But I did have a wife and another daughter. They were passengers on the *Melpomene* when it was taken by pirates."

Braden went to the door again. The corridor was empty. He came back.

"The crew, Mr. Braden, rose and killed the officers. In time they killed the passengers. In time! I say this because against all probability the wrecked *Melpomene* was found two years later. There was no publicity when she was found. To remind people that such things can happen discourages them from travel. It injures the passenger business! But it was plain that the officers were killed first, and the passengers—at least the women passengers—con-

siderably later. But this was not publicized. It could hurt business!"

The skipper's tone was the quintessence of bitterness.

"I was told," he said, "so the identification of their bodies could be certain. My wife and my daughter were murdered. One crew member was killed—but all the officers and passengers. There were, of course, very exact descriptions of all crew members and passengers on file. I spare you the details I cannot spare myself, but it was very clear that the crew rose, that there was some fighting during which one crewman was killed and all the officers, and then the ship and its passengers were in the pirates' hands. It was also clear that after an interval the passengers were murdered and the crew escaped in a spaceboat with what loot the *Melpomene* had yielded."

The skipper stopped for a long minute. He was a huge man, and even his eyes were rimmed with fat, but he did not look humorous. He looked deadly.

"I'd had descriptions of the crew," he said with a sort of icy precision. "I had doubts from the beginning. I kept an eye open for them. After the *Melpomene* was found I hunted for them. Once or twice I thought I saw one of them, but I positively found the steward more than a year and a half ago. I was reasonably sure of him, but to find him alone was not enough. And I could be mistaken. Eventually I got him on my ship. I made the post of steward attractive. I pampered him. I trusted him foolishly. I gave him privileges. He became a skipper's pet. But—I could be mistaken. One man alone, though he perfectly fits a description, may still not be the man described. But six men joined together, and each of them fitting the description of a member of the *Melpomene's* crew—that is something else!"

Then he said: "Look out the door."

Braden obeyed. He came back and shook his head in token that the corridor was empty. The skipper went on icily:

"The steward picked these five others for this particular voyage. He has been with me for months. He has practically run the ship. He is convinced that I am a fool. I told him—it was reasonable to tell a man I trusted implicitly—that there would be treasure aboard—some millions of credits in cash. And he found a crew. Many men would not be willing to sign on for this voyage because there is no landing grid at the other end of it. But he found them! And every man matches the description of a member of the *Melpomene's* crew. Six men match six descriptions! Tell me if their behavior bears out my belief! Tell me what they signed on for!"

Braden said wryly:

"I think you're very likely right, sir. But there is still a chance, however small —."

"Granted," said the skipper heavily. "I could be wrong. So I am waiting—and I shall wait—until the instant they make it perfectly clear that I am not mistaken. My plans for that moment on do not concern you, Mr. Braden. You might . . . you might be shocked by them!"

"On the other hand," said Braden, "you might be killed."

"True," said the skipper. "I would be sorry for that! But you won't doubt that I've prepared for it! Once in every twenty-four hours, Mr. Braden, I press a little button. If during any twenty-four hours I do not press it—and the steward does not know about it, Mr. Braden—there will be no *Rim Star*. She will be blown to atoms. Therefore, if I am killed or disabled—I have ordered you to put the passengers into a spaceboat and abandon ship. It is a kindness on my part."

"Except," said Braden, "that a spaceboat has an extreme range of five light-years. The odds aren't too good that there'll be a habitable planet—let alone a colonized one—if I leave the ship at a random moment. Not in this part of space!"

The skipper rose to his feet. He rumbled:

"That's a better chance than you'll have otherwise, Mr. Braden! I've done all I can bring myself to. I have risked everything I've lived this long for, out of charity for passengers I have not seen and will not see!"

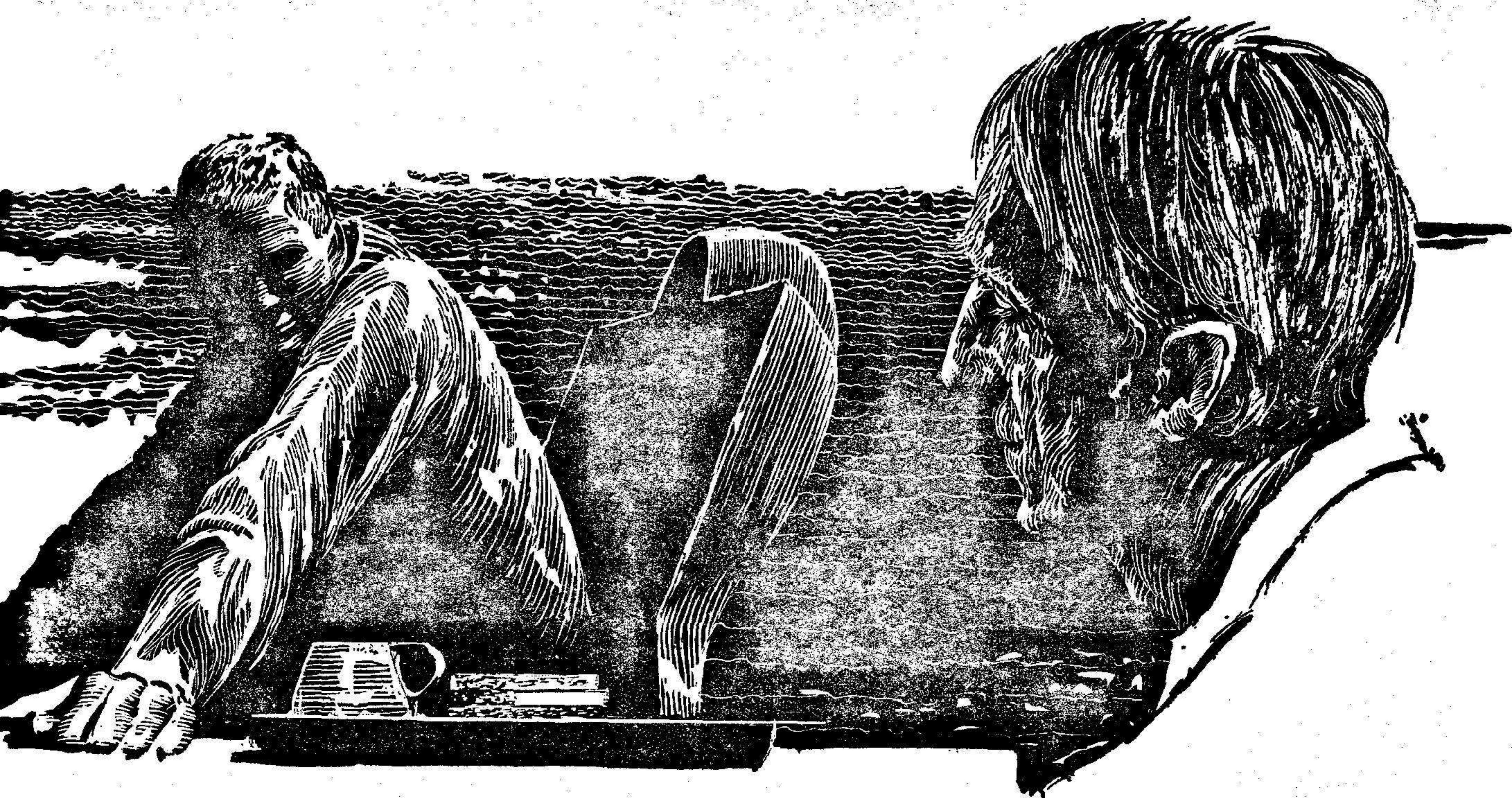
He moved toward the cabin door. Then he paused and said evenly:

"You are quite right, Mr. Braden! I am a murderous monomaniac. But in my place you would be, too!"

IV

The *Rim Star* swam on magnificently through space. It was an enormous hollow shape of steel. Its holds filled all but a tiny fraction of its volume. They were packed with cargo intended for Handel's Planet. The invoice would begin with some thousands of tons of fabricated steel, designed to be erected as a landing grid. But the rest of the cargo was varied. There were hundreds of tons of food and drinkables. There were cranes and jungle plows and bulldozers. Roofing and a smelter and antiseptics. A plastic-making unit, and machine tools and antibiotics expressly designed for the microscopic flora and fauna of the new-colony world, and metal billets and explosives. The *Rim Star* carried all the ten thousand and two different kinds of objects and supplies needed for the setting up of a self-supporting city on a brand-new world not less than scores of light-years from its nearest sister colony.

The ship drove on, and nothing happened. Nothing. In overdrive it was requisite only that somebody be in the control room prepared to meet an unimaginable emer-



gency, plus someone at this place and that. These men were necessary in case an unpredictable event required the kind of decision that any man can make, but no computer can possibly arrive at. The steward readied meals and delivered them to the passengers and the forecastle and to the skipper and to Braden. Braden did his work; kept his watches in the control room; checked with the passengers and made sure that nothing in the least out of the ordinary had taken place. The members of the crew relieved each other as their watches required. They behaved with exemplary docility. Once, to be sure, the steward reported with extreme deference that there had been discussion among them. Were they actually being credited with the pay due them because the crew was one man short?

They were.

Two days passed. Four. Six. Seven. The *Rim Star* would be eighty-two light-years from its port of departure if it broke out of overdrive and view the stars that then would surround it. It did not break out. It remained in overdrive. The steward was all bright and cheerful obsequiousness. It would have been impossible to discover by anything in his manner that he had stolen a blaster out of Braden's ship bag and hidden it under his pillow—and it had been taken away and Braden apparently possessed it again. Braden observed nothing in the manner of the crewmen to show that they remembered he'd roughed up the lot of them in the forecastle and taken illegitimately carried weapons away from them. Each of them was liable to a prison term because of the blasters and sheath knives in their bags. It might have been expected that they'd be sullen, or else they should have tried by extra alertness

and dutiful behavior to wipe out the offense.

They didn't. The ship ran smoothly, and orders were obeyed with precision, but it was precision that was almost mocking. The routine and tedium went on for watch after watch and day after day, but Braden felt eyes upon him which held derisive anticipation as the least unpleasant of the emotions they expressed. Face to face, naturally, no man's expression was other than blank and entirely impersonal. But sometimes Braden noticed quite different looks.

On the eighth ship-day, loud-speakers throughout the ship made a warning din. A booming voice said:

"Attention! Breakout coming! Breakout coming! Prepare to come out of overdrive in five seconds. Five . . . four . . . three . . . two . . . one—"

The universe seemed to reel, and one's body and especially one's stomach seemed to try to turn inside out. There was an instant's intolerable dizziness. Then the vision screens in the control room lighted.

There were a thousand million stars, and a close-coupled binary sun off to starboard. One of its components was a giant yellow sun, with a smaller white star circling it so closely that both were visibly distorted. A thin and wavering voice came from an outside-receptor speaker.

"Checkpoint Alyx," said the voice metallically. *"Checkpoint Alyx. Report. Report."* A pause. *"Checkpoint Alyx. Report. Report."*

The voice wavered rhythmically, from strong to weak and back again. This was a Space Patrol checkpoint at

one of the crossroads of space. Ships bound on other than local runs came out of overdrive at such checkpoints to verify their course and position. It was not unlike the practice of primitive sailing ships making land falls to correct their longitude on voyages over the oceans of ancient Earth. But here there was another purpose, too.

The log tape began to run swiftly through its guides. Automatically, but without sound so far as the control room was concerned, the *Rim Star's* taped log was broadcast on an appropriate Space Control frequency. Heard as transmitted, it would have seemed no more than the shrillest possible vibrating whine. But in a matter of seconds the record of the huge ship's voyage to this point was spreading through emptiness. It would be recorded at high speed on the Patrol ship. It was the function of the Patrol ship to stay tediously here until relieved, receiving the reports of all ships passing this spot in space. Eventually, the recorded logs would be played back at a lower speed at the nearest Space Patrol base. They would be listened to. Any oddities would be noted, and, if necessary, investigated. The object was to localize any untoward event so it could be looked into.

If a ship failed to arrive in port, it could be traced for at least a part of its course through such taped checkpoint recordings. Its log might then offer a clue to the cause of its failure to arrive. At worst, any dangerous condition in space—ranging from a gas cloud in emptiness to the non-existent other side of nowhere—could be partly localized and might in time be discovered.

While the log tape whirred, the ship's computer-operated astrogation unit searched the heavens. The double star was duly noted in reference to the ship's gyro-indicated heading. There were checks with the pattern of brightest stars at this position. The aiming point for the next checkpoint would be determined. It was. The ship's blunt nose swung and centered upon it. There were other spacecraft nearby. Two, or ten, or a hundred ships might pass Checkpoint Alyx in a single standard day. The *Rim Star's* outside receptors picked up whinings, and buzzings, and the metallic voice continuing to say monotonously: "*Checkpoint Alyx. Report. Report . . . Checkpoint Alyx. Report. Report.*"

Then something clicked, somewhere in the ship. In sealed-off compartments, to be entered only when aground and then only by specially trained technicians, the computers and memory banks and observation instruments and information-integrating devices had finished their work. It was made evident by that click. The *Rim Star* had come so far and reported. It would now proceed to the next place where it should report. The booming voice said resonantly, throughout the ship:

Attention! Prepare for overdrive!" Each syllable was repeated at the same fraction of an instant all over the huge freighter. "*Overdrive coming in five seconds. Five . . . four . . . three . . . two . . . one—*"

There came the unspeakably unpleasant sensation of going into overdrive. It would be intolerable if it lasted.

The vision-screen images vanished. The thin and wavering checkpoint call ceased to arrive. It had been faint when it reached the *Rim Star* because the Patrol ship was half a light-hour from the spot where the ship had broken out to normal space. But within minutes the Patrol craft was light-weeks behind, and the *Rim Star* whisked away in its cocoon of negatively stressed emptiness. With the ship gone away, the wavering call continued, but it did not matter to the *Rim Star*.

It seemed, of course, that the breakout and check was a matter of no importance at all. But Braden found himself growing more tense after the ship was back in the unspeakable isolation of overdrive, light-years from any star or world or even other spacecraft. The *Rim Star* was now a week of time and an illimitable distance from its starting point. Its log was on record. It contained absolutely nothing to indicate any undesirable behavior or action of the crew. The skipper had prevented Braden from logging the discovery of weapons in the forecastle. There was nothing recorded or transmitted to the Space Patrol files to indicate anything in the least out of the ordinary on this voyage, other than the ship's destination and its intended method of landing there. If the crew was the crew of the murdered *Melpomene*, tricked into shipping on the *Rim Star* to repeat that crime, there was no evidence outside the ship to hint at it.

Which was sound reason for the crew to have behaved most piously until the first checkpoint was past. If the *Rim Star* did vanish from space, there would be no reason to suspect her crew unless somebody noticed that the description of her crew matched that of the *Melpomene's*—which was unlikely. The crewmen had acquired something on the order of an alibi in advance.

Braden went to his cabin. He found his dinner set out on the cabin's folding table. It was just such a meal as many families throughout the galaxy consider the only meals possible—pre-cooked and neatly designed for quantity production, with appropriate enzymes and amino acids added. The steward had readied it and placed it for Braden when he came off-duty in the control room. He'd probably eavesdropped on what conversation there'd been there, and timed the delivery of the food so it would be exactly right and at its most appetizing state when Braden reached his cabin.

But Braden was in the wrong mood to be pleased by such attention. In the control room he'd been unable to speak frankly to the skipper. The control room was bugged. There'd been only the one time since he came aboard when the skipper'd spoken frankly, in assurance that he wasn't overheard. Braden had had no chance to argue then, to reason later, or at any time to protest as ship's mate that a legitimate voyage shouldn't be turned into something to make a personal vengeance possible.

He hadn't even been able to arrange a signal by which one or the other could give warning of suspicious events. There'd been eight days in which every word had had to

be considered overheard. It was a strain. And now was the time when piracy or mutiny—they were the same—was really likely, and it was Braden's job to prevent it.

He'd picked up his knife and fork when suspicion really came to him. It was because he was thinking of the steward, that tidy, brightly smiling, obsequious individual who seemed as unlike a mutineer as any man could be. His manner was solicitous and deferential. But he had picked the crewmen—and they were not mild and law-abiding characters. The man they'd beaten on the spaceport tarmac —.

But the meal smelled good. It was appetizing. The steward had prepared it with loving care. And Braden was suddenly and unreasonably and almost violently suspicious.

He tasted it very gingerly. He could detect nothing out of the way in the first dish, or the second, or the third. They were very appetizing indeed. They were almost spicy. But he put only the barest morsels in his mouth. He came to the coffee.

That was not right. If he'd come to it in the ordinary way of eating a meal, after a succession of dishes of which some were slightly spiced, and with the keenness of his sense of taste blunted—then he wouldn't have noticed anything. But he did, now. It had a somewhat musky flavor, infinitely faint. It did not belong in coffee.

Blood drummed in his ears. Then he reached in his pocket. He brought out a notebook. He wrote on a page. He stood up suddenly as if remembering something. He went back to the control room. The skipper, himself, had just sat down to the dinner brought him by the steward. Duty-watch in the control room didn't require continuous attention. It only called for someone's presence. The skipper sat before his meal.

"I thought of something, sir," said Braden. "I think I skipped making a note about the air-freshener unit, sir."

He stood before the skipper, holding his notebook open. The skipper glanced at it.

"Very well," he rumbled. "I'll check it and attend to it."

"Wouldn't it be better, sir—"

"No!" said the skipper peevishly. "I'm tired of looking at your silly face, Mr. Braden! Get out of the control room! Go to the devil!"

He turned to his plate. His knife and fork made appropriate noises.

"I'm thinking of the passengers, sir," insisted Braden while he looked at the skipper's hands.

"Then go and ask them if they noticed anything deficient in their air!" snapped the skipper. "Get — out, Mr. Braden!"

Braden still waited. The sound of a knife and fork in operation was perfectly normal. But the skipper was making those sounds without eating at all. His eyes blazed triumph. He'd read what Braden had written on his notebook page. "*My coffee drugged. Yours?*" He tasted the coffee, delicately, and spat it back into the cup. He nodded to Braden and almost swelled with satisfaction that now

at long last he was about to have in his hands both the proof of guilt and the individuals to pay for the murder and worse of his wife and daughter.

Braden went on. He made sure his blaster was handy. He went down the long curving corridor of alternate ramps and stairs. He came to the passengers' quarters, nearly a quarter mile from the control room. He knocked and went in.

Diane smiled at him. He'd made it a point to visit the passengers' section at least once each day. His reception, except from Diane, was becoming less and less cordial as time went by and nothing unusual occurred. Duckworth fretted about the waste of opportunity, with spaceship shots to be made for that epic, "Other Side of Nowhere." He was no longer sure that Braden told the truth, but he was not yet doubtful enough to rebel.

The steward, of course, had been among the passengers much more often than Braden. He'd been sympathetic. He'd murmured against the orders confining them to so small a part of the ship. He'd spoken with extreme respect and seeming admiration to Derr Carmody. And Derr Carmody had been a star, which is an addiction-forming experience. Having once been a personage of very great importance, the withdrawal symptoms of lessened fame were severe. She wanted at least to get ready for resumed greatness. Her own group aboard ship was not big enough to supply the adulation she'd had once and almost frantically craved again.

Braden looked worriedly at Diane. Dinner was in place on the saloon table. The steward had made a most tasteful arrangement of tableware and dishes. Derr Carmody had seated herself. She regarded Braden with some haughtiness.

"Well, Mr. Braden?"

"Well, so far," admitted Braden.

"Mr. Duckworth is becoming impatient." The star of the picture-to-be looked severe. "And I am not satisfied to be put off like this! There are scenes to be staged before we reach Handel's Planet! You will tell the captain that if he does not take back his ridiculous order—"

Braden blinked.

"You mean . . . about all of you remaining in your quarters?"

"What else?" She said annoyed. "There is no other ship on any good space line which would treat me . . . me! . . . so stupidly!"

Diane shook her head at Braden. Fortescue said quickly, and smoothly:

"We've explained to Miss Carmody that you are working on the captain, to persuade him to change his orders."

Braden blinked again. He'd been concerned with very deadly realities. This absorption in taking pictures of imaginary events seemed startlingly unreal. Of course he'd assumed that since his cabin as well as the skipper's and the control room was wired for eavesdropping, that there would be great care about what was said. But he hadn't

realized that Derr Carmody couldn't be trusted to rise to a situation. She'd play it dramatically, instead.

"You will tell the captain," said the star imperiously, "that I will not submit to it any longer! I am bored! My art demands that I work! I have instructed Mr. Duckworth to ignore the captain's orders if they are not changed immediately!"

Braden drew a deep breath. The state of things was very, very bad, and the lid was about to blow off. But the skipper had prepared for something just like this. He'd planned it for years. He had some trap contrived. To let it out before the trap closed could be catastrophic.

"I'll tell you," said Braden. "Let me look at the cameras and lights. If they won't block a corridor that needs to be kept open, maybe I can persuade him."

"I'll show you," said Diane quickly. "They're in here."

She led the way into one of the cabins. He put his lips close to her ear and whispered:

"Things are about to break! The coffee is doctored! Maybe something else, but the coffee certainly!"

She went white. Then she said in an astonishingly natural voice:

"These are the lights, Mr. Braden. You can read off the wattage on them."

She put her finger to her lips. She pointed to a spot behind the door frame. There was something very tiny there. It could have been taken for a hardened drop of paint. But she pointed again, and he saw twin raised lines where thread-thin wires were painted over, and would never have been seen if they hadn't been searched for very, very carefully.

Braden took her hand and pressed it. Aloud he said:

"This stuff isn't bulky. It shouldn't block a corridor. I'll talk to the skipper. I can promise nothing, of course." Then he whispered: "That coffee musn't be drunk! Nor the food eaten!"

She nodded, watching his face. He showed her the butt of his blaster and looked a question. She nodded, very pale. They went back to the saloon. Braden said politely:

"I'll speak to the skipper."

"Tell him," said Derr Carmody imperially, "that if he does not change his orders I will defy them!"

He went to the door. Diane followed him. Braden sweated. Outside, he said hurriedly:

"The skipper's set somehow. But I don't like it!" Then he said furiously:

"The woman's a fool!"

Diane smiled faintly.

"She's my mother. And I'm a cameraman because she wouldn't want to compete with her daughter as an actress."

"I'll apologize later," he told her bitterly. "But now I'm trying to keep things lined up for whatever the skipper has planned. Keep watch! And stay armed!"

"We will," she said steadily. "Some of us, anyhow."

He went away. But he looked back and she was still

standing in the doorway, watching him. He waved for her to go inside. She smiled rather shakily and obeyed.

He trudged up toward the bow of the ship again. There would be a pause now. He could see it very clearly. On the *Melpomene* there'd been fighting, and one of the pirates—or mutineers—had been killed. That wouldn't be risked, this time. A meal had been served simultaneously in the control room, and in Braden's cabin, and to the passengers. The mutineers would be waiting, now, for the hidden microphones to tell them that only they remained alive and conscious on the ship. So long as there was movement they would not stir. So he could make his way safely back to the skipper, to receive orders for action consistent with the skipper's plans.

He knew a deep disturbance because he was neither with Diane, to take part in her defense, nor acting rationally in combination with the skipper. In the skipper's place, he wouldn't have let matters go this far. Days ago he'd have gotten the steward into the control room and made him prisoner, bound and gagged. He'd have called the others in, one by one, in the hope of breaking the back of the mutiny by taking action first. Prisoners could be put in an air lock with food shoved in to them from time to time, and the ship could be run without anybody but the skipper and himself to the next checkpoint or even to Handel's Planet, when help could be had by spaceboat from the colony itself.

But that would have been Braden's answer. It would not have satisfied the skipper. Planetary laws were elaborate. Accused criminals were always considered innocent unless proven guilty, and there was no way to prove these men guilty. There were no witnesses against them from the *Melpomene*. They'd killed them. So if turned over to the law, the six men would probably be freed.

Braden thought of Diane, looking after him from the doorway. He suddenly knew grimly that if he were the skipper, he might have killed the steward when he first was sure of him. But it would have been unwise. He'd have been imprisoned for the steward's death, and the other five men would be left unpunished.

It was no easy problem to solve, and this was no time to be trying to solve it. The skipper had planned his vengeance and he'd have it even if it meant the destruction of the ship. More, if harm came to the skipper, there would be no longer than twenty-four hours of life left for anybody on the *Rim Star*. There was nothing to be done but work with the skipper, for the passengers' sake. And already that meant Diane.

At this moment, the crew waited zestfully to become sure that everyone but themselves—the skipper, and Braden, and all the passengers—were unconscious and wholly unable to offer resistance. It wasn't likely that they intended simply to cut the throats of those not of their number. At least five of the crew had reason to dislike Braden, and they'd shown gleeful anticipation of express-

ing that dislike at some future time. Now would be their expected time. The steward would want, at the least, to gloat over the skipper's presumed folly in getting himself at the mercy of men who'd shown no mercy to his wife or daughter. And there were the passengers—and the laughter of the crewmen when they saw that some of the passengers were women.

This piracy would not be a simple case of murder and theft. It would be more. And worse. Braden felt a wave of purest rage sweep over him. It was rage so monstrous that he seemed entirely calm.

It was as well. He was about to pass his cabin door when he saw that the door was open. He looked in. The steward was there. He looked up distressedly. He'd been regarding the apparently untouched meal.

"Beg pardon, sir," he said unhappily. "You haven't eaten your dinner, sir. Was anything wrong with it?"

Braden considered. It was startling that the steward acted as if nothing were wrong, as if nothing were known. But—so far, nothing was! And in the icy fury that filled Braden, it was somehow worth while to let it stay that way for the moment. The steward had doubtless come here to find him unconscious in his chair, for a negligent murder or more diverting activities later.

"There's nothing wrong with the meal," said Braden in a voice so natural that it astonished him. "But going into overdrive always upsets my stomach. I have to skip a meal after it. It doesn't matter."

He entered the cabin. He sat down in his armchair. He said conversationally:

"By the way. Things seem to be going along all right. You said you were suspicious of the crew. But you seem to have been mistaken. They have done their duty well enough."

The steward smiled brightly.

"So they have, sir. But I'm not satisfied even yet. Of course I've complete confidence in the skipper, sir. I've told him what I thought, and he told me I was a fool. But I'm sure he's taken precautions."

Braden nodded. It was ironic. It was, in an unfunny fashion, amusing to talk to the steward like this, when murder was in the air and Braden knew that the steward was debating whether a blaster-shot would be premature. He could see a small bulge in the steward's pocket. It would be a blaster. He'd expected to find Braden unconscious, and now he had to kill him. But he thought Braden didn't know. Braden, though, was sure he could kill the steward first.

"May I ask, sir," said the steward, "if you've ever talked to the passengers about the Other Side of Nowhere? It seems they plan to do a tape-play about it, sir."

"I know that much," agreed Braden. "Sit down. I'm off-watch."

The fact that one of them must presently kill the other, on a signal of disturbance outside, made it fascinating to see the steward seat himself in a somehow deferential

manner, as if he were happily aware of the honor done him.

"I've been wondering, sir," he said zestfully, "if you've noticed that they have it all wrong. It's actually a sort of fourth-dimension, sir, but they have the idea it's simply fantastic—whatever they choose to put into it."

Braden made himself comfortable. His blaster was, he considered, handier than the steward's.

"The story varies," he observed. The fury he felt was so great that it numbed him. He said: "Some of it's nonsense. A place where all physical laws run backwards—That's hard to believe."

"I don't know, sir," said the steward sagely, "I'm not so sure it's nonsense. The scientists, sir, say that there's such stuff as contraterrene matter. They've made atoms of it in cyclotrons and such, sir. It has neutrons and negatrons in the nuclei, and positrons in orbit outside."

Braden nodded. He would have heard any sound made anywhere in the ship. His ears had never been so keen.

"You see, sir," said the steward eagerly, "a planet of matter like that couldn't be landed on. It's contrary to normal matter. It wouldn't attract a ship of normal matter. It would have antigravity! It would repel it! And if a ship drove against its antigravity to make contact with a world like that . . . why . . . when it reached atmosphere the contraterrene air would cancel out the normal matter and the ship would vanish in a monstrous explosion with all its matter-energy freed!"

Braden nodded.

"You should have been a scientist," he said as if admiringly, while he thought that shortly the steward should be a corpse.

"And it would not only have antigravity, sir," he pursued enthusiastically, "but it shouldn't have the same time-direction. What's the future to us, sir, should be the past on a contraterrene planet! On such an antiworld, sir, time should run backward! And it's all so logical! There's matter, sir, here in our space. It's little knobbls of energy, as we know. You might call it plus energy. But if there's plus energy here, sir . . . why . . . somewhere there must be minus energy, to make things balance! Every action has its reaction, sir, of equal moment and opposite sign. So every atom must have its anti-atom, of equal charge and opposite sign! There's talk about it, sir, in forecastles. Some men say that a ship of normal matter in contraterrene space couldn't be worked. They say that its controls would all work backwards. But I say, sir, that normal matter will always obey normal laws!"

The steward beamed at Braden, and he was strangely amused at being lectured on the physics of hypothetical anti-matter by a man who intended to murder him at the first convenient moment. But he did not smile.

The steward said apologetically:

"I didn't mean to take up your time, sir. May I fix you something to eat that would be more to your taste than this, sir?"

He gave every evidence of ruefulness.

"Truly I'm sorry, sir! If your stomach's upset from going into overdrive, perhaps some fruit juice, sir? Or perhaps a really hot cup of coffee?"

Braden heard something. He could not distinguish what it was, but it seemed like voices. And it was not normal for there to be the sound of voices in the corridors of the *Rim Star*. She was too big a ship, and there were too few folk on board.

He stood up, leisurely. The steward instantly got to his feet.

"I really think, sir, that a fine cup of coffee—"

"I think not—"

Then Braden heard the rasping bellow of a blaster. A voice—a man's voice—shouted. A woman screamed.

Braden struck out savagely at the steward. He literally did not think of his blaster. Diane was in danger, and he struck terribly at the man who at that moment stood between him and the door that would lead toward her.

The steward's blaster was halfway out when Braden's fist landed. He crashed against the wall. Braden saw the blaster. He snatched it up. He should have stopped to incapacitate the steward for longer than it would take him to recover from a knockout. There came another blaster rasp. Others. Something close to a fusillade. The woman screamed again.

Braden went plunging back to the passengers' quarters, a blaster in each hand, his fury taking over from the unnatural calm he'd felt and filling him with a horrible hunger for the life of anybody who would try to harm Diane.

V

At the bottom of the corridor, Braden saw the streak of

intolerable brightness which was a blaster bolt. It slanted across the corridor and hit the steel wall, where it disappeared, scorching the paint where its charge heated the metal. A man howled. Running figures appeared and vanished, and additional intolerably bright flashes followed them. A woman screamed and screamed.

Braden raced down the curving corridor without any thought except a berserk fury that anybody could have dared to think of harming Diane. But the crewmen—or at least four of them—were in flight at the moment and they'd been pursued by lightning flashes which were regrettably, it seemed, fireworks instead of deadly ball-lightning bolts.

Panting, he came to the passengers' quarters. The crewmen were vanished, now. Fortescue stood in the doorway with a blast-rifle in his hand. Since Braden had supplied only pistols, it would be a theatrical weapon, of moral value only until it was known for what it was. Then it would have no value at all.

Fortescue jerked up the weapon. He lowered it as he recognized Braden. He was deathly white, but he tried to grin.

"Get inside!" snapped Braden. "Peek out only! And not at head-height, either!"

He went through the door to where a woman still screamed.

It was Derr Carmody in hysterics while Duckworth and Hardy tried to control her, while Diane watched with composure. There is hysteria and hysteria. Some of it is the honest crack-up of a personality under intolerable stress. Some of it is the result of habitual tantrums put on to achieve one's successive desires. In the latter case it becomes an automatic reaction by which the responsibility for any unpleasant situation is put upon others by



the supposedly delicate nature of the person affected. It is "temperament." This hysteria was something in between. There was real terror involved, as there'd been real danger.

Braden snapped: "What's happened? Anybody hurt?"

Diane told him, her voice unsteady. They hadn't dared tell her rejuvenated mother during the past week that mutiny by the whole ship's company was expected. Even just now they hadn't dared tell her that the coffee on the table was doctored to make them unconscious while the ship was taken over. It was possible that other parts of their meal might be fatal to any idea of defense against the mutineers—or pirates. So Diane had, with seeming carelessness, knocked over the coffee pot. She'd spoiled not only the coffee but the entire meal.

Her mother denounced her in a fine, incoherent temper-tantrum which was a combination of great-actress temperament and maternal scolding. No one dared protest and—considering microphones—no one dared explain. As a climax, Derr Carmody stalked to her cabin in a towering rage. Silence followed. There was nothing to be said by any of the rest. Some time passed. Somewhere, someone listened in on the passengers' quarters. There was silence. Crewmen zestfully moved toward the supposedly helpless folk. On the way down the corridor they talked freely. It could not matter. They believed all non-mutineers, all non-members of their group completely insensible. They made babblings. They were heard. They reached the passengers' quarters door. They crowded in, grinning.

Hardy, the cameraman, sent a theatrical blast-bolt between the heads of two of them before the door was fully opened. In the instant Fortescue fired. His shot hit the ceiling. Diane fired.

A man bellowed, and Derr Carmody appeared in the

doorway of her cabin. She saw crewmen in the doorway and blasters in action. She saw Diane fire again as a crewman incredulously held up a forearm with the sleeves on it burning luridly. He cursed. Derr Carmody screamed.

Diane fired again. So did the others. The crewmen fell over each other getting out of the doorway. Derr Carmody continued to scream. Fortescue plunged to the doorway and sent unfortunately harmless theatrical bolts after the fleeing mutineers. He found himself doing it with a splendid air. It made a fine scene.

Then Braden appeared.

Duckworth and Hardy took Derr Carmody to her cabin. The door closed. Her screams were muffled. In a little while, with a lessened audience, they diminished.

"So far," said Braden harshly, "so good. But not so good, at that. If this works in with the skipper's intentions it's very good indeed. But I don't know how he's made out. He was warned, though."

He felt cold sweat on his forehead and wiped it off. He began to shake because Diane had been in danger and he wasn't there to fight for her.

Diane, still very pale, regarded him very matter-of-factly.

"What do we do now?"

"I don't know—Look!" said Braden desperately. "I'm afraid to try to take you to the control room. We could be butchered! The skipper and I will . . . we'll hunt them down. If they come here again, we'll hear the shooting and we'll come. Barricade yourselves. They can't get in before we can get here. And they'll have to tackle us first, anyhow. They thought . . . they wouldn't have to fight anybody!"

The outcries from Derr Carmody's cabin were not exactly screams, now. They were sounds like yelps in between frenzied sobbings.

"I'll do that, at once," he said, again desperately. "I don't like it, but—they won't try too hard at first. Just—don't let them surprise you! I'll be back—"

He turned and ran toward the bow and the control room. It was not what his instincts demanded. They required that he hunt down the mutineers, regardless of danger, and kill them one by one for having dared to think of harming Diane. He despised himself for acting as a thinking human being when he wanted to practice infinite violence upon his enemies. He despised himself again for thinking of a spaceboat, and getting Diane away from the *Rim Star* where she would be safe. Against everything but the fact that it was unlikely he could ever get a spaceboat to a habitable planet in this part of space.

He came to steps. He went up them three at a time. He remembered bitterly that he hadn't showed them how to use a mirror out the doorway to see the corridor with no danger greater than a smashed mirror. He recalled that he hadn't put the passengers' quarters on emergency lights. The mutineers—pirates—might cut off the lights and close in on them in the dark. He'd told Diane how



to find the switch, but then she might not remember.

He raced along a sloping curved ramp. He was risking the corridors, but he could take the chance. A running man is a bad target. Also, there was still confusion among the mutineers. The steward might still be out cold. There'd been a defeat of those who went to the stern. What the skipper had done was uncertain, but he must have done something.

Braden panted, and ran, and ran, and panted. Around him the giant ship was completely silent. There was nothing to hear and nothing to see to show that anything out of the ordinary had taken place. The ship itself was an impersonal steel hull more than a quarter of a mile in length and with the thickness of a twenty-story building's height. It contained exactly thirteen people, of whom some now must murder the others or be executed for having tried and failed to capture the ship.

He found himself becoming panicky because he was going away from where he felt he was needed. He abruptly ceased to have confidence in the skipper's undisclosed plan for the handling of the mutiny he'd invited, by the mutineers he'd had the steward bring on board the ship. A space officer should not have done that. Things could go wrong. They'd almost done so! If he'd drunk that coffee, or if the skipper had, everything would be ruined, now.

He was about to pass the galley. He raised a blaster to readiness. But it was empty. He ran on, panting, and saw the door of his own cabin. The steward —. The door was open. His cabin was empty. The steward had recovered from his knockout and was gone.

Braden swore. He should have killed the steward. Here were the skipper's quarters. He went past them, and there was the control-room door, and it was open. He panted: "It's Braden!" and fairly dived within. If there were an ambush, calling his name ahead would seem to be a warning to the skipper, and they'd expect him to pause for an acknowledgment. But if the skipper were inside, the fact that he'd come at a headlong run would be assurance that it wasn't a mutinous member of the crew. He fairly burst into the control room, blasters ready to kill as many as possible if he'd run into an ambush.

It was empty of all life.

But there was a dead man on the floor.

It was the crewman with sharp eyes, whom Braden had picked first in the forecastle to empty his ship bag. He lay on the floor with his head at a completely impossible angle to his body. His neck was broken.

Silence. Stillness. Braden listened with impassioned intensity. If the skipper was dead, he had to get the passengers to a lifeboat and take to space regardless. The skipper had said the ship would not outlive him by more than twenty-four hours. If he was alive, the two of them must hunt down the mutineers ruthlessly, killing them in any fashion possible. So he listened for a sound that might be the skipper.

Something whirred, and he whirled to face it. But it

was simply that this was one of the moments when all the readings of the ship's innumerable instruments were recorded on the log. The log-tape whirred between its guides. There was a tiny humming sound. It stopped. The state of the ship was on tape, so far as the ship alone was concerned. But it was somehow shocking that the ship—the *Rim Star*, the enormous thing created by men and tended by men and which men almost thought of as animate—was oblivious to men. A dead man on the control-room floor called for no record on the narrow strip which was the great ship's memory. The dead man did not matter. Nor did Braden, nor the skipper, nor Derr Carmody nor even—incredibly!—Diane.

Braden shook his head to clear his mind of such irrelevances. Then there was a tiny squeaking noise.

The door of a locker opened. The skipper was wedged in it. He squirmed out. His expression was blank. He seemed filled with a bitter astonishment. But he made a gesture commanding silence. He pointed urgently at the door. Braden moved to look out, down the corridor.

The skipper went down on his hands and knees close by the control board. He was a hugely fat man, and he looked grotesque in such a position. He crawled under the knee space, breathing heavily. He scraped at something. He backed out with a miniaturized microphone and hair-thin wires in his hand. He jerked the wires, and they broke. He threw the tiny object on the floor.

"Bad business!" he said querulously. "But no more eavesdropping, anyhow! I'm . . . frightened, Braden! This man came in here. No knock. No word. He just came in. He'd cord in his hands to truss me up to helplessness, thinking me unconscious. He was composed and business-like. I lolled in my chair, pretending sleep. He came over to me and felt in my pocket. He took my blaster and put it in his own pocket. Then he began, very professionally, to wrap cord about my feet. I took him by the throat, Braden. Gently! I didn't want to kill him. Not as easily as that! I took him by the throat—and he jerked my blaster out of his pocket. So I snapped his neck."

The skipper wiped sweat from his face with his hands.

"But he'd pulled the trigger, Braden! He'd pulled the trigger, and my blaster didn't fire! It didn't go off! And I've looked it over and . . . and somehow at some unknown time the steward has got at it and it's all smashed inside! It's useless! I . . . I was never without my blaster, Braden! I can't imagine when he got at it! I've been disarmed without knowing it, Braden."

Braden said urgently:

"The passengers have four pocket blasters and some things that look like blasters and sound like them. We'd better join forces with them and start fighting."

"No!" protested the skipper. "I . . . I hid, to think. You saw it. There's something more important than that! Much more important! Don't you see? If the steward got at my blaster, what else has he got at? Has he guessed all my plans? Did he know all along what I was doing?"

It would be like him, Braden! I'm . . . I'm frightened!"

Sweat started out on his face again.

"I've . . . got to find out!" he panted, almost whimpering. "It couldn't be! But that man yonder . . . he didn't come in here to cut my throat, but only to bind me so I'd wake up helpless. Maybe because they knew I'd planned to trap them . . . that I got the steward to bring them aboard. Maybe they wanted to laugh at me as they laughed at—"

Then the skipper's throat clicked shut.

"I'll find out!" he said hoarsely. "I'll come back!"

As if blindly, he went out of the control room, his hands clenching and unclenching. He turned into his own quarters. Braden was unbearably tense for seconds. There were now four crewmen instead of five, who with the steward had to kill everybody else on the ship or be destroyed. They could not be everywhere in so gigantic a vessel as this ship, but the skipper should not go about unarmed.

Braden thought of Diane, and a vast, impatient urgency filled him. In a situation like this, the initiative is everything. When trouble comes, the advantage is always with those who start it. The crew had tried to take the ship without using arms. They'd failed. Now if two raging men began to hunt them they'd be rocked back on their heels. The skipper and Braden should take ruthless and violent action. They should put the fear of hell into the crewmen; keep them confused; wipe them out as they were found. It was their duty as merchant-space officers, and they should do their duty now, while the choice of action lay with them.

But the moment for action was being lost! The passengers were barricaded in their quarters and the two ship's officers were doing nothing either to increase their safety or to keep the mutineers from recovering from the setbacks they'd suffered, and from which simple desperation must arise. There could now be nothing but absolute victory for the mutineers or else absolute defeat. And victory for the mutineers would mean much more than defeat for their antagonists.

Braden was bitterly aware that piracy is not practiced solely for profit. There are men to whom criminality is satisfying in itself. Some men feel a kind of ecstasy in acting against all honor and decency and mercy. Braden had met them. They find joy in hatred and bliss in malevolence and pleasure in the causing of disaster to others. The power to injure gives them satisfaction. It is the object of a strange, inverted ambition. So the seizure of the *Rim Star* would be only partly for the treasure aboard. It would mean indulgence in enormity. In atrocity. Braden hated men who could act on such motives.

He raged, pacing helplessly in the control room while time passed in which the crewmen could recover from their first failure and realize the stark necessity of success—for them.

He heard a sound behind him. He whirled. But it was an emergency intercom buzz, from one of the boxes on the wall of a passageway. He threw the switch and the steward's voice came:

"Calling control room. Captain, sir?"

The voice was smooth and suave and obsequious. The steward didn't know where Braden was. He didn't know whether or not the skipper knew about the shooting in the passengers' quarters. He didn't yet know what had happened to the man with sharp eyes, who actually lay in a shapeless heap on the control room floor. But he could ask. He hadn't unmistakably intended to murder Braden. Rather, he hadn't done anything which really proved that intention. He could insist that his expressed suspicions of the crewmen were justified, and he'd been completely loyal, and could claim total ignorance of the doctoring of any of the food he'd served.

"Captain, sir?"

His voice was openly uneasy. It was good acting.

"What the hell do you want?" demanded Braden.

"Oh! Mr. Braden!" The voice expressed infinite relief. *"I'm so glad you answered! There's the devil to pay, Mr. Braden! I'm afraid you believe I was mixed up in it. Terrible things have happened, sir!"*

"So I've noticed," said Braden.

"The crew has mutinied, sir! They've armed themselves somehow, and . . . I don't know what their plan is, sir, but it's terrible!"

A pause.

"I'm afraid they're searching for me, sir! To kill me! I'm hiding at the moment, but I don't know what to do! May I speak to the captain, sir?"

Braden waited an instant. Then he said:

"He's not available."

It could mean that the skipper was not in the control room. It could also mean that he was dead. Braden would have answered just that way, with just a hesitating pause, in either event. Or, if he'd made his way to the control room and found it empty. The answer was designed to give no information whatever—not even that one of the steward's followers lay dead at Braden's feet with his head at an impossible angle.

The steward's voice acquired just the right touch of the frantic.

"But what should I do, sir? I need someone to tell me what to do!"

"I can't give you any orders," said Braden curtly.

He flipped the switch to end the talk. Seconds later the intercom-buzz came again. He did not answer. The steward wanted information. He hadn't gotten it. He should be very much disturbed. He had no working hidden microphone in the control room now. The skipper must have torn it out. Its absence must appal him.

Braden made a gesture of pure rage. The control room was important. From it all manner of dials and indicators reported innumerable facts about the ship's condition, and switches and levers directed innumerable operations.

Fires could be fought from it. The air-supply to any compartment could be adjusted or shut off. The temperature, the gravity, the corridor lights, the holds—even compartment doors could be closed simultaneously all over the giant ship. But he could use none of these facilities in the absence of the skipper and in ignorance of the skipper's plans.

There was no word or sign from him. Braden became half-mad with impatience. There should be action, now!

Then there was a sound in the corridor and he plunged to the door with his blaster ready. But it was the skipper.

He came out of the door to his quarters and stumbled to the control room. His face was gray. He seemed to have shrunk. In the bare ghost of his former rumbling voice he said dully:

"Dog the door shut, Mr. Braden. I must have some time. That devil . . . knew! Ah-h-h! He knew! He's been laughing in his sleeve all the time I've been pampering him . . . toadying to him . . . in the hope of having him get his fellow-pirates aboard and in my trap! Shut the door!"

Braden said urgently:

"I can see down the corridor, sir, when it's open. We'll have warning if they intend to try anything against us."

"No—They've heavy-duty rifles now! Dog the door shut! I'd a plate hinged in my cabin, Mr. Braden. There's a way . . . between the ship's inner and outer skins to where I had the . . . bomb that was to make it certain they couldn't win. I thought only I knew of it. But that devil found it! And I had . . . weapons there, too. It was in my mind—Close and dog the door, Mr. Braden!" Then the skipper said almost hysterically: "Make sure the door hasn't been tampered with! Make sure it can be locked!"

Braden made certain the door was fastened against any possible effort to open it. The skipper was working, ridiculously, to get loose the lever that would release emergency-air into the ship in case of an air leak. It could be worked by hand because in such a case only hand-operated controls would work. He got the lever clear, and it was immediately evident that it was not only a control, but could serve as a wrench. He fitted it to the end of a bolt in the wall under the CO₂ repeaters. He heaved on it, panting.

"I'd a bomb there, Mr. Braden! So they couldn't win! So the ship would be blown to atoms if I didn't press a certain button within twenty-four hours of the last signal. And that devil . . . has found it! He cut the detonator to little bits! Nothing else will set it off!"

The bolt squeaked. It yielded a quarter of a turn.

"I'd thought of everything!" panted the skipper, heaving on the wrench. "It was . . . it was to be perfect! I . . . even had weapons there in case I had to hunt down one or two of them who wriggled out of my main trap! Heavy-duty rifles, Mr. Braden! I . . . didn't want to use them. Quick killing . . . ah, they deserve so much more than that! But I was ready even to kill them quickly if I had to! I'd

save the ship if I could—" He heaved. "Even if I had to kill them quickly—"

The bolt yielded again. Braden was close by the door. He said harshly:

"I hear movement in the corridor."

"No matter. It will take time for them to break in."

Something crashed against the door. There was no challenge. No summons to surrender, mockery as such a summons would be. The crash came again. The door shook. The skipper heaved on the long-handled wrench once more. The bolt turned.

"In here" panted the skipper, "place to carry money . . . jewelry . . . such stuff—" He heaved again. "I always hoped . . . to find *Melpomene's* crew. So I . . . put things here. After . . . I found the steward I . . . prepared I thought more adequately. But this was . . . from before his time—"

He turned and grimaced at Braden. Bent down, he began to loosen the bolt with his fingers.

"Sporting rifles in here," he wheezed. "Ultra-high voltage. Special license. Shipped for a hunter who was killed by some beast before they arrived. They'll stop any beast! It's a pity . . . it's a great pity to kill these devils so quickly!"

He stood up. He pulled. A plate swung out, with the CO₂ repeaters swinging with it. There was a space behind it. It was a perfect hiding-place for the carriage of treasure or weapons which someone might be tempted to steal if shipped in any of the ship's holds.

The the skipper made an inarticulate cry. There were grease-marks on the floor of the closet. There had been weapons there. There was part of the outline of a blaster, marked in grease, on the floor plate of the cubicle. But the skipper cried out in horror and grief and rage.

The cabinet, the closet, the place for the storage of treasure or weapons—was empty.

There was a harsh rasp beyond the door. Then the smell of burned paint. Of hot metal. A point on the metal door of the control room turned dull-red. It became cherry-red. The former crew of the *Melpomene* had abandoned cleverness as a way to destroy the skipper and all others in authority. They'd run into trouble when they tried trickery. So now they used pure, ravaging, arbitrary force.

With heavy-duty weapons they could melt down the door if they chose. They did choose. And four men playing heavy weapons' enormous energies before them could not be faced, not even for the half-second needed to fire a blaster at them.

The steel door showed an incandescent spot. It melted through. There was a shower of coruscating sparks. The hole widened. It extended. Two blast-rifles were working on it. Two more spots glowed red.

This was a strictly workmanlike preliminary to the destruction of Braden and the skipper.

Another hole melted through.

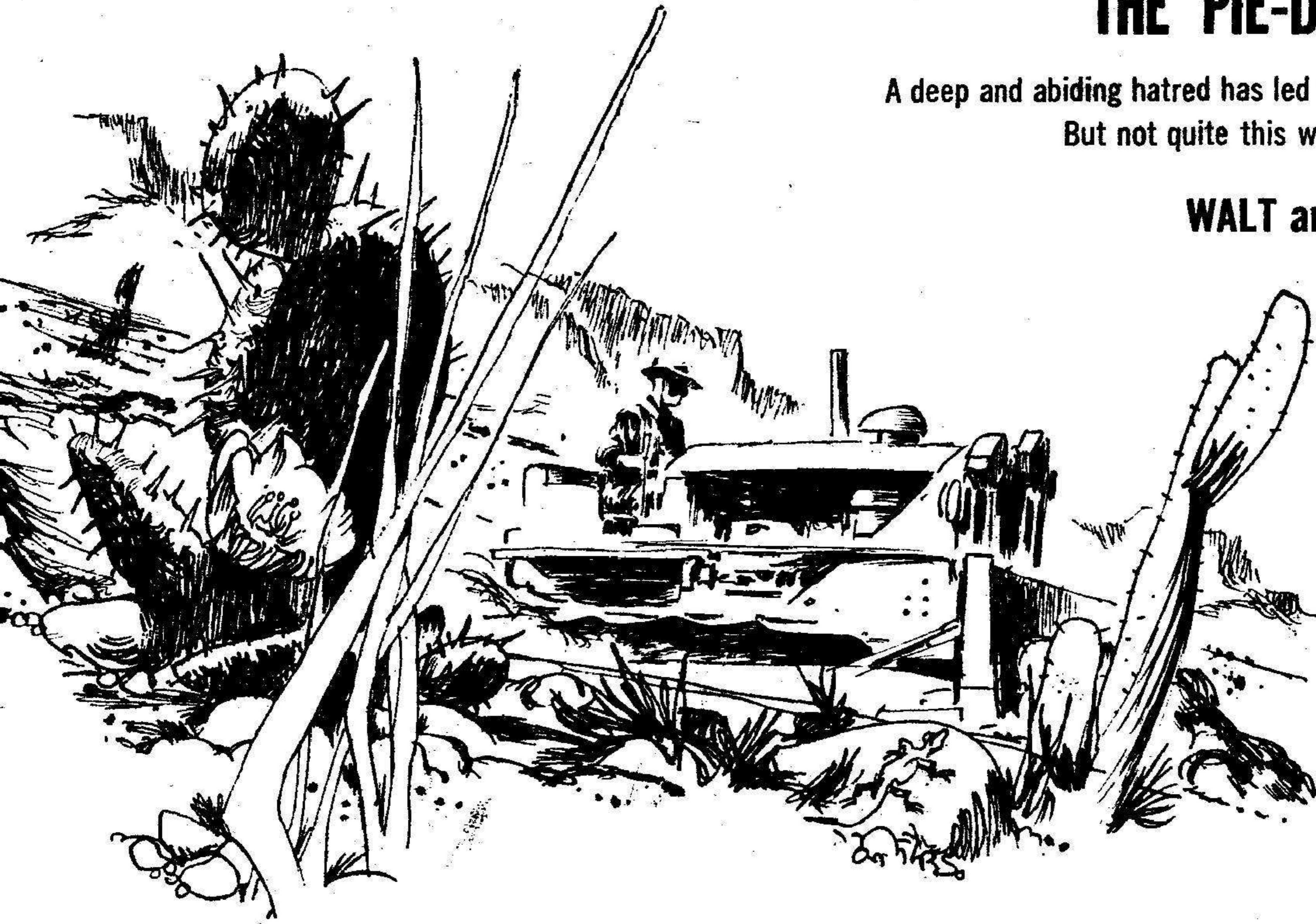
TO BE CONCLUDED

THE PIE-DUDDLE PUDDLE

A deep and abiding hatred has led to dynamiting many times.
But not quite this way, or with these results—

WALT and LEIGH RICHMOND

Illustrated by Leo Summers



Mal R. Key hated water.

He hated water so much that he almost never touched the stuff, except for drinking. If it should happen to rain, he would head, helter skelter for the nearest shelter.

And if there were puddles about he would refuse to go out.

And as for baths, he had his own methods that had nothing to do with water.

There were things in the world that he liked—but water certainly wasn't one of them.

At the moment he was sleeping peacefully in the sun—his long, lanky frame stretched out in a fluid grace that was particularly his own. But, if you watched closely, you might see an occasional twitch as, in his sleep, he contemplated the touch of some water or other, and twitched carefully away from it, shrinking from any contact with it.

But then, water wasn't too prevalent in this particular area. In Mal's experience it had happened rarely that it rained; and even more rarely that the ground stayed wet for any length of time. For this was Arizona, and rainfall here was scarce.

Mal's family owned a large ranch, and Mal was fond of helping with things on the ranch, though he was never given any real responsibility. Somehow the family just

never considered him to be a very responsible member.

He had often observed the cows being milked, but he'd never been asked to help. And that, in general, was the way things always were.

Of course, he had his self-imposed duties—the things he did without being asked. Just little things, some people might say; but to him they were important.

And then there were always the long strolls across the desert, through the thin mesquite brush, past the big, gaunt saguaros, with their prickly spines.

And there was all sorts of interesting animal life, most of it small and harmless, but then occasionally a rattler, and a few others that were dangerous, too. Some of these, Mal chased playfully; others he avoided. Still others he ignored, on his daily walks.

That is, when he felt like walking. Drowsing in the sun was one of his major pastimes; for actually he liked to do things at night when the rest of the family were sleeping.

At night he could be a mighty hunter and go, unseen, for miles through the dim blue vastness of the suddenly cool and altered desert—much, much different than it was in the daytime.

Mal rose and stretched, and observed that the sun was lowering towards the horizon, and purple fingers were stretching across the eastern edge of the desert. Soon it

would be night, and he could get about his nocturnal business. But first he was curious.

All day Big John, the foreman of the ranch, had been busy on a new project, running the tractor round and round out in the field, stirring up huge clouds of dust. An awesome project, from Mal's point of view; not quite understood, but awesome. There had been other things going on that he should really look into. But first he would observe what Big John had accomplished.

The tractor, he noted, had a changed appearance from its usual. There was a large blade on the back, or, as Mal thought of it, a pusher. And a scoop on the front which, as Mal thought of it, was a claw, obviously.

The preparations had all centered on a dry-wash where sometimes, though not often, there was lots of the hated water that seemed to come from nowhere and then rush off again, after a few hours, and be gone.

But now the dry-wash had taken on a different appearance—cut, scraped and clawed by the tractor. One end of it had been filled with dirt, a high mound, and the sides had been clawed away to make a huge pie-shaped depression in the soil.

Mal wasn't sure, but it looked to him like the water might have trouble coming and going as it had.

With a final push, pat and snort of the pusher blade, the tractor worked itself up out of the hole and headed back towards the barn. Somehow Mal felt that although Big John was now hot, sweaty and tired, he was pleased with what he had done.

Mal inspected the pit briefly, and then with a twitch of disdain for things he didn't understand, headed back for the house where Momma Joinson was serving the evening meal.

This was something Mal never missed.

The conversation around the dinner table that evening didn't include Mal, and he paid scarce attention to it. Big John had a proud note in his voice.

"Got that whole pond dug out in one day," he was saying. "Couldn't have done that forty years ago when we first started farming, could we, Momma? It's pretty something how people have grown up so fast, made machinery to do the work, in the past forty years.

"Hope it don't rain in the mountains, though, before I can get that pond cemented in. I'll have to tear down the sides tomorrow and put cement over the dike, or it won't really do us much good. That water sure will be useful."

Mal twitched when he heard the word "water." Sort of automatically and unconsciously. But it didn't take his attention away from the piece of steak he was nibbling on.

After dinner, Mal wandered out as was his accustomed habit, and looked the situation over from the back stoop. But the night seemed a bit different. There was a charge in the air that was seldom felt; and Mal's instincts were aroused.

With the feeling that maybe it had something to do

with the new project that Big John was working on, he wandered down towards the dry-wash to look over the situation more closely.

The smell of the fresh-turned earth in the evening air was exciting; and perhaps something had been turned up by all the plowing and shoveling and scraping. So he wandered far into the area, probing behind an occasional rock, carefully inspecting the new bottomland.

And suddenly the enemy was upon him. Water. Down in the bottom. A splash of brown water, and behind the splash a roar—a crashing flood of water. More water than Mal had ever seen in his life.

It came roaring and tumbling down the dry-wash, and meeting a fresh new earth dike, it curled and swirled back. The little hillock that Mal had been exploring was almost instantly an island; and the island shrank and shrank.

Suddenly the water was over his feet, and then—helplessly, frantically, Mal was swimming in the dark, treacherous, swirling water that he hated; swimming in circles, for the water had come in with a mighty crash and was circling the pit, seeking an exit. Some of it, of course, soaked into the ground, but most of it swirled and swirled, and with it Mal swirled.

But closer to shore. Frantically he struggled—and there was the mouth of the wash, pouring more water, and he was battered back towards the center again, and struggling still.

Suddenly above him was the new earth-work dike. He clutched it convulsively, and crawled up it, wet and bedraggled and spitting mad.

Mal *hated* water.

Carefully he began drying himself off as he sat looking over the swirling pit-full of water lapping ever and ever closer to his dry but temporary safety on top of the dike. Abruptly he was startled by a crumbling splash near his feet, as part of the new dike caved and slid back into the restless waters.

Startled, Mal backed away. Perhaps the water was after him. He couldn't be sure.

Mal was scared. But more than scared, he was furious. Indignant, exasperated, apprehensive—and furious.

Spaced along the dike in even rows were the white paper bags of cement that Big John had planned to use in the morning, and Mal had a thought. He'd seen this stuff before. He'd seen Big John use it.

Mix it with water, and then the water got hard and was not water any more—a magic that had puzzled him at the time, but magic just the same.

And maybe what he needed now was magic.

If the waters were after him, they were bigger than he. But, if he could just harden them up, they couldn't chase him—or so he reasoned fuzzily.

And there at the far end—Mal walked towards the bank—open, with the greasy white sticks. They were magic, too. And they made an awful noise.

Mal had watched Big John move things with them.

and though he wasn't sure that the things moved the way that Big John wanted, he knew that the things always moved with a loud bang that hurt his ears.

Carefully he approached the box, the white sticks gleaming in the moonlight. Gingerly he reached out and touched one. Hesitantly he picked it up. Carefully he carried it to the sack at the farthest end of the dike.

The dike was crumbling now, but not very much—not yet. And the water was less than halfway up.

Carefully, Mal examined the sack. It should move into the water, so the white stick ought to go here. Gently he placed the white stick behind the large paper sack, and went back for another.

It took time and the waters rose. He could feel his anger, and he could feel the fear, but he kept them out of the way, because the enemy was right there, and the magic had to be right.

The sticks were placed at last. And now Mal had another problem. How did they go bang? He wasn't sure. His big, ugly face creased in a frown as he thought about it.

The little strings. And the little gray bits that were tied to the strings. He'd watched Big John do this. Big John always put the little gray bits into the white sticks, but maybe they didn't have to be put in. Perhaps just laid carefully underneath.

Carefully he fished one of the caps out of the little box, and began stringing the string from each stick as he had seen Big John do it.

And then at last he was done. And the waters were still only two-thirds of the way up the side of the dike.

It was a real problem, hooking the string to the little box. And there were so many of the white sticks. Maybe he should move the box farther away, but that he couldn't do.

So he made the connection to the shiny terminals, and at last, gingerly, reached out and pressed the button.

The bang was tremendous. It seemed to lift him and hurl him and turn him inside out, and left him lying stunned. So he didn't observe the sacks of cement that went hurtling over the edge of the dike into the water below. He had seen the flash as the cruel fist seemed to close on him, and he lay there, wondering if the waters were still coming after him, or if, perhaps, they had hardened up.

Big John's magic was very real, even if he didn't understand it . . .

The conversation when he opened his eyes again didn't mean too much to Mal, although he understood some of it.

“. . . Just right.” Big John was saying. “Just exactly right. Each sack of cement was ripped open and dumped into the water. And, of course, it will harden and set before the dike can give way. I'm telling you, Momma, it's a miracle!

“Of course I'll have to finish the top third myself, where the water didn't reach. But I still don't understand who could have placed that dynamite. I'd left it laying out there when I put up the tractor, thinking to use a couple of sticks tomorrow to cut the spillway in the left bank.

“But I swear it wasn't laid out—and it certainly wasn't behind the sacks of cement.”

Big John stared down at the tawny fur and the tremendously oversized head in Momma's arms. People had come a long way in the last forty years. Maybe anima . . .

“Do you suppose Malarkey . . . ?”

“Hush, John. He might have been killed, playing with your igniter. How could a cat do a thing like laying out dynamite?” ■

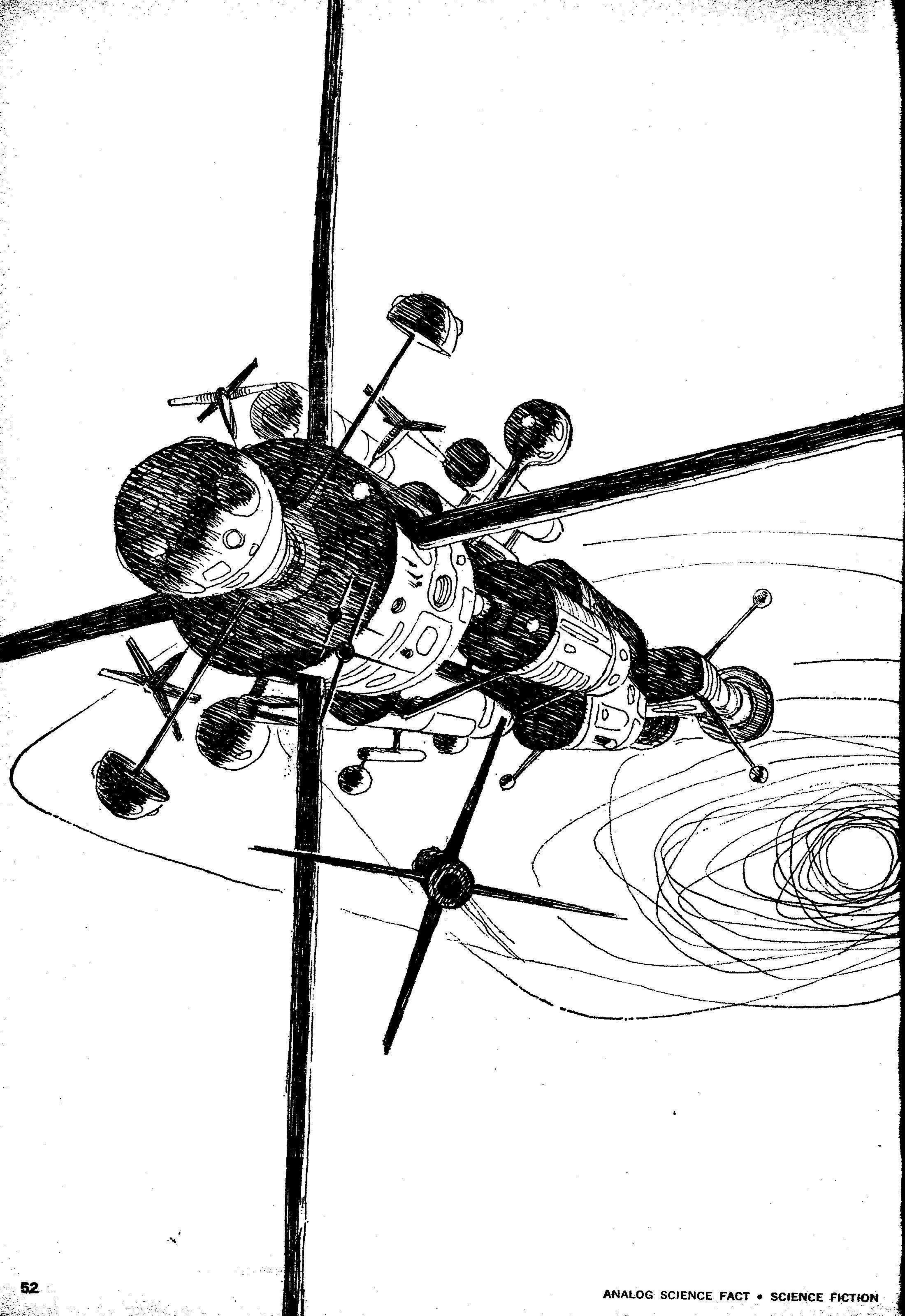
IN TIMES TO COME

Next issue's cover by a new artist—Harvey Woolhiser—illustrates a new Winston P. Sanders story, “Sunjammer,” concerning interplanetary shipping between the asteroid cities and the major planets. Earth, in this case. And the use of the cheapest form in interplanetary drive—the ship driven by the force of solar light-pressure. (Which was first accurately described as an interplanetary drive mechanism in the pages of ASF!)

But Sanders in this yarn brings out a very peculiar type of problem inherent in space-based concepts of technology. “Nothing” is a very tricky concept; there is no such thing as a perfect vacuum; all vacua contain some remaining traces—even the intergalactic spaces. So how little is “nothing”—and how much does it take to convert a cubic mile of “nothing” into “something”?

Also coming up is a discussion of “The Extinction of Species.” What causes species to vanish in a very few years, after existing for megayears? Sudden extinctions are normally blamed on Man's interference, simply because the instances we have full data on have occurred while Man was around to interfere. Man was not responsible for the extinction of the trilobites, the dinosaurs, or the marsupials of South America.

So . . . what does happen . . . ? ■ The Editor.





OUTWARD BOUND

Of course, the one answer
no bureaucracy could imagine as the Right answer
would be completely successful insanity...

NORMAN SPINRAD

ILLUSTRATED BY JOHN SCHOENHERR

Captain Peter Reed floated closer to the big central viewport of the conning globe.

Before him, filling half his field of vision, was the planet Maxwell, green continents and blue seas reminding him of Earth.

He shook his white-haired head. Earth was fifty light-years off, or to put it another way, seventy years ago, or in another way, only four months.

Reed shrugged, not an easy task for a seventy-year-old man in free fall. Or to put it another way, an eight-hundred-year-old man.

Reed could not help laughing aloud. Fifty subjective years in space, he thought, eight hundred years in objective time, and still it has its wonder for me.

As he watched, a mote of light detached itself from the disk of Maxwell, and arced upward.

That would be Director Horvath's ship, thought Reed. Last time the *Outward Bound* was at Maxwell, it had been ruled by a hereditary king. But that was three hundred years ago. King La Farge, thought Reed sadly, dead and gone three hundred years.

This Lazlo Horvath, now. He seems to be a different proposition. Ambitious, dangerous.

Reed smiled wryly. If he keeps up this way, he may soon be honored by a visit from Jacob ben Ezra.

The captain spoke into the communicator. "Rog, get the reception room ready. Our customer's on the way."

He paddled awkwardly to the rear of the conning globe,

grabbed a guard rail, and pulled himself through the rotating doorway, into the main cylinder of the *Outward Bound*.

Immediately, he felt the tug of gravity. The *Outward Bound* was an untidy collection of cylinders and globes, held together by spars. While in orbit, the whole conglomeration spun about a central axis, creating an artificial gravity. But, of course, it was necessary that the conning globe be stationary, so it hung in front of the main cylinder, mounted on frictionless bearings, so that it alone did not share the ship's rotation.

Captain Reed made his way to the reception room. Lazlo Horvath should be an eager customer. The last tradeship to hit Maxwell had been the *Stargod*, one hundred years ago, and that was still in the days of the Kingdom.

Director Horvath was new and ambitious, and like all planetary leaders, he chafed under the yoke of Earth. An ideal customer.

Roger Reed was already in the reception room when his father arrived. There was some family resemblance. He had his father's large frame, but on him it was well-muscled, not hung with loose flesh. His hair was a flamboyant red, and he was going through one of his periods of experimentation with mustaches. This one was only a week old, and its ultimate nature could not yet be discerned.

"Horvath's on board, Dad," he said.

"Please, Roger," said the old man, with a weariness born of endless repetition, "at least when there is a customer aboard, *don't* call me 'Dad'."

"Sorry, sir."

Captain Reed looked about the reception room. It was the one area of calculated ostentation on the ship. It was paneled in real knotty pine. A genuine wool carpet lined it from wall to wall. The captain sat behind a huge mahogany desk, on a genuine red leather covered chair. Three other such chairs were scattered about the room. A viewer was built into one wall.

The room always made Peter Reed feel uncomfortable.

"Well, Roger," said the captain, "do you think this'll be a good haul?"

"Don't see why not, da . . . *sir*. The Directory of Maxwell seems to be at that stage when they think that with a *little* help, they can break the Terran hegemony. They ought to go quite high for the force field, for instance."

The old man sighed. "They never learn, do they?" he said. "No doubt Horvath will think that the force field is an ultimate weapon. He'll never stop to realize that on Earth, it's already seventy years old."

"Why so glum, *captain*?" said the younger Reed. "After all, it's our stock in trade."

"So it is, so it is."

An orderly appeared at the door. "Captain Peter Reed," he said formally, "it is my honor to present Lazlo Horvath, Director of Maxwell."

A short, squat man, of about fifty, stalked into the room. He was dressed in a black uniform, with gold trim, encircled by a wide Sam Browne belt. He wore heavy black boots.

Oh, no, thought Peter Reed, not one of *them*!

Nevertheless, he rose politely, wryly aware of the plainness of his simple light-green coveralls. "Director Horvath."

"Captain Reed."

"My second, Roger Reed."

"Mr. Reed."

"Sit down, Director," said the captain.

Horvath perched himself on the edge of one of the chairs.

"It has been a while since a starship visited Maxwell," he said. His voice was deep and crisp.

"Yes, I know. The trader *Stargod*, one hundred years ago."

For a moment, there was a flicker of puzzlement on Horvath's tough face. "Ah, yes, the *Stargod*," he said smoothly. "Well, Captain Reed, what have you to offer?"

"Several new concepts," said Peter Reed, studying the Director. It was obvious that the man had let something slip. But what?

"Such as?"

"For one thing, an amusing new concept in drinks. Roger, the refreshments."

Roger Reed waved his hand, and a panel slid aside,

revealing a pitcher of red liquid, and three glasses on a tray. He poured the drinks.

Captain Reed smiled as he saw the perplexed look on Horvath's face. The drink was made up of two different wines, one hot, one cold, kept separate by a new chemical technique so that one tasted alternately hot and cold liquid. It was a strange feeling.

"Very amusing, Captain Reed," said Horvath. "But surely you don't expect Maxwell to pay good radioactives for such a parlor trick."

Reed grinned. The hot-and-cold liquid technique was just a come-on, of course. The really big commodity he had to sell was the force field.

"Director," he said, "as you know, traders don't sell *products*, except radioactives, at times. What we sell is science, knowledge, techniques. Now the drink may be a parlor trick, but there can be practical applications of the technique."

"Perhaps, perhaps," said Horvath shortly, "but what *else* do you have? Perhaps . . . perhaps you at least have the secret of Overdrive?"

Peter Reed laughed. "Maybe I have the Philosopher's Stone, as well?" He saw that Horvath was not amused. "I'm sorry, Director," he said. "It's just that we've never made port on any planet, in the eight hundred years that the *Outward Bound* has been in space, where they didn't ask that question. No, we don't have the secret of Overdrive. It is my opinion that there never will be an Overdrive. Man will never travel faster than light. It's a chimera, a schizophrenic compulsion to leave the limiting realm of the real universe, to find a never-never land called Hyperspace, or what have you, where reality is suspended, and the Galaxy belongs to Man."

Horvath frowned. "A very pretty little speech," he said. "So easy for *you* to say. But then, you are not under the heel of Earth. You starmen are by nature free agents. But we, we *colonials*, we know what it is to suffer the tyranny of time. Maxwell is fifty light-years from Earth. Therefore, since we were settled from Earth, from an Earth that was already sixty years ahead of us when we emerged from Deep Sleep, we will *always* be sixty years behind Earth, just as the outer ring will always be two hundred years behind. To you, an Overdrive would be just one more thing to peddle, although it would bring the best price in history. To us, an Overdrive would mean freedom."

"Of course, you are right, Director," said Captain Reed. "Nevertheless, that doesn't make Overdrive any more possible. However"—he noticed Horvath's anticipation with satisfaction—"we do have something new, something big. I suppose they've been looking for this as long as they've been looking for an Overdrive—a *force field*."

Horvath's eyes widened. "*A force field*?"

"Ah, you are interested."

"Of course. It would be idiotic to try and hide it. *This*, Maxwell wants."

"And what have *you* to offer?" asked Peter Reed softly.

"One ton of thorium."

"Oh really, Director!" said Reed. "That's all right for the hot-cold technique, but—"

"Two tons!"

"Come, come Mr. Horvath. A force field is the ultimate defensive weapon, after all. Two measly tons—"

"Ten tons!"

"Now, what are we going to do with all that thorium? Can't you do better? We deal in knowledge, you know. Perhaps you have something in that area—"

"Well," said Horvath, his hard eyes narrowing, "there was another ship here, only three years ago."

"Oh?"

"Colonizer, heading for the outer ring. Direct from Earth."

"So what?"

"Well, captain, there was a *passenger* aboard."

"A *passenger*?"

"Yes, a Dr. Ching pen Yee. Had to leave Earth quickly, so it seems, some kind of mathematical physicist. We're holding him."

"I don't see what this has to do with *us*," said Peter Reed.

Horvath smiled crookedly. "Grand Admiral Jacob ben Ezra is on his way to Maxwell. In fact, he's decelerating already. Should be here in about a month."

Captain Reed stroked his nose. If Earth was sending ben Ezra himself after Dr. Ching, the man must be someone really important. Earth virtually *never* pursued a fugitive beyond the twenty-five light-year radius of the Integral Control Zone. And Horvath knew it.

"So what are you offering?" he said slowly.

"Ben Ezra can't know that he was put off here," said Horvath. "He'll be eager to get away. I propose that I trade you Ching for the force-field theory."

"But neither of us knows whether Ching has anything of value," said Reed, knowing that anyone who was being pursued by Jacob ben Ezra over fifty light-years must know something *very* valuable indeed.

But Horvath knew it, too. "Come, captain. We both know that Earth would not send ben Ezra, unless Ching was very important indeed. Ching and one ton of thorium for the force field."

"Ching and three tons," said Reed, with a little smile.

"Ching and two tons."

Peter Reed laughed. "Ching and three tons for the force field *and* the hot-cold technique."

"Very well, captain," said Horvath, rising and sticking out his hand, "you've got a deal."

The two men shook hands.

"Have your men begin bringing up the thorium immediately," said Reed, "and get your scientists up here quick, to learn the techniques. I certainly don't want to be in this system when ben Ezra gets here."

"Of course not," said Horvath, with a grin. "Rest assured, captain, I'm a very good liar. And believe me when

I say it has been a pleasure doing business with you."

"The same, Director. Mr. Reed will show you to the air lock."

As Roger Reed opened the door, Horvath stopped and turned.

"Captain," he said, "one thing. If you ever do get hold of an Overdrive, Maxwell will match anyone's price for it. You can write your own bill of sale."

Captain Reed frowned. "You know as well as I do, that we traders sell the same knowledge to every planet we touch."

Horvath eyed him thinly. "I am aware of the practice," he said. "However, in the case of an Overdrive, Maxwell would make it well worth your while to make it an *exclusive* sale."

Reed shook his head, and grinned. "I'll keep it in mind, Director," he said.

Grand Admiral Jacob ben Ezra finished his fourth cigarette of the morning. On a starship, with its own self-contained atmosphere to maintain, smoking was a hideous luxury. But Admiral ben Ezra was a man with privileges. A small, frail old man of eighty subjective years, he had been in space for over seven hundred objective years, and was something of a living legend.

Right now, he was nervous. He turned to his aide. "David," he said, "can't we cut a week or two off the time?"

"No, sir," replied the young commander. "We're using maximum deceleration as it is. Photon sails, plus ion drive."

"What about using the atomic reaction rockets as well?" asked the admiral, knowing full well what the answer would be.

"We just don't have the reaction mass to spare," said the commander. "Photon sails, of course, cost no fuel, and the ion rockets use very little, but with the ion drive going, and three weeks left till planetfall, we can't use the rockets for even an hour. Besides—"

"Besides, our course is already plotted, and we'd undershoot," said ben Ezra. "David, David, don't you know when an old man is talking just to let off steam?"

The young commander fidgeted with embarrassment.

"Nevertheless," said the Grand Admiral, rubbing the end of his long nose, "I wish we could. It's going to be a close thing."

"Why, sir?"

Jacob ben Ezra lit a fifth cigarette. "The *Outward Bound* left Earth just about when we did. They're scheduled to stop at Maxwell. No doubt, the *SS-185* will put Ching off somewhere before they get to Toehold. My guess is that it'll be Maxwell."

"So, sir?"

Ben Ezra exhaled a great cloud of smoke.

"Sorry, David," he said. "Somehow, I'm beginning to find it difficult to remember that not everyone is as old as I am. The *Outward Bound* is one of the oldest trade-

ships around, in fact, if my memory serves me correctly, it was the *first* one built specifically for the purpose. Her captain is Peter Reed. He's been in space longer than I have."

"Longer than *you*, sir?"

Ben Ezra laughed. It was not the laugh of an old man. It felt good to laugh, especially under the circumstances.

"Yes, my incredulous young friend," he said, "longer than I have. Reed is one of the cleverest captains in space. Also, don't forget, he has the force field to sell, this trip."

"You mean you think Maxwell will trade *Ching* for the force field? But, sir, once they find out why *Ching's* out here, *no one* would trade him for *anything*."

Jacob ben Ezra puckered his leathery lips. "You are assuming that Dr. Ching will talk. I doubt that very much. He knows that we'd follow him to Andromeda, if we had to. My guess is that he'll figure his only hope is to change ships as often as possible, and not tell *anyone* why he's on the run."

"Then why would Captain Reed accept him in trade?"

"Because," said the Grand Admiral, raising his bushy white eyebrows, Reed is clever *and* experienced. He will *know* that anyone who is being pursued by us, all the way from Earth, is someone who has something of vital importance."

Jacob ben Ezra crushed his cigarette against the bulkhead. He shook his head violently.

"If only he knew," he said, "if only he *knew*."

The *Outward Bound* orbited low over Maxwell. She was an untidy spectacle—one great central cylinder, around whose girth the space gigs were clustered; three lesser cylinders, connected to the main body only by spars; the conning globe; and, far astern, the propulsion reactor, a dull black globe, behind which sprouted two sets of rockets—the small, almost inconspicuous ion drive, and the great reaction rockets, which fed off whatever reaction mass happened to be in the huge fuel tanks, located just forward of the reactor.

To make the whole thing even more messy looking, the main cylinder and its auxiliaries were pocked with globes, tubes and blisters, looking for all the world like budding yeast under a microscope. Like *Topsy*, the successful tradeship just *grew*, adding a cylinder here, a globe there, a blister in another place, as the ship's fortune waxed. In deep space, where friction was no factor, this wild messiness was a status symbol, a sign of prosperity.

Now, Maxwellian ships were coming and going constantly, bringing thorium, food, water, scientists. They had one great navigational hazard to overcome. Four mile-long spars sprouted from amidships on the main cylinder. During acceleration away from a sun, or deceleration towards a sun, four immense triangles of ten-molecule thick plastic would stretch from the spars, catching the energy of photon packets outward bound from light sources. By grams-per-square-yard, the solar sails provided negligible thrust, but cumulatively, over two

square miles of surface area, they were good for a steady, if mild acceleration. Besides, the energy they provided was free.

But now, since the spars were empty, and the ship was spinning about its central axis, the spars were the arms of a monstrous windmill, which the Maxwellian ships had to avoid.

Captain Reed smiled as he watched the ships thread their way gingerly toward the *Outward Bound*. No doubt, there were simple ways of making the spars stationary while the ship spun, perhaps using the same circle-in-circle bearings that served to immobilize the conning globe. But no starship *he* had ever heard of had bothered to try. It was just too amusing watching the planethogs dodge the whirling spars.

Well, this would be the last day they'd have to brave the whirlwind. The last of the thorium was aboard, the Maxwellians had their force field and hot-cold technique, and Ching would be coming aboard on the last ship.

None too soon, either, thought Peter Reed. Ben Ezra will be here in another ten days. Ten days to get here, perhaps a week or two to break Horvath. Captain Reed had few illusions about *that* individual. Within three weeks, at the outside, Jacob ben Ezra would know that Ching pen Yee was aboard the *Outward Bound*.

Ben Ezra would be able to close the gap to a week or less, at the next planetfall, Nuova Italia, only ten light-years away.

But by that time, thought Reed, I'll know whether Ching's worth keeping. If he isn't, ben Ezra can have him at Nuova Italia. But if he is . . . well, ben Ezra will probably have to take on supplies at Nuova Italia. We can get away from him once more, if we have to. But . . . he can catch us easily, and wherever we head, he can be there before us, with us only having a couple of days lead.

We'll jump off that bridge when we come to it, thought Captain Reed.

"Dr. Ching is aboard," came a voice from the communicator.

"Good," said Reed. "How soon can we break orbit?"

"Everything'll be secured in another three hours, Dad."

"Roger!"

"Sorry, sir."

"All right, Roger," said the old man. "Make ready to break orbit as soon as possible. And send Ching to the reception room. Have Olivera there, too. In fact, stall Ching a bit, and have Manny get there a few minutes earlier. Tell him I'll be right down."

"Yes, *sir*."

"But, Peter," said Manuel Olivera, his dark eyes raised to the ceiling in supplication, "I am *not* a theoretical physicist. I am *not* a mathematician. I am a tinkerer, a librarian, a maker of stinks, a—"

"Manny! Manny! Please!" said the captain. "I know the whole song and dance by now. Nevertheless, you *are* the *Outward Bound's* chief scientist."

"Yes, yes," said the small dark-skinned man excitedly, "but you know as well as I do that all that means is that I'm a glorified librarian. We—"

"All right, all right. All I want you to do is *be* here, and pay attention. This Dr. Ching has something of value, I'm *sure* of it. And we may not have him very long. We've got to be quick, and—"

"Dr. Ching pen Yee to see you, captain," said an orderly.

"Send him in."

Dr. Ching was a small, though well-built man of about sixty. His straight black hair was parted neatly in the middle. Only his shifting eyes betrayed his nervousness.

"Thank you for accepting my passage, Captain Reed," he said.

"Not at all, Dr. Ching. Frankly, we hope you may be of value to us. As you know, the lifeblood of a tradeship is knowledge. We sell it, and we buy it. To be blunt, we have *bought* you from Maxwell. You get passage with us, for as long as you want, and in return, we expect you to share your knowledge."

"But, captain," said Ching nervously, "I am a mathematical physicist. You are engaged in the business of selling practical technological knowledge. We mathematical physicists are not noted for producing marketable knowledge."

Reed frowned. This Ching was cool, and he was scared. A tough combination to crack.

"Please let Mr. Olivera and myself be the judge of that. By the way, I believe I've forgotten to introduce you. This is Manuel Olivera, our chief scientist."

"How do you do, Mr. Olivera," said Ching smoothly. "Captain Reed, really you are wasting your time. I am purely a theorist."

Reed wondered if he should spring his knowledge Admiral ben Ezra's pursuit. He decided it could wait.

"Suppose you just tell us what you're working on?" he said.

Ching fidgeted. "Mathematical theory," he said.

"Come now, Dr. Ching," snapped Olivera, "we are not complete scientific ignoramuses, you know. What sort of theory?"

"A development of a small corollary to the Special Theory of Relativity."

"Oh?" said Olivera. "Involving what?"

Ching's eyes flickered from focus to focus like a bird's. "Involving . . . some work with transfinite substitutions," he said vaguely.

Olivera continued his pursuit. "Transfinite substitutions? Where? For what?"

Ching laughed falsely. "Really, Mr. Olivera," he said. "It's all a complicated mathematical exercise. It amuses me to substitute infinite and transfinite numbers for some of the variables. As I said, nothing practical."

"Just why are you doing this?" snapped Olivera.

"Really," said Ching blandly, "that's an unanswerable

question. Indeed. Why do men climb mountains? Because they are there. Really, gentlemen, I'm quite tired. May I be excused?"

Olivera was about to continue his sortie, but the captain waved him off.

"Of course," he said. "We will soon be leaving for



Nuova Italia. In about two hours. We will have time to talk again, before we all go into Deep Sleep. By all means, rest up."

"Thank you, captain," said Ching. An orderly was called, and he led Ching off.

"Well, Manny?" asked the captain.

"Well, *what*? Am I a mind reader? Gibberish. Vagueness. Perhaps outright lies. I ask you, Peter, would Jacob ben Ezra travel fifty light-years after someone engaged in 'a complicated mathematical exercise?' Would Earth give a damn?"

"Of course not," said the captain.

"Then why in space didn't you tell him that you knew ben Ezra was after him?" snapped Olivera.

Peter Reed smiled thinly. "Time enough for that be-

tween now and Deep Sleep. That's a whole week. I think the strategic time to spring it is just before he goes into Deep Sleep. Impending Deep Sleep makes a man realize just how dependent he can be."

"You'd *better* loosen him up then," said Olivera, "because it's just possible that when we wake up, we'll find ben Ezra right on our tails."

A three minute burst on the huge reaction rockets kicked the *Outward Bound* out of orbit.

As she drifted slowly outward, the huge triangular photon sails were reeled out onto the mile-long spars, blotting out whole sectors of stars.

The pale, almost invisible, blue stream of the ion drive shot noiselessly, vibrationlessly out of the nozzles.

The *Outward Bound* was on her way to Nuova Italia.

During the next week, the ship would be secured, the automatic systems checked, re-checked, and finally given command of the ship. There would be a final course correction, and then the thousand men, women and children who made up the crew of the *Outward Bound* would go into Deep Sleep.

Deep Sleep was the technique that had given Man that insignificant portion of the Galaxy which he possessed. A starship could accelerate to nearly three-quarters the speed of light, but this took over a year, and, although it had been proven true that subjective time on a fast-moving starship *did* contract, as Einstein had predicted, the factor was still far too short. The spaces between the suns would still eat up lifespans.

Deep Sleep had been developed to deal with this dilemma. Partly it was a technique developed from yoga, partly it was simply a careful, controlled lowering of the body temperature, till life slowed down to the barest crawl. The elements of the technique had been known even before rudimentary spaceflight. But it took the technical integration of all the factors to make Deep Sleep an effective and relatively safe form of suspended animation, and to give Man the stars.

Peter Reed was getting disgusted. It was now time to go into Deep Sleep, and still no one had been able to get anything out of Ching. Clearly, the man was scared silly.

Well, thought Reed, maybe I can shock him out of it now.

He was standing in one of the Deep Sleep chambers. The walls were lined with transparent plastic cubicles, coffin-sized, honeycombed with passages, through which liquid oxygen was passed.

Another of the ship's economies, thought the captain. The same oxygen that served as the ship's air supply was cooled by the cold of space, and used to freeze the Deep Sleep chambers. It took a lot of liquid oxygen, in fact, the entire ship's supply, but since no one would be needing it while the crew was in Deep Sleep, and since it was reusable, it made a neat saving.

Most of the crew were already in Deep Sleep. The

cubicles were filled with frozen crewmembers, the Environment Masks snugly fitted over their faces. Only the skeleton Deep Sleep detail, the captain and Dr. Ching remained unfrozen. Now, the captain and the passengers would take their places, and then the automatics would handle the Deep Sleep detail.

A crewman was escorting Ching to his cubicle. The mathematician's face was pasty and pale. His eyes flickered furiously over the frozen figures in the plastic coffins.

Reed smiled, half in sympathy, half in satisfaction. He had spent a total time of nearly seven hundred years in those cubicles. Still, it always made him shudder a bit. But Ching had only experienced Deep Sleep once, and somehow, the second time was always the hardest.

"Well, Dr. Ching," he called out, "how do you feel?"

"A bit foolish, captain. I must admit that I am afraid, and yet there is really nothing to be afraid of."

For a moment, Reed's distaste for Ching was washed away. The Grand Admiral of Earth's fleet had hounded him across fifty light-years, and now he was facing what must to him be a great irrational fear. And yet, he's so calm.

"I don't see why a man like *you* should be afraid," said the captain deliberately, hating what he was doing.

"Captain?"

"Well, it seems to me that a man who's being chased across the Galaxy by Jacob ben Ezra, and still refuses to tell me *why*, must have a surplus of guts."

For a moment, Ching trembled. Then he smiled slowly. "I *thought* you knew," he said. "Why else would you be so interested in me?"

"Why don't you tell me what this is all about Ching? What are you on to? Why is Earth so concerned? I don't expect you to believe that we're your *friends* but surely you must realize that it's in our interest as traders to protect you if you're working on something important."

Ching sighed heavily. "Captain Reed," he said, "Earth is not after me because they *want* what I'm working on. I'm really not working on anything practical at all. Just a mathematical and physical concept."

"And yet, they're chasing farther than they've ever chased a fugitive before."

"Yes," said Ching. "Captain, some day you may know why I must keep my secret. If Jacob ben Ezra catches up to us, you will be *glad* that I've remained silent."

"Why, man, why?"

"Because," said Ching, "I'm fairly certain that ben Ezra has orders to kill anyone who knows what I know."

The captain frowned. "Perhaps you will change your mind when we come out of Deep Sleep at Nuova Italia."

"Perhaps, captain, *you* will change *yours*."

Peter Reed shrugged irritably. "Let's get on with it," he said to the attendant.

He climbed into his cubicle, and settled himself on the foam-rubber mattress. The attendant secured him with clamps. The ship's spin would stop when the crew was in Deep Sleep. There would be no gravity.

The soft, lined mask was fitted over his face. He inhaled the soothing tranquilizer vapor. He was comfortable, content. He vaguely felt the prick of a needle, then his senses began to dull, first sight, then sound, then feel, then smell. The last sensation was a dry taste in his mouth, and then that was gone, and he was an entity within himself, in his own private universe . . . a mote swimming in the sea of himself . . . and then, even the sense of mind began to dull . . . to fade . . . to softly melt away, like a mouthful of cotton candy.

A blinding redness which pervaded the universe . . . a pins-and-needles feeling . . . then warmth, overwhelming, welcome warmth, motion, smell, sound.

Jacob ben Ezra sat up in his Deep Sleep cubicle, slowly, patiently teaching his old eyes to focus.

You never get really used to it, he thought. What year is this? Let's see . . . Maxwell to Nuova Italia means fourteen years in Deep Sleep, and when we left Maxwell, it was 3297 A.D., or '98? On Earth . . .

Ben Ezra gave a dry little laugh. Time! What is time? Does it matter? I am eighty years old, I am eight hundred years old, or maybe a thousand.

This life means giving up many things. A firm sense of time is one of them. The people who've sent me after Ching, back on Earth, are all dead. I'm a ghost, a shade, the expression of the will of a group of men, all of whom are dead—in a sense.

Man was not meant for this kind of life, thought Jacob ben Ezra sourly. This is a poor way to command the stars, a poor and pitiful way.

He laughed bitterly. This is a life fit only for Gypsies and Jews. Come to think of it, Gypsies don't have a sufficient sense of history, in the long run.

Maybe that's why so many in the Fleet are Jews. To a Jew, a thousand years is supposed to be a reasonable length of time. Or so the legends say. So they say.

But what is a Jew? There is no such thing as Judaism, anymore. There is hardly such a thing as race.

A Jew, thought Jacob ben Ezra, nowadays is anyone who thinks of himself as one. *Homo interstellarus*.

Ben Ezra leaned on the shoulders of a waiting attendant, and climbed down from the cubicle. His legs were a bit rubbery, but he was used to it.

Homo interstellarus, he thought, as he made his way slowly to the conning globe, lousy Latin, but very good sense.

It was as if Jews had been training to man the Great Fleet for five thousand years. How long had they been a self-contained culture, independent of geography, living, even, in their own time stream? In the pre-stellar past, they had been feared for it, damned for it, but now, it had a purpose. Who else could isolate themselves on the twenty ships of the Great Fleet, but Jews? Knowing no planet, no time to call home?

"They, they," mumbled the admiral. Why not *we*, he thought. Heh! Peter Reed is as much a Jew as I am. What

does it mean now? It means the exiles, the planetless ones, the timeless ones, defying the Universe, spitting in the face of Einstein himself.

The steps of Jacob ben Ezra became firm and sprightly. He lit a cigarette.

"Feels good!" he said to no one in particular.

Several men were already in the conning globe—Chief Navigator Richard Jacoby, several minor crewmen, and his aide, David Steen.

"They're there, sir," said Steen. "We've got a fix on 'em."

The admiral frowned. This job was getting more odious to him every minute.

"How far behind are we?" he asked.

"About six days."

"Then they haven't made orbit yet?"

"No, sir."

"Good. That means we can keep an eye on them. Jacoby, is it possible for them to get away?"

The tall, thin navigator frowned. "Depends on what you mean, admiral. Wherever they go, of course, we can track them. Do you mean will we catch up to them before they leave orbit? Then, I'd have to say no, not if they're trying to get away."

"Can we *stop* them?" said the admiral.

"You mean *destroy* them, sir?"

"I don't mean make love to 'em, Jacoby! I know we can destroy them, but can we get close enough to disable 'em, carefully, without killing?"

"Hard to say, at six days distance."

"That's what I was afraid of. Well, tomorrow, we'll radio 'em to heave-to and wait for us."

"Do you think they will, sir?" asked Steen.

"That depends, David, that depends. If they know why we're after Ching, they'll do *anything* to keep him. But, then, they may not know. In which case, they won't take any silly chances."

"And if they try to get away?"

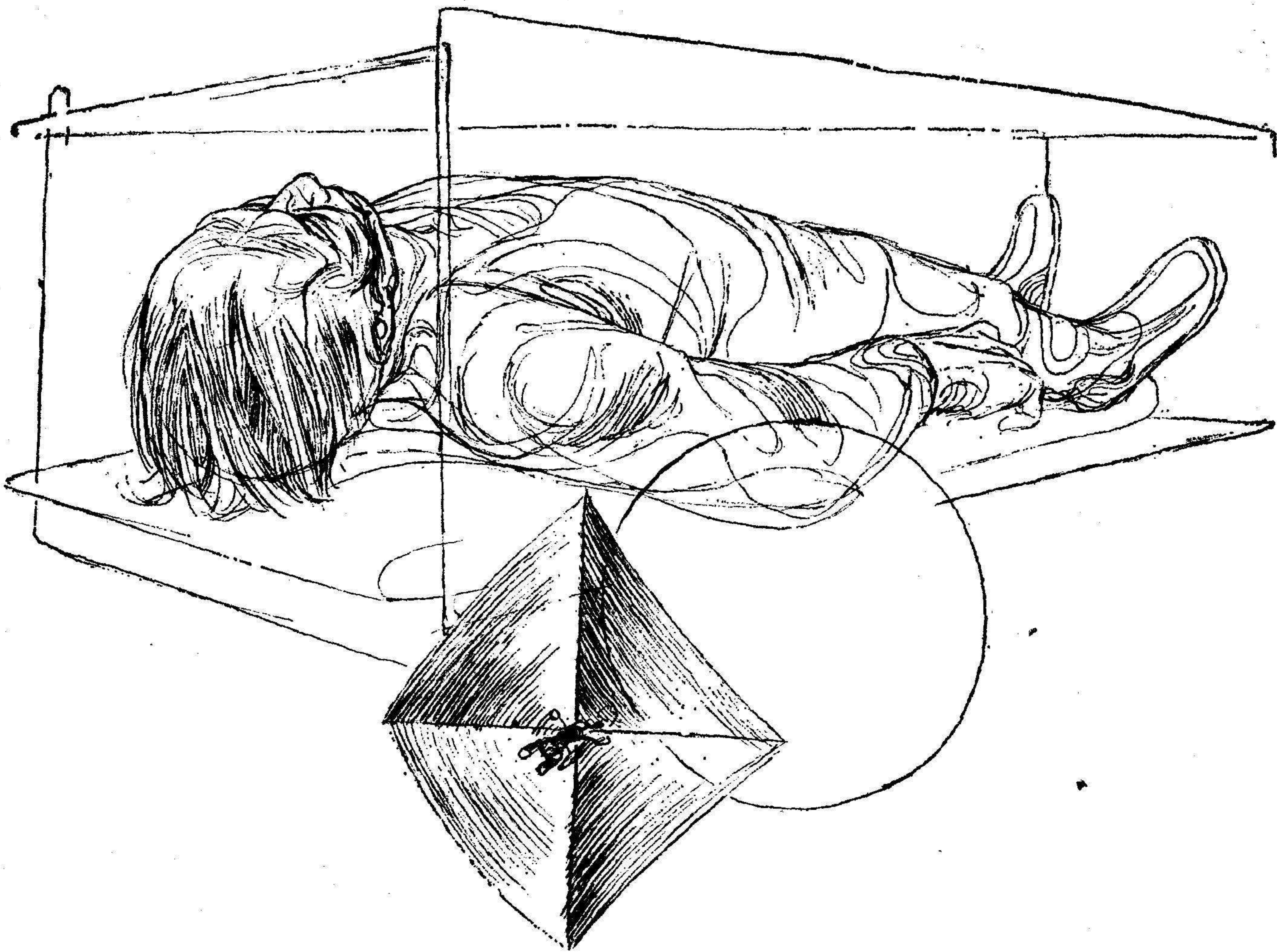
Grand Admiral ben Ezra frowned. "If they try to get away, we have two choices. We can blast 'em, or we can plot their next course, and be waiting for 'em. Six days, we can easily make up on the next hop. The thing is, if we *do* blast 'em, and can't confirm that Ching was aboard, then we'll have to backtrack to Maxwell, maybe even back to Earth, and we'll never really *know*."

"But, sir," said Steen, "do you really think Reed would risk his ship for Ching, *even if* he found out?"

Jacob ben Ezra laughed, and shook his head. "I'm not sure," he said, "but I am sure that Captain Reed is as clever as I am. Which means, if he *does* find out, he'll know that we can't blast him without *knowing* that Ching is aboard. If he finds out, he'll run all right. And you know something, David?"

"What, sir?"

The admiral lit another cigarette. "I'd do the same thing myself," he said.



Captain Peter Reed cursed loudly. "Just great, just wonderful! Six days away! Six days away, and that bloody sphinx of a Ching hasn't—I've a good mind to call it a business loss and turn him over to ben Ezra."

"Sir," said the radioman fearfully, "Admiral ben Ezra is still calling—"

"Put it through to this 'visor, but *don't* answer. And stop all communications with Nuova Italia. I want it to look like our radio's dead."

"Yes, sir."

"Roger!" said Reed into the communicator. "Prepare to break orbit immediately, and stand by. And get Ching up to the conning globe on the double!"

"But, sir, Ching has never been in zero gravity before, he—"

"Drag him up here by the hair, if you have to!"

It was only three minutes later when Roger Reed hauled a green-looking Ching into the conning globe.

"Captain," said Ching, "is this *really* necessary? I—"

"I want you to hear something, my tight-lipped friend," said the scowling Peter Reed. "I want you to hear it directly."

He turned on the televisor. The tired, wizened face of Jacob ben Ezra filled the screen. Ching paled, even through his nausea.

"... Calling the *Outward Bound* ... Calling the *Outward Bound*. Calling Captain Peter Reed ..."

The pale visage on the televisor paused to light a cigarette.

"Really, Peter," said Jacob ben Ezra, "this is ridiculous. I know you're reading me."

Peter Reed could not help smiling.

"Very well, Peter," said the voice of ben Ezra, "we'll play it your way. So *don't* answer me. *I'll* do the talking. You probably have a Dr. Ching pen Yee aboard. I want him. I've come all the way from Earth for him, and, by space, I'll have him, or I'll blow you to bits. You have five minutes, plus the time lag, to answer. If you don't answer *then*, I will take appropriate action."

Captain Reed turned the televisor off.

"Well, Dr. Ching," he said, "do I turn you over to ben Ezra, or do you talk?"

A new emotion crossed Ching's face. It did not seem to be fear, it was more of a manic defiance.

"You don't understand. I do not care about death, captain," he said. "I have not fled to save my life. Had

I remained on Earth, my life would not have been endangered. But—”

“But *what?* You heard the admiral. You have five minutes to make up your mind.”

Ching sighed. “It is my work that must go on. *That’s* what they want to stop. Very well, captain, I must take the chance.”

“So?”

“There is no simple way of explaining it. I have told you that I am working on a corollary to the Special Theory of Relativity. It is the Special Theory of Relativity, as you must know, which limits all speed to the speed of light. Essentially, it means that at the speed of light, mass is infinite, therefore it would take an infinite thrust to accelerate to that limit, and exceeding it would be impossible. But, as I have said, I am working on transfinite substitutions. I hope to evolve an equation—”

“Come to the point, man, come to the point!”

“There is no simple point, captain. I am engaged in the preliminaries of a work that some day may lead to a theoretical means of exceeding the speed of light within the Einsteinian Universe—”

“*An Overdrive!*” shouted Captain Reed.

“Not for a long time,” said Ching pedantically. “It—”

But the captain was no longer listening. *An Overdrive!* Countless others had tried before, but Earth thought that *this* man was close enough to send ben Ezra sixty light-years to . . .

Reed’s trader’s brain analyzed the situation with the speed born of commercial instinct. An Overdrive would be the most valuable commodity any trader ever had to sell. The *Outward Bound* could sell it again and again, on each of the sixty-seven planets inhabited by Man, each time commanding a price undreamed of in all history!

And ben Ezra would not take the chance that Ching *wasn’t* on the *Outward Bound*. He would have to *know*. He couldn’t . . .

“Hang on to something,” shouted Peter Reed.

He yelled into the communicator: “Break orbit! *Do it now!*”

“What course, sir?” came the tinny voice.

“Who cares?” roared Reed. Just get us away from here. Raise the sails, activate the ion drive. Maximum thrust on the reaction rockets! Do it now! Now! *Now! NOW!*”

Jacob ben Ezra shook his head, with a Gallic shrug. Reed was running. What else could he do? But that means he *knows*. It must!

Ben Ezra lit a cigarette. “Change course,” he said to his navigator. “Accelerate. Follow them.”

“Are we going to attack?” asked Commander Dayan, floating alongside the admiral in the conning globe. His dark, mustachioed face was alight with an eagerness that ben Ezra found distasteful. But then, one could not really blame Dayan. Gunnery officers usually have nothing to do but sit around.

“Not now, at any rate,” said the admiral. “Better strap in. Acceleration coming up.”

Ben Ezra stared out the viewport at the stars.

My stars, he thought. Our stars. Mine and Peter Reed’s. No wonder my stomach isn’t in this. Reed and I have been in space longer than anyone else. In eight hundred years, we’ve met just five times, and yet . . .

And yet, I feel closer to him than to all the politicians on Earth. What do *they* know about the stars? All they’re interested in is preserving their petty little planet’s rule over Man. They wouldn’t know what an Overdrive would mean. It would mean that Man would have the Galaxy, it would mean that one wouldn’t have to be a pariah, a man without a planet or a time, to be a starman.

But is that what they think of? Huh! All they see is the end of Earth’s control. Of course, they’re right. The only thing that makes Earth undisputed master is *time*. Earth is always generations ahead of the planets. Its head start in technology will hold up forever—

But not if there should be an Overdrive—not if Man could go from Earth to the outer ring in months, not centuries.

He glanced at David Steen, strapped in beside him. Young but intelligent. Some day—

“It’s a dirty business, David,” he said, almost involuntarily.

“Sir?”

“I said it’s a dirty business. I never thought I’d be a hired murderer.”

“But, sir, we have orders. It’s a military mission. You have no reason to blame—”

“Orders! The orders of men who are all dead by now. The orders of an Earth that doesn’t even give a damn about the possibility of Man *really* having the stars. Orders to destroy, orders of a willful, selfish . . . ah!”

“Admiral ben Ezra, our orders are simply to make sure Dr. Ching doesn’t escape. Not necessarily to kill anyone. Besides, we’re—”

“Yes,” said ben Ezra bitterly, “yes, I know. We’re soldiers.” A new and narrow look came into his large gray eyes.

“But you have a point, David,” he said. “Our orders are simply to bring back Ching, and eliminate all knowledge of his work. They don’t say anything about blowing up traders, do they? I’ve not been ordered to kill Peter Reed.”

“No, sir.”

“No, indeed,” said the admiral slowly.

“By all space,” he roared, “we’re going to carry out our orders! But we’re going to do it without killing Captain Reed!”

“Well,” said Manuel Olivera, “where do we go from here?”

“Out to the outer ring, I suppose,” said Peter Reed. “We are in a very peculiar position. I’m *sure* that ben Ezra won’t blast us without boarding. He’s got to make sure

he gets Ching. But wherever we go, he can plot our course, and be there first. Whatever we do, we've got to do it between now and the next planetfall."

He leaned his face in both hands, propped upon his elbows on the mahogany desk top.

Ching sat nervously in front of him, and Olivera paced the room.

"I still don't see *why* Earth wants to stop you, Dr. Ching," said Olivera.

"In a way, I do," replied Ching. "Positively speaking, the Overdrive would mean the inevitable end of Earth's domination. Without the time differential, Earth would be just another planet."

He managed a small grin. "But on the other hand," he said, "scientifically speaking, they're being most foolish. I am perhaps twenty years from an equation from which an Overdrive could be developed. All I have, right now, is a new point of view. For a thousand years, men have been searching for an Overdrive, always trying to escape from the Einsteinian Universe. Sometimes they look for a mythical thing called hyperspace, or subspace, or the fourth dimension. What I have done, is simply to begin an inquiry, *within* Relativity Theory, modifying not the equation, but the substitutions."

"What is all that about?" snapped Olivera.

"I'm not sure yet," said Ching abstractedly. "But basically, if you accept the Special Theory of Relativity, the reason that the speed of light cannot be exceeded is that mass is infinite at the speed of light, hence it would take an infinite force to accelerate it to that speed.

"*But*, if there were a drive whose thrust was a function of the mass it was accelerating, then, as mass increased, thrust would increase, and at the speed of light, theoretically, where mass was infinite, *thrust* would also be infinite. And if the thrust-mass equation involved a suitable exponential function — in theory, anyway — thrust could become *transfinite*."

"Making it possible to go faster than light!" said Olivera excitedly. "Yes, yes, Dr. Ching. If there ever is an Overdrive, it will have to be developed along those lines! Tell me, how close are you?"

Ching laughed bitterly. "As I said, perhaps as much as twenty years away. Who can tell? Right now, all I have is a point of view, a direction in which to proceed. I must experiment with substitutions, then I must develop the proper thrust-mass equation. And at that point, the real work only begins. I must then develop a theoretical basis for a drive that can utilize the thrust-mass equation, a drive, where, not only does thrust depend on mass, but in the precise proper function as well. It's a very long way off."

"But man, it would be an Overdrive!"

"Not even then," said Ching. "That would be the end of *my* work, and the beginning of someone else's. I am not a practical scientist. Someone else would have to take my equations and develop the actual Overdrive."

He sighed and shrugged. "That's why I can't under-

stand why Earth won't let me be. All I want is to be free to develop my equations. It's my whole life! I could build no drive, I—"

"When you rule an empire of more than sixty planets, over a time differential of over two hundred years," said Captain Peter Reed, "you must plan and plot far ahead. You must take a very long view."

"Well, now that we know what we've got," said Olivera, "what are we going to do about it?"

Captain Reed drummed his fingers nervously on the desk top. "I'll be damned if I know," he said. "Fact: an Overdrive would be the greatest commercial coup in history. Fact: it would take about twenty years to develop one, from the start we have. And finally, fact: we will *have* to let ben Ezra aboard on our next planetfall. He'll be waiting for us, and there'll be no escaping. That's why he's let us get this far. This, gentlemen, is what is known as a bind."

"Time," said Ching absently, "why does it always come down to time? The Overdrive wouldn't even be necessary, if it weren't for the time factor. Then Earth would've let me continue my work unmolested. And now, it's a matter of time before ben Ezra gets me, too little time—"

"You're a mathematician," said Peter Reed. "You should know that time underlies the Universe, space . . . history—"

"Time," said Olivera. "Peter, we've just *got* to save the Overdrive! It's bigger than us; it's bigger even than the *Outward Bound*. It's bigger than Earth! We've just got to buy the time, *somehow*."

"Twenty years," said Peter Reed. "In twenty *days*, we'll have to go into Deep Sleep, or we'll run the risk of depleting our oxygen, our food, our water. And when we come out, Jacob ben Ezra will be waiting for us."

A slow, grim smile parted Ching's tight lips. "Twenty years—" he said slowly. "Captain, where are we heading?"

"Out to the outer ring, maybe to Toehold."

"And how long will such a trip take?"

"About a hundred and twenty years."

"Captain," said Ching, "we don't *all* have to go into Deep Sleep, do we? There would be enough food and air for, say, one man to stay awake, for say, *twenty years*?"

Peter Reed suddenly became aware of the feverish glow of the abstract fanatic in Ching's eyes.

"You mean you would stay out of Deep Sleep? You would die in space, in the nothing between the stars? You would be alone, *utterly alone*, for twenty years."

"I am well aware of the consequences, captain. Nevertheless, it would enable me to complete my work. *That* is all that matters. Could it be done?"

Reed stared wonderingly at the small man. "Sure. There'd be plenty of food and air for one man to do it. By a factor of ten, at least."

"Well then, captain?"

"Are you sure, Dr. Ching? It's one thing to talk about



it now, but when you've been alone for one, five, ten years—"

"I am willing to take that chance."

"Well . . . we could rig up a cubicle so that you could go into Deep Sleep any time it got to be too much for you—"

"Why, he might complete his work, and still make it to Toehold!" cried Olivera.

"He might," said Reed. "Of course, even then, we would still have the problem of dealing with ben Ezra—"

"Oh, space, Peter!" yelled Olivera. "One thing at a time. This is it! This is the *only* way!"

"I suppose you're right, Manny. Have your boys set up the necessary automatics. Let Dr. Ching get acquainted with our computer."

"Thank you, captain," said Ching. "We will beat them, after all."

"Perhaps," said Reed. Is your *we* the same as my *we*, he thought; is your *them* the same as my *them*?

Olivera had ceased his pacing. He appeared lost in thought.

"Manny," said the captain, reading his old friend's mood. "Manny, what is it?"

"Dr. Ching," said Olivera, "what will we have when your work is finished, I mean, what end result?"

"Why, I hope, an equation giving a principle upon

which an Overdrive could be built," said Ching gravely.

"A *principle*," said Olivera slowly, "an *equation*. But not *plans*, not *blueprints*, not even a schematic diagram."

"What do you expect of me?" said Ching plaintively. "I'm a mathematician, not an engineer. Such a thing would take a pragmatic scientist, working hand in hand with—"

"Yes," said Manuel Olivera, "so it would."

"*Manny!*" shouted the captain. "You wouldn't—"

"I must, Peter, I must! Someone must. We've got to have more than an equation, when we run into Ben Ezra. If we've got pragmatic plans, we can send out all six of our gigs to Toehold. It's an undeveloped planet, they'd never be able to do anything with an equation. But plans—And ben Ezra would have to destroy seven targets, instead of one. Someone would get through."

"It would not be as bad for him, captain, as it will be for me," said Ching. "He could stay in Deep Sleep until I was ready for him. It would only be a few years for him."

"All right, Manny," said Reed, "you win."

But even as he gave the orders for setting up the automatics, something was nagging at the back of his mind.

Disperse the plans indeed! Sacrifice the *Outward Bound*! There must be a better way. Perhaps, ben Ezra could be fooled—just this once. What if he *got* Ching?

Might it not be possible to convince him that Ching had never talked? Perhaps, perhaps—

Even as the nothingness of Deep Sleep overtook him, Peter Reed was still dreaming of the greatest commercial coup in history.

Jacob ben Ezra was dissatisfied, and he didn't know why. His ship was already orbiting Toehold, the *Outward Bound* had been spotted, a week away, all was set, and within eight days, he would have Ching.

But somehow, he felt dissatisfied.

"David," he said, "I feel *dirty*."

"But, sir, why?"

Ben Ezra lit a cigarette, the thirtieth of the twenty-four hour period. As far as he could remember, it was a record for him.

"We're men of space, David," he said. "We're no more emotionally bound to Earth than Reed is. *Homo Interstellarus*, I think of us as. An Overdrive is something we should welcome, not suppress."

The young commander was silent. To him, ben Ezra knew, orders were orders. He had been born aboard ship, the Fleet was all he knew or cared about. And the Fleet was an agent of Earth.

"Don't you see, David? Of course you don't! Our duty as officers is clear—to obey orders. But we have a duty as men, as well. And, by space, that duty is to preserve the Overdrive!"

"You would disobey direct orders, sir?"

"No, dammit! I've been in this service all my adult life. Orders must be obeyed. If the Fleet decided to take the law into its own hands, we'd be no better than pirates. No, David, orders must be obeyed. But that doesn't mean I have to like it. It won't help me sleep any better, or enable me to smoke less of these infernal cigarettes."

"No, sir."

"I almost hope . . . I almost hope—"

"What, sir?"

Ben Ezra grinned humorlessly. "I almost hope Peter Reed can figure out a good way to trick me. I'd almost like to see him get out of it."

Manuel Olivera held the sheaf of papers in front of him. "Seven years!" he said. "Seven awful, lonely years, the two of us working together. But here it is, here it is!"

Peter Reed looked in wonderment at Olivera. His hair was now flecked with gray. He had lost fifteen pounds. But the greatest change was in his eyes. There was a haunted fire, an emptiness. What those seven years must've been like, thought Reed.

"And now he's dead," said Olivera. "Dead of old age."

"But did he get into the cubicle?" asked Reed. It was essential to have Ching's body.

"Yes, he got in. But he was a broken old man. Even as I watched him go under, I knew he would never survive the thaw." Olivera sighed heavily. "It was hard for me, but what was it for him! Twelve years! Twelve years

alone! It was a full twelve years before he thawed me out."

"But he did it," said Reed.

"Yes, he did it."

"And now we have ben Ezra to deal with. He's already orbiting Toehold. Six days—Manny?"

"What, Peter?"

"I don't suppose we could rig up an Overdrive? We have plans, blueprints—"

"Not a chance. There's a good three or four years' work, technical experimentation needed, and even if we had the time, we need things we couldn't possibly make ourselves."

Reed shrugged. "Just thought I'd ask. We're sitting on top of a mint—"

"A mint!" roared Olivera. "A mint! Is that all it means to you, a *commodity* to sell? Peter, I didn't think you were such a fool. Is that what Ching died for? To line our pockets?"

"Ching died for that mysterious thing called abstract knowledge, and you know it Manny," said the captain. "He didn't care any more about giving the Overdrive to Man than he did about the profit!"

"Profit! You think you can make a profit out of this? Think, Peter, think. What will happen to the *Outward Bound* when Man has the Overdrive? We'll be finished. All tradeships will be finished. We owe our existence to the time lag, as much as Earth's rule does. I thought you realized that from the beginning. I thought you were willing to sacrifice it for Man. I . . . I was a bigger fool than you are!"

It hit Reed like a piledriver. Manny was right. The Overdrive meant the end of the tradeships. Selling the Overdrive would ultimately be the end of the *Outward Bound*, of the way of life he had followed for close to a thousand objective years.

Peter Reed knew that if the Overdrive became known, he would be the last captain of the *Outward Bound*.

"You're right, Manny," he said. "I suppose that solves our problem. We'll just give it all to ben Ezra."

"*Will we now, captain?*" sneered Olivera. "Even if you don't care what this means to Man, think of your own hide. What do you think ben Ezra will do if he knows *we* know?"

"Why, he'll—"

"Exactly. He'll kill every one of us. Or at least haul us back to Earth, where the best we can expect is to be imprisoned for the rest of our lives. *Without trial*."

Reed cursed. It was true. The only thing to do, is to play it through. At least, if we can fool ben Ezra, I can make my own decision.

"Well, captain?"

"Destroy those plans. But first, microengrave them in some part of the ship, a wall, a toilet, anywhere. Don't even tell me where. I don't want anyone but you to know, till this is over. Then destroy our transmitters. Make it look like they've been out ever since Maxwell, but make it look like an accident."

"What about Ching? Should we destroy the body? Maybe we can convince ben Ezra that he was never aboard."

"Not a chance. I've got it! Rig his cubicle so that it looks like the machinery failed, and he died of old age, *inside* the cubicle. Can you do it?"

Olivera puckered his brows. "Won't be easy," he said, "but I think so."

"Well, that's all we can do until ben Ezra boards."

"You're going to try and convince ben Ezra that Ching never talked? You expect him to be so stupid as to swallow *that*?"

Peter Reed licked his lips.

"No," he said, "but I know Jacob ben Ezra. What I'm banking on, is that he'll try and convince himself."

"To what do I owe this pleasure, Jacob?" said Peter Reed, sitting behind the big mahogany desk.

"To what— Peter, you *know* I've followed you all the way from Maxwell," said Admiral Jacob ben Ezra.

"All the way from Maxwell!" exclaimed Peter Reed. "Why in blazes didn't you give me a call on the . . . oh, oh! I keep forgetting that the radio's out of commission. Then you *did* call me?"

Ben Ezra looked at his aide, and then at the ceiling. "Yes I did call you. Is your radio *really* out of order?"

"Freak accident," said Reed. "Meteor hit the radio shack. Small one, but enough to smash things up. Say, you wouldn't have a spare F-46E transmitter housing?"

"I'll see what I can do," said ben Ezra coolly.

"Roger, get us some drinks, will you?"

Roger Reed produced four of the hot-cold cocktails.

"These are most amusing, Jacob," said Captain Reed.

"I left Earth about the same time you did, this time, Peter," said ben Ezra. He lit a cigarette.

"Still smoking those filthy things, eh?" said Peter Reed conversationally.

"*Captain Reed*," said ben Ezra, "aren't you even *interested* in why I've followed you for a hundred light-years?"

Reed laughed. "Something sinister, Jacob? I assumed that when you hailed us at Maxwell, and we didn't answer, you thought we were in trouble, and—"

"Really, Peter!" said ben Ezra. "I'll come to the point, even if you won't. Do you have a passenger?"

Peter Reed frowned. "So that's it," he said. "Look, Jacob, we're fully insured for this kind of thing. Million credit liability policy. It's a hefty premium, and the chances of it ever happening are so slight, but—"

"What in blazes are you talking about?"

"Why our passenger, of course," said Reed blandly. "Isn't that what *you're* talking about? I sure as hell don't know how you found out, but I assure you it was a legitimate accident, and we're fully covered."

"Covered? Accident?"

"Oh, come on, Jacob, stop playing cat and mouse with me!" snapped Reed. "All right, all right, if that's the way

you want it, I'll tell you the whole thing as if you didn't know what happened."

"I certainly wish you would," said ben Ezra.

"Well, we *did* have a passenger. Picked him up on Maxwell. Strange little fellow called Ching pen Yee. That director, what was his name?"

"Lazlo Horvath," said David Steen.

"Yes, yes, Horvath. The dirty crook. Told me some kind of fish story about how this Ching was some kind of important scientist. Well, ordinarily, you couldn't fool me with a thing like that, but as you know, we have the force field to sell this trip, and Horvath simply didn't have anything better to pay for it, so I took a chance on this Ching. What a joke!"

"Joke?"

"Yes," said Reed. "Scientist? Why the man was a raving lunatic! Classic case. Paranoid delusions. Thought the entire Terran hegemony was out to get him. Literally. Not only that, but delusions of grandeur as well. Why, he thought he was the greatest thing since Einstein! Secret of immortality, conversion bomb, all the usual mythical nonsense."

"A madman?" said ben Ezra, his eyes narrowing to slits.

"What a madman!" exclaimed the captain. "To top it all off . . . why do you know what, Jacob? He thought he had the secret of Overdrive as well!"

"*Really*," said ben Ezra, perhaps a shade too dryly.

"I swear, I expected him to pull the Philosopher's Stone itself out of his pocket!" laughed Peter Reed.

"Indeed."

"Where is this Dr. Ching?" said David Steen.

Ben Ezra flashed him a dirty look.

"Ah, you know as well as I do, Jacob, don't you? A one in a million accident, but it *did* happen. The automatics in his Deep Sleep cubicle malfunctioned. He died of old age on the last hop."

"Died?" said ben Ezra slowly.

"I assure you Jacob, there was no lapse in safety procedures, and we are fully covered."

"To be sure," said ben Ezra. "To be sure." His eyes were even more unreadable than usual.

"Do you by any chance have the body?" he said.

"Yes," replied Reed. "It's still in the cubicle."

"Good. Mr. Ching had relations on Galdwin, which . . . er . . . is our next stop. We will take the body to them. David, get a detail."

"But, sir—"

"*David!*"

"Yes, sir."

"A most unfortunate accident, Peter," said ben Ezra. "Yes."

"But you say the man was mad anyway," said ben Ezra, bringing his face close to Reed's.

Reed stared back. "Very mad," he said evenly.

"You are *quite* sure?" said ben Ezra.

Reed drummed his fingers nervously on the desk. Ben Ezra's glance fell to Reed's hand, for a short moment. Reed's gaze followed. Then they were staring in each other's eyes again.

"Quite sure," said Peter Reed.

"I see," said Jacob ben Ezra. The corners of his mouth curled upward in the slightest suggestion of a grin.

Reed's mouth went dry.

"Well, Peter," said ben Ezra, suddenly and unexpectedly convivial, "it's been nice meeting you again. Very nice. But I really must be going."

"Sorry to see you leave so soon," said Reed.

"I'll bet you are!" said ben Ezra with a little laugh. He walked to the door and opened it.

"Good-by, Peter," he said.

"Good-by, Jacob."

As he stepped through the doorway, the admiral swiveled his neck to face Reed.

"Perhaps," he said dryly, "*I'll be seeing you a lot sooner than you think I think.*" Then he was gone.

"What in space did he mean by that, Dad . . . *sir?*" asked Roger Reed.

The captain stared at the empty doorway.

"I think I know," he said, "but I'm not sure I *want* to know."

Peter Reed floated by the viewport, watching ben Ezra's ship break orbit.

He's really going, Reed thought. But he did not feel like congratulating himself.

He *knew*. He *had* to know. Jacob would never have swallowed a cock-and-bull story like that unless he wanted to. Well, he's got Ching's body, and he'll take it back to Earth, and that'll be the end of it. The Overdrive is mine.

But what, he thought, am I going to do with it? The safe thing would be to destroy the plans . . . or—

It'd take time and money to build it. The *Outward Bound* could never do it alone, but there are planets out here on the outer ring who'd do the work, and not ask too many questions.

Or there's Maxwell. Horvath is dead, but there's never a dearth of his kind. The Overdrive would bring a fantastic price from someone like that. But what would he do with it? Rule the Galaxy?

The Galaxy . . . who can say anything about the Galaxy? Man has seen such a small piece of it. Naturally, the chance of running into another intelligent race has been nil, as long as we were confined to such a small volume of space. But now—What exists in the center?

Without realizing it, Peter Reed had made his decision.

Ching had died for the Overdrive, thought Reed. Manny's given seven years of his life for it, seven lonely years.

And Jacob—Jacob took the biggest chance of his career to give Man the Galaxy.

Captain Reed sighed resignedly. One doesn't go in for this kind of life unless one is something of a romantic, he thought, no matter what I may say about profits.

What have all the profits been for? Just to keep the *Outward Bound* in space. Why stay in space? What logical answer is there?

Reed remembered a quotation from a man thousands of years dead, so long his name had been forgotten.

"Why climb mountains?" they had asked the mountaineer.

"Because they are there," he had said.

Why go to the stars? *Because they are there.* It was enough.

Manny understood that. In a way, perhaps Ching understood it, too.

And Jacob had risked a thousand-year career so that Man could have the Galaxy. *Because it was there.*

And can I do less, thought Peter Reed. A few hundred light-years of space is no substitute for the Universe.

Roger may never be captain of the *Outward Bound*. The twilight of the tradeships has already begun—

Reed looked sadly out the 'port at ben Ezra's receding ship. Good-by, Jacob, he thought; good-by to a way of life a thousand years old.

But Man must have the Overdrive.

Jacob ben Ezra watched the green disk of Toehold slowly recede. Hidden on the other side of the planet now, was the *Outward Bound*.

By now, he thought, Peter will have decided to build an Overdrive.

He laughed softly to himself. We old foxes understand each other. We both have our excuses—Peter his profits, me my duty.

But when it comes down to it, we're both in space for the same reason. and neither of us can put it into words.

So Earth will be satisfied. They'll have the body of poor Ching. Little will they know, little will they know, until it's too late.

There are planets out here that will ask few questions. Peter has the force field to sell, and for that, he can get his Overdrive built. And after that—

After that, in the short run, who knows? Ben Ezra shifted his gaze to the vast, multi-colored cloud of stars that is the center of the Galaxy.

In the short run, who knows, he thought. Who cares? But in the long run—

In the long run, Man will have the Galaxy, perhaps not to himself, *certainly* not to himself, but have it he will.

The admiral put out his half-finished cigarette. I've been in this business so long, that I'm a legend, he thought. How ironic that the thing I can be most proud of is something that, once the Overdrive is a reality, will be called a failure.

He looked at the cloud of stars. They seemed to be looking right back. Come on, they seemed to say, we've been waiting.

A failure—Maybe you could call it that—

He grinned at the far glow of the Center.

"Coming!" he said. ■

THIRD ALTERNATIVE

The problem,
when you're caught with a choice
between two obnoxious choices, is to
find a third alternative, of course.
With the added proviso it isn't
an even worse stinker . . .

ROBIN SCOTT

Illustrated by John Schoenherr

In the morning before he started out, Jonathan Burke stopped off at his office in the New Chicago Gallery long enough to inspect some new acquisitions from the Colorado cave probe and to dictate a few letters into the voice-writer. He puffed a cigarette for a moment or two, waiting for the clean copies to be delivered, and then signed them, gave them to his secretary to be transmitted, and walked out to the Gallery lobby to catch the down-state local. He showed his sterility certificate and free-movement pass to the conductor, and left his thumbprint on the plastic disk of the identi-recorder with the same sense of irritation he always felt toward personal controls. Like all rational men of his time, he appreciated the necessity for movement and population controls: Malthus' mathematics had been wrong, but time had proved his predictions accurate. Still it rankled Burke. He had seen too much of other times, other civilizations, and it was difficult for him to accept controls.

As the local flitted quickly through the Loop traffic and headed out on the intermediate level toward Cicero Interchange and the twenty-minute trip to the St. Louis Interchange, Burke relaxed, letting the acceleration push him back deep into the couch. The problem that had been teasing at his mind all morning, that had been teasing at his mind every morning—and afternoon and evening—for months, could no longer be repressed. Now, briefly freed of welcome distraction, held immobile in the couch, he could no longer keep it submerged. With a look of annoyance on his face, of self-disgust at his lack of mental discipline, he sighed, folded his arms behind his large, rather square head, and staring unseeing up at the rounded cabin ceiling, began the endless internal dialogue anew.

What the hell, Burke. It's a simple enough choice. Really very simple. You have two—count 'em—two alternatives: A, you accept the Assistant Directorship at the Gallery and don't go time-probing anymore; or B, you turn down the Assistant Directorship and continue time-probing. A simple enough choice. A, you don't get sick as a dog every time you run into some un-mutated virus nobody in your own time ever heard of; you don't get arrows fired at you by some Sixteenth Century Moor or get caught in Eighteenth Century Italian wars; you don't get stuck for six months in a cold Bavarian attic trying to put together some kind of a workable antigrav sled with-

out even a soldering iron; you don't find yourself aging six months or a year every time you go off for an afternoon's work.

More than that: you sit in comfort and let some other yahoo fight off the Moors; you get a nice raise in salary and Class II status; you get a chance to run the collection the way it ought to be run; you can meet some nice girl and sign a shackup contract with her—or maybe even get a eugenics permit and get married. It would be good to have some kids, and you're not getting any younger, Burke. You're not getting any younger, but fast.

That's A.

B, you keep on time-probing. You get sick. People try to kill you. You're on the move all the time. After a while you're no more at home in your own time than you are in a dozen others. You're rootless. Yes, all that, but you're free. You're one of sixteen men—the most rigorously selected and intensively trained group of men in the world—who are time-probers. You work under incredible conditions, and you suffer. And your reward? For certain segments of your life—when you are outside your own time, your own civilization—you live free, without controls. For a little bit, you are yourself.

Yeah, Burke, a simple decision. A or B.

Not some of A and some of B. A or B.

The local cleared the St. Louis Interchange and headed south toward Cairo. Burke's destination was some five minutes away.

The acceleration ended, Burke sat up in his couch and stared at his reflection in the port without really seeing it. As he fretted over his problem, his widely-set eyes, gray

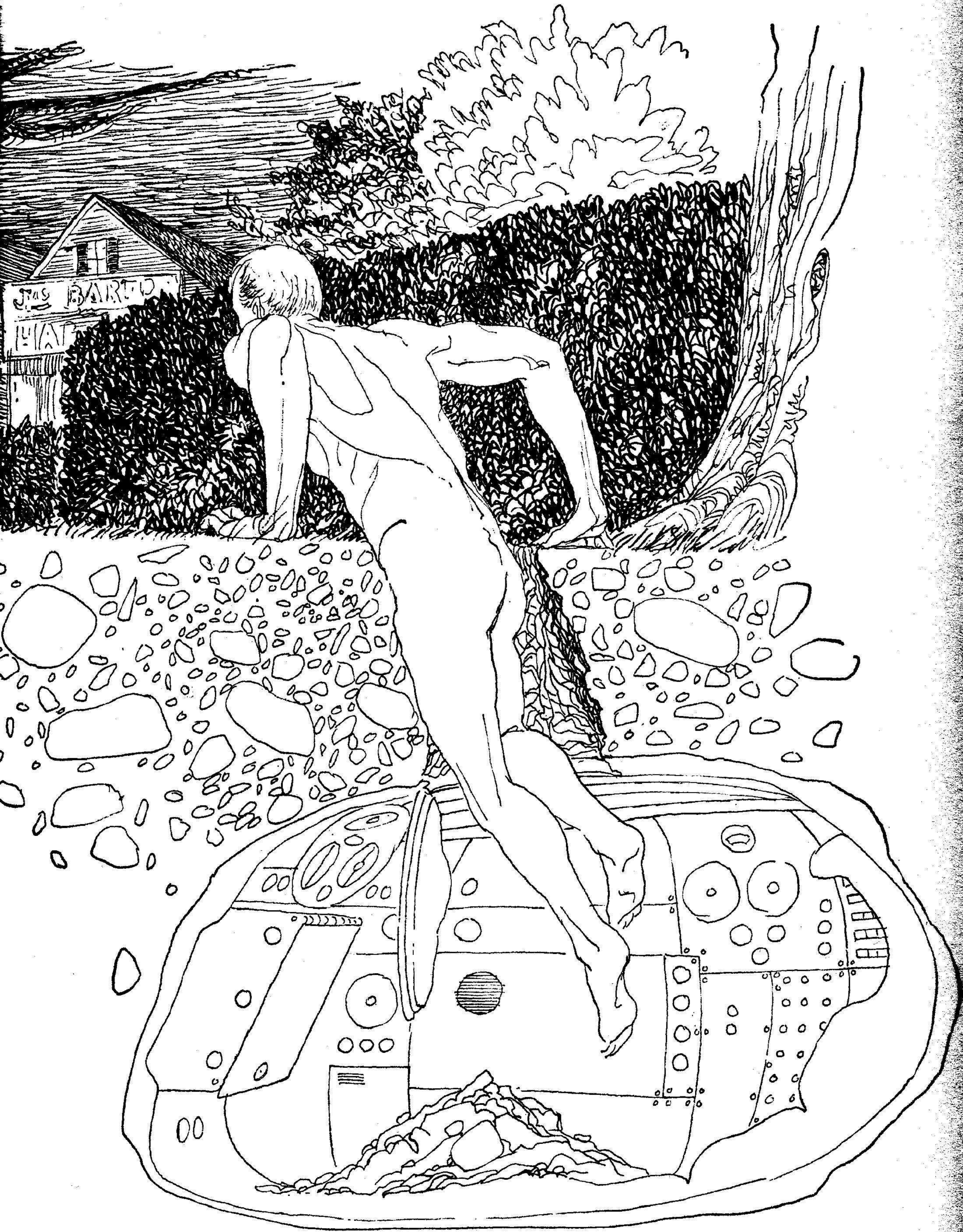


under bushy dark brows, assumed a piercing, almost hostile look. He felt a growing, senseless anger. It was not the choice of one alternative over the other that bothered him so much, but the fact that in choosing he was forced to renounce the other alternative so completely. He wanted the Assistant Directorship, wanted it very much indeed, but the thought of giving up time-probing forever was almost unbearable. "Why couldn't a man do both," he thought irritably, foolishly. "Why must a man give up something he loves in order to do something he loves?"

But he knew the answer, and felt childish in his petulance. Both jobs were too demanding, too consuming. No man could do both and do justice to either. The terrible division between the man of action and the man of thought has always worked a special hardship on those men in every modern generation who are both; Burke, like many other men of his time, had reached the point where brain and muscle and nerve and skill would not support both modes of life, and he had to choose between them. His alternatives were attractive—too attractive—and he could not accept either without a painful sense of loss for the other.

The local slowed to discharge speed as it passed over Burke's destination, the small southern Illinois town of Center City. Burke left his couch, exited through the chute along with a traveling salesman clutching his sample case in his arms, and spun down with him to the catcher located to one side of the sleepy town square in front of the courthouse. Dr. Emerson was waiting for him near the center of the square next to the small prefab building containing the capsule. A few loungers in front of the courthouse looked up with a flicker of interest as Burke jumped down from the catcher and walked across the square to the waiting Emerson. But time-probes had already become fairly old hat. The prefab, freighted down from Chicago the day before, would be gone in another day, and the World Series, then into the fifth game and all tied up, held a great deal more fascination for the residents of Center City than did the Chicago Gallery crew and its featureless aluminum prefab.

As Burke and Emerson walked to the prefab, Burke peered around the square carefully, orienting himself in the strange town. He was already unzipping his coveralls as they stooped to enter the low doorway.



"We've set the height vernier as accurately as we could," said Emerson when they were inside, "but if you come in too deep, or if there's too much tree or bush over you, come on back and we'll set again. This square was pretty well covered with trees and shrubbery at target time."

"O.K.," said Burke. "How much digging do you figure?"

"No more than two feet, and maybe a little less."

"Good. That last one, in Washington, I had to dig for about six hours."

"Why didn't you pull back and come in again higher?"

"Well, it was Washington in '65-1965. There was a lot of ground water that year and they figured I'd better come in under a good clay layer or on the surface. And I couldn't risk a surface appearance because it had to be in downtown Washington. One of those dandy two-hour political jobs."

Emerson whistled soundlessly. "Boy, you do catch 'em, don't you. Well, this'll seem like a milk run to you. You've got all the time in the world. You'll have more than seven months before target time, which ought to give you plenty of time to get established. And Center City ought to be just about ideal for your appearance. Small, sleepy, not in the least hostile."

Burke was now nude. Dr. Emerson's two technicians were handing him small plastic-coated packets which, with considerable discomfort, he began to deposit within his body. Emerson made some notations on a clipboard hanging on the wall. Then, suddenly remembering, he said: "By the way, Burke, congratulations. I hear you've been named Assistant Director. When do you start?"

"I don't know yet," answered Burke. "Don't know if I'm going to take the job."

Emerson peered at him quizzically for a moment and then nodded. "Yeah, I know. Same with me when I gave up time-probing to be Project Director. Hell of a decision, isn't it?" Then, after a pause, he added: "But I was married. Made it a little easier for me, I guess."

By this time, Burke had only his mouth, his nostrils, and one ear free. With the oral packet still in his hand, he walked over to the pit in the center of the prefab and looked down at the capsule several feet below. Roughly egg-shaped, about two meters along its long axis, it was roughly camouflaged to resemble a boulder. In the early days of time-probing, more than one capsule had been dug up by accident and destroyed by mystified indigenes, necessitating a costly and difficult rescue operation.

As Burke let himself down the thin metal ladder to the exposed hatch in the capsule, Dr. Emerson squatted at the edge of the pit and said: "You can expect a pretty rough couple of weeks at first. 1904 was a bad year for virus infections, and while we've layered your initial drug packet for just about everything we could think of, there's bound to be something going around you'll be wide open for."

Burke glanced up at Emerson. "What did they call

virus infections? Ought to know in case I need a doctor."

One of Emerson's two assistants checked her notebook. "No real virology then. According to this they called it 'summer flu' or 'grip'. If you were younger, they would probably diagnose any virus infection as 'growing pains'. They may dose you with a mixture of crude orthorhombic sulphur and dextrose. 'Sulphur and Molasses' they called it." She grinned maliciously at Burke. "Have fun!"

Burke groaned in mock horror and made a wry face at her before turning to lower himself through the hatch. He pushed it shut behind him, squeezed into the seat in front of the console, and began to read off the instruments. One of the technicians, listening through the communications inductors taped lightly to the outside of the capsule, noted each reading on a clipboard.

"Air, green. Mass equivalent, green. Integrity, stable and plus forty. Power, on and full charge. Coil continuity, safe. Interlocks, off. O.K., give me the time tick."

The girl above him consulted a chronometer, and after a brief pause, threw a switch. Burke heard a series of three four hundred cycle notes. On the third, he threw a toggle to "on," stuffed the uncomfortable oral packet into his mouth at the same time, and waited for the ten seconds of gut-wrenching nausea that would signal his passage back through nearly one hundred eight years to June 17, 1904, 0210 hours.

The wrench came, and then it went. Burke waited for his vision to clear and checked the console. Everything was normal. He pulled the oral packet out with one hand and slid the protective shield down over the console with the other. Turning in his cramped seat, he reached up to ease the hatch inward an inch or two. A shower of earth and pebbles poured through the opening and then slowed to a trickle. Burke pulled the hatch fully open and reached up to claw more earth in. After a moment his hand broke through the surface and he felt cool night air pour in on him. He reached behind him to turn off the capsule light, and then, slipping the oral packet back into his mouth, he worked his head and shoulders, and finally his entire body up out of the hatch and through the hole to the surface. Breathing heavily, he lay stretched out on the dewy grass and looked anxiously about him. The square was heavily overgrown with ornamental shrubbery and small trees. Through the foliage he could just make out the gas street lamps and the row of shop windows along Main Street, across the square from the strangely new and clean stone of the courthouse.

His brief reconnaissance complete, Burke reached down into the hole and pulled the hatch upward until its latch snapped. Turning, he scabbled around under nearby bushes for loose soil, refilled the hole in the ground over the hatch, and tamped the fresh earth with the heel of his hand. Last of all, he grubbed up turf and leaves, and did his best to hide any signs of the fresh excavation.

Then, keeping low, Burke made his way silently to the largest tree in the immediate vicinity. He carefully noted

its position in relation to the arched entrance to the courthouse and the end of an ornamental iron horse trough so that he could find it again easily, and dug a small hole with his hands between two large and easily recognizable roots. He relieved himself of as many of his body packets as he could then conveniently recover and carefully buried them.

Sweating from his exertions despite the fact that he was nude and the night chill lay heavily in the deserted square, Burke sat to rest a moment and consider his next move. He wanted a cigarette, but he had none. The peculiarities of the time capsule were such that only living protoplasm could be transported—or things inclosed in living protoplasm: hence Burke's nudity and the necessity for the body packets. Burke himself was the cargo carrier in the time capsule; there was no room for such nonessentials as cigarettes. And this it was that made time-probing such an adventurous challenge: the time-probe operator was delivered into the target time—like a new-born babe—with nothing to help him in his mission except his own abilities and certain essential materials whose quantity was very much limited by the size of the "cargo carrier."

The capsule itself was like a fragile soap bubble, a tenuous skein of energies coursing through the capsule's shell and through all inanimate material within it. Burke—or any animate entity—represented a separate and distinct energy system. He could pass through the "soap bubble" without destroying it, but he could not remove any portion of it, could not rupture its "integrity" without destroying the continuity of its energy flow. Early in time-probing, experiments had been made with organic package carriers, but only the primates had body structures sufficiently like that of man to withstand the journey, and it was a messy and unpleasant business to strangle a small monkey, recover packets from its body, and then dispose of the body without attracting dangerous attention in the target time. It just wasn't worth it.

Rested from his exertions, Burke rose to a crouch and looked at the clock in the courthouse tower. It was 0417. "Good," he thought, "plenty of time." Like an agile ghost, he rose to his feet and flitted on bare feet from shrub to shrub across the square, stopping every dozen paces to watch and listen. He paused behind a large rose near the sidewalk, and then, his nude body glinting whitely in the early dawn light, he dashed across Main Street to the shadows in front of the drugstore. Cautiously, he made his way down the street to the first corner, worked his way around to the alley running behind the row of Main Street shops, and stood panting beside some trash cans behind the feed and implement store. He pulled a small pellet from his left ear, peeled its protective covering off, and grimacing, swallowed it. He stretched out full length on the cold gravel and cinders of the alley and within seconds lost consciousness as the drug took effect.

Some twelve hours later he awoke in a pleasant room with late afternoon sun streaming in through white cur-

tains. He was lying in a clean bed, its starched sheets cool against his skin. He glanced about curiously. There was a marble-topped stand next to the bed with a white enameled basin on it. Against the ornate brass rungs of the bedstead itself there hung a fever chart. Through the open window he could hear the rare—to him—sound of children laughing and the far off wail of a train whistling for a crossing.

"Ah! good," he thought, "a hospital." That was one of the good things about going back to early American civilization. They looked after strangers and bums then; they took care of the ill and the indigent. He remembered a similar foray into Seventeenth Century London, just before the fire. No hospital then. No chance to use a soporific to help him get through the first hours of difficult physiological adjustment.

A tall and handsome young woman dressed in a gray dress which extended demurely to her ankles, her luxurious auburn hair piled high on her head, came into the room. She smiled at him with an honest solicitude that had not yet become all professional veneer. "Well!" she said, "I see we're feeling a little better." She laid a cool hand on Burke's forehead. "Just let me call Dr. Saunders."

Burke smiled weakly back at her. He didn't dare attempt more than a smile until he had heard more of the local speech and had mastered the accent. He was a very good mimic, but it took time, and the Chicago English of 2012 would sound very strange indeed in Center City, 1904.

The nurse returned almost immediately with an older man, long haired and bearded. Behind him followed a middle-aged man, paunchy, with a star pinned to his vest. Dr. Saunders felt Burke's forehead and shook his head professionally. "What happened to you, young man?" he asked. "Did you have some kind of an accident?"

Burke shrugged his shoulders and shook his head helplessly. "Dunno," he said thickly. "Can't remember."

The doctor turned to the young nurse. "Carrie, you better get some cool water—not cold, just cool—and we'll try to bring his fever down." Then he turned to the sheriff. "Do you want to talk to him, John?"

The sheriff nodded, edged closer to the bed, and looked down sternly at Burke.

"What's your name, son?"

Burke hesitated as if lost in thought and then answered slowly, "Jonathan Burke."

"Where you from?"

Burke hesitated again, then shrugged and shook his head.

The sheriff's sternness turned to irritation. "Now look, buster, it ain't every day a stranger shows up here in Center City unconscious and naked as a jaybird! You better tell me about it."

When Burke still failed to respond, the sheriff thrust his face close to Burke's and his voice rose in anger.

"What happened to you? How did you get here? Did someone rob you?"

Burke remained silent. He closed his eyes, feigning weariness. It took no great acting skill. One of the 1904 viruses Dr. Emerson had warned him about had gotten to him already, and he felt feverish and lightheaded. His limbs ached, and his stomach was cramped with pain.

Dr. Saunders drew the sheriff away from the bed. "John, I think you're not going to get much now. He's a pretty sick man, and whatever's happened to him seems to have made him lose his memory." He wrung out a cloth in the basin of cool water the nurse had brought and laid it on Burke's forehead. "It's not at all unusual," he continued. "There's no sign of injury, but judging from the shape he was in when they brought him in, he's been in some kind of a fight. He was covered with dirt."

The sheriff walked to the door, shaking his head with irritation. With his hand on the knob, he turned and said: "Well, young man, I'll be back to see you." Then, as if Burke's mysterious appearance were a common event in southern Illinois, he added vaguely: "We don't put up with things like this in Center City!" Dr. Saunders and the nurse—Miss Hutchins—followed the sheriff into the hall, their heads together in whispered consultation.

Burke closed his eyes and slept, waking later only long enough to smile weakly up at Miss Hutchins as she bathed his face. "Pretty girl," he thought as he drifted off again. "And that's sure one thing that hasn't changed over one hundred eight years."

For the next ten days, Burke was really ill. 1904 *had* been a bad year for virus infections, and it seemed to him that he had to suffer all of them then current. Despite his weakness, however, he managed to recover the rest of his body packets and to secrete them in one of the hollow bedposts. Otherwise, he did nothing but concentrate on recovery and spend several hours each day contemplating the beauties of Carrie Hutchins.

Finally, on the 26th, he felt well enough to eat a good meal, and on the 28th Dr. Saunders pronounced him strong enough to be discharged. John Abercrombie, the sheriff, provided Burke with an ill-fitting suit of clothes from the County Farm, and after Burke had said good-by to Dr. Saunders and Carrie, Abercrombie took him over to his courthouse office for a talk.

When they were seated in the sheriff's tiny office, Abercrombie began: "I'm sorry if I was hard on you, Burke. The Doc tells me you look like a genuine case of . . . um-m-m . . . amnesia or whatever to him, so I won't hound you no more. But maybe I can help you. You must have folks somewheres, or maybe a wife and kids." He thumbed through a pile of circulars on his desk, humming quietly to himself, and then continued. "You ain't wanted nowhere far's I can tell, so you're free to go where you want. What you plan to do now?"

"I don't know, Mr. Abercrombie," said Burke. "I don't **know** what I should do. I guess go to work so I can pay

back the County Hospital and for these clothes." Burke tried to work a rural drawl into his voice.

"Well, you don't have to worry none about paying nobody back for a while. If you want to stay here in Center City there are plenty jobs. There's the new mill a-building over on Palmer Street, if you got a trade, and there's the railroad and the pipe works if you got any learnin'. They always need smart young fellers who can keep books and all. Then Ed Martin over to the livery stable needs a man. It don't pay much, but you can get by on it and it's a start."

"That would be fine," said Burke. He didn't want to work at anything technical for a while. Too easy to betray himself. The livery stable would be fine. Give him a chance to get established. Dr. Emerson had been right: Center City was an ideal place to get started. Here he could adjust himself to the new civilization, learn to get along without attracting attention, so that later, when he began to operate on a sizable scale in Chicago, he could do it with minimal risk.

"Meanwhile," continued the sheriff, "I'll wire Chicago to see if anybody has reported someone looks like you missing. I judge from your talk you ain't from anywhere 'round here."

"Thanks a lot, Mr. Abercrombie," drawled Burke. "I wish I knew where I was from and if I got folks, but until I find out, why a man's got to eat, doesn't he." Burke was proud of that sentence.

Abercrombie took Burke across the square to the livery stable, introduced him to old Ed Martin, and for the next two months Burke carried feed bags, curried horses, and learned to know the business end of a manure fork with considerable intimacy. Evenings, he sat with other idlers—including most of the male inhabitants of Center City—on the benches in front of the courthouse or the drugstore and swapped stories and talked politics and discussed the price of corn. Burke was mostly silent, and by keeping his ears open, he received a practical and detailed education in American culture c. 1904.

These months were pleasant ones for Burke. Despite his lack of a past and his apparently rather meager prospects for the future, the people of Center City soon accepted him as one of their own with the sort of easy and informal kindness that characterized the era. To the courthouse loungers he was simply "Johnny Burke," just another one of the boys. Families began to invite him to Sunday dinner, and because he was a healthy young man, obviously intelligent, and rather good-looking, he got special attention from families with marriageable daughters. Evenings and weekends when he was not otherwise engaged, he withdrew stacks of books from the Center City Free Library, and rediscovered the pleasure of reading. It had been years since he had had that kind of time.

And backward as it was, Center City itself impressed him. There *was* opportunity there. And more than that, there was a unique kind of freedom. There was neither the highly-structured society of lord and serf that Burke had

seen so often before in so many guises, nor the society of necessarily tight personal controls which was his own. There were, of course, obvious centers of power, obvious injustices and obvious unfairness. But the basis of power was economic, and economic power was there for every man to grasp. The big man in Center City was the President of the Farmer's Bank and Trust. He had been a railroad timekeeper twenty years before and had developed a knack for speculating in rights-of-way. The President of the Center City Pipe and Iron Works had been the village blacksmith in 1885 when he developed a method for hot-forging pipe and rod in his smithy.

And outside Center City, beyond the corn fields and railroad that were the immediate sources of its prosperity, the national economy was growing by leaps and bounds. Technology—primitive though it was—was increasing geometrically in scope and intensity. There was an aura of confidence and excitement everywhere. The Republican convention had, of course, renominated Roosevelt, and his promises of continued prosperity, of smashing the trusts for the benefit of the little man, of a "square deal" for everyone, began to capture Burke's imagination as it was doing for Americans all across the country. As the great wave of national pride, of faith in the country's future, of belief in self-reliance which were so characteristic of the Roosevelt era swept over Center City, Burke found it increasingly difficult to dissociate himself.

"What am I getting so worked up over?" he would chide himself in the silence of the night. "This isn't *my* time, *my* culture." And then, despite himself, he would find himself arguing the gold standard question with real passion, or standing with a group of others at the depot door, listening to the station master reading the latest news from the nominating conventions from the clicking telegraph instrument on his desk. It wasn't the first time Burke had felt himself losing perspective during a probe, but his sense of identification with the people of Center City was too great, and like a Stanislavsky actor, he watched himself getting lost in his part.

And then, in spite of himself, Burke found himself falling in love with Carrie Hutchins. He realized the idiocy of it: he would leave soon, forever. He had no business getting entangled in emotional ties. And anyway, Carrie was literally old enough to be his great-grandmother! And it wasn't just Carrie, not just her willowy figure and remarkably beautiful face. But there was still something of the pioneer tradition in Center City and in Center City women. Carrie's self-reliance, her level gaze and inner strength—without falsity or hardness—came to symbolize for Burke the virtues of her era. But these lofty thoughts deserted him when she nibbled playfully at his ear and came to symbolize the vices of all eras. He fell in love and cursed himself, but logic holds little sway in the kingdom of love, and as Burke sat on the Hutchins' front porch swing, the soft odors of the August night combining with the sweet perfume of Carrie's hair as she nestled beside

him, her head on his shoulder, the sweet bitterness of his foolish love overwhelmed him.

"Jonathan?" she said, stirring beside him. "Something is wrong, isn't it, Jonathan?"

"Yes," said Burke.

"Is whatever is wrong—is it something to do with your past?"

Burke paused before answering. Then, firmly, "Yes, that's it."

"It's not that you're . . . that you're married?"

"No! Oh no! It's not that. But Carrie, I must go away."

"Well, I won't pry, Jonathan. And I'll wait, I'll wait as long as I have to—if you want me to."

Burke wanted to say: "Don't wait, sweet Carrie. Don't wait. I'm not coming back. I can't." Burke wanted to say: "Find a nice young man, Carrie. Forget me." But he couldn't say it, and further conversation was stifled in a long embrace.

With an effort of will, Burke forced himself to go ahead with his plans for leaving Center City, resolutely thrusting all thoughts of the town—and the girl—he had come to love out of his mind. After eight weeks at the livery stable he had saved nearly eighteen dollars. Late one August night, when the moon was obscured by low, scudding clouds, he waited until after the courthouse clock had struck midnight and set out to recover his cached body packets. First to the hospital, where he stole by the night nurse and crept silently to his old room on the second floor. Fortunately, the room was empty, and he had no trouble recovering the packets from the brass bedstead. He slipped out the same way he had entered and made his way across the dark square to the tree at whose roots he had buried the other packets.

Back in his room above the stable, Burke packed the body packets into a cheap cardboard suitcase along with his few personal belongings, including the straight razor which had cost him so much sweat and blood to learn to use, and crawled into bed for the rest of the night.

The next morning he made his apologies to Ed Martin, explaining that he wanted to go up to Chicago for a while to visit a specialist, to see if something couldn't be done to restore his memory; or if not that, to see if he couldn't get a line on his past from the Chicago police. "Somehow," he said with just the right air of mystery, "somehow, I think the answer may be in Chicago. Just a hunch, you know, but I can't rest 'til I go see for myself."

Martin nodded sympathetically, and so did Abercrombie when Burke told him the same story. They both saw him off on the morning train, and Martin pressed a two-dollar bill in his hand as they shook their farewell.

Later, as the train jerked and rattled its way northward over the flat Illinois corn land, Burke sat quietly staring out the window, ignoring the exuberant poker game going on among the drummers across the aisle. The acrid odor of soft coal from the locomotive irritated his nostrils, and he got soot in his eye. "I won't miss this, anyway," he

thought, trying to console himself for the unhappiness he felt at leaving Center City. "We've sure got it better than this, anyway. And no more dentists!" Burke had suffered an abscessed tooth three weeks before, and the primitive treatment by Center City's "Painless Dentist" had horrified him. He probed at the gap in his lower jaw with his tongue and felt a little smug thinking about the medical wonders of his own time. But the pain in his jaw three weeks before was no match for the pain he felt now in another more romantic organ. He forced his mind away from Center City and Carrie and concentrated his thoughts on the job lying ahead.

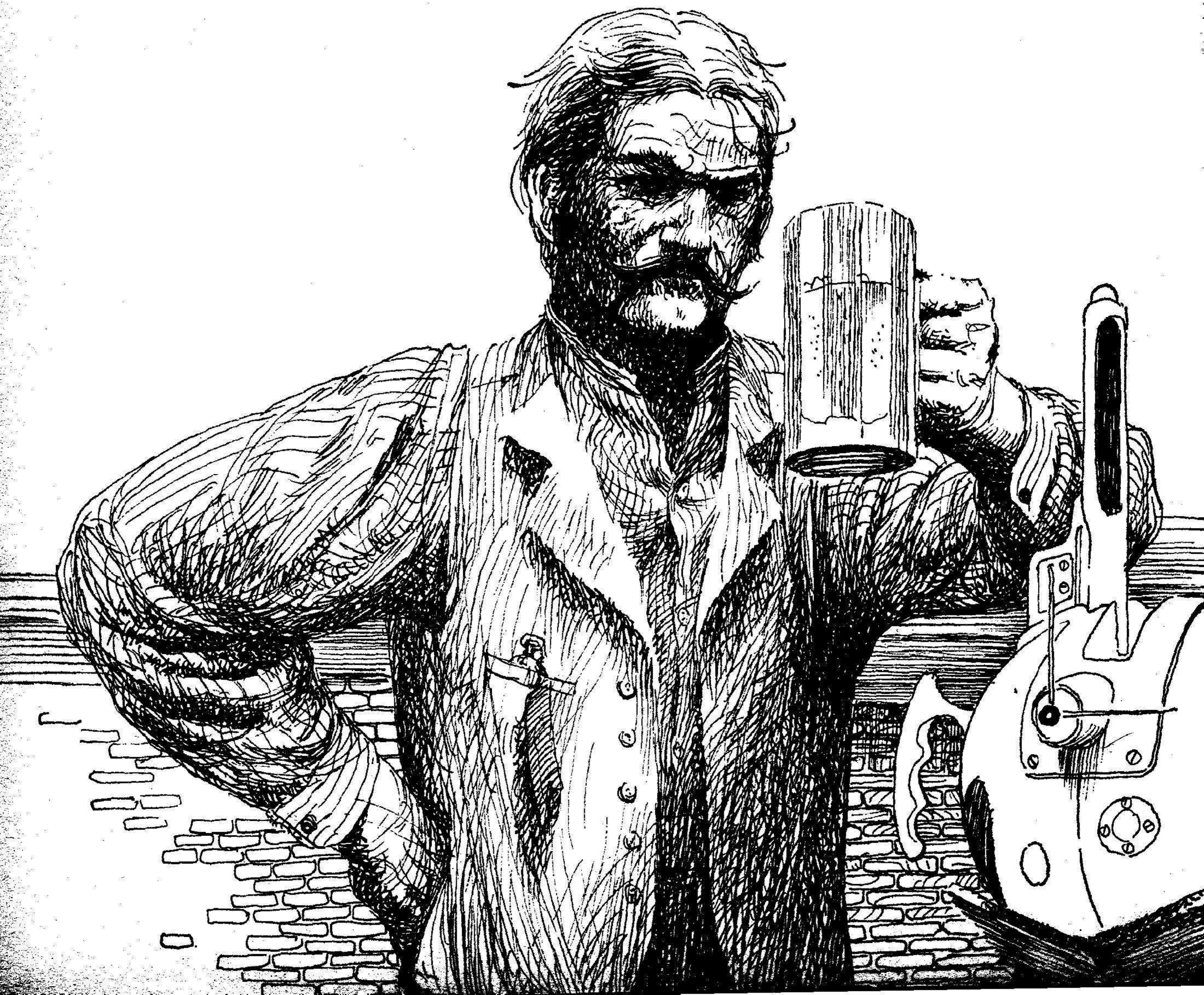
The train took nearly eight hours to reach downtown Chicago, and Burke had to hurry before the shops closed for the day. He strode rapidly down Clark Street looking for a stationery store, spotted one across the street, and was nearly run down by a clanging horsecar as he dashed across to it. A mustachioed policeman twirling his nightstick grinned to a lounge in front of the cigar store and said something about "rube."

Burke found the cheap magnifying glass he sought, bought it, and walked on to the Brevoort where he rented an inexpensive single room. He tipped the bellhop a dime and carefully locked the door behind him. He took the

precious body packets out of his suitcase, put them in his coat pockets, and went out for a dinner of spare ribs and beer. After dinner he spent some time consulting the commercial directories in the hotel lobby, making careful notes on the major business enterprises in the city, and then retired to his room. There he carefully locked the door and pulled the blinds before turning up the gas. He wished he had gotten a more expensive room, one of those on the ground floor equipped with the new electric lamps. He sat down at the flimsy writing desk and broke open one of the body packets. He carefully removed a number of sheets of microfilm, three-quarters of an inch on a side. They were microfilms of the *Chicago Tribune* and the *New York Times* for the last two weeks in August and the month of September, 1904.

With the aid of his magnifying glass, he began to read the miniscule type, taking copious notes all the while. Before Burke could proceed with his job, he needed money, lots of money. With six weeks of newspapers—future newspapers—he was assured of it.

First he copied off the race results during the August running at the Chicago Fairgrounds. It was already the 27th of the month, and he had only a few days to make good on those. Next he copied off grain quotations for all



of September, and then the weekly summaries of the New York Stock Exchange. After that he recorded changes in the business community: announcements of new real-estate purchases, bond issues, new products being marketed, changes in key personnel—in short, changes in the Chicago and the national economy from which a prescient operator with a good supply of cash would make some fast money. Finally, his eyes bloodshot and weary, he returned the microfilm to its packet, resolving to buy a small microscope at the first opportunity, and turned in for the night.

The next morning he took the new El out to the Fairgrounds, and with constant reference to his notes, turned his \$6.50 worth of capital into \$12,000 by track closing, fearful of winning more and attracting dangerous attention. During the next three days, the last of the running, he ran that sum up to just under \$50,000, now and again losing as heavily as he won, but only now and again.

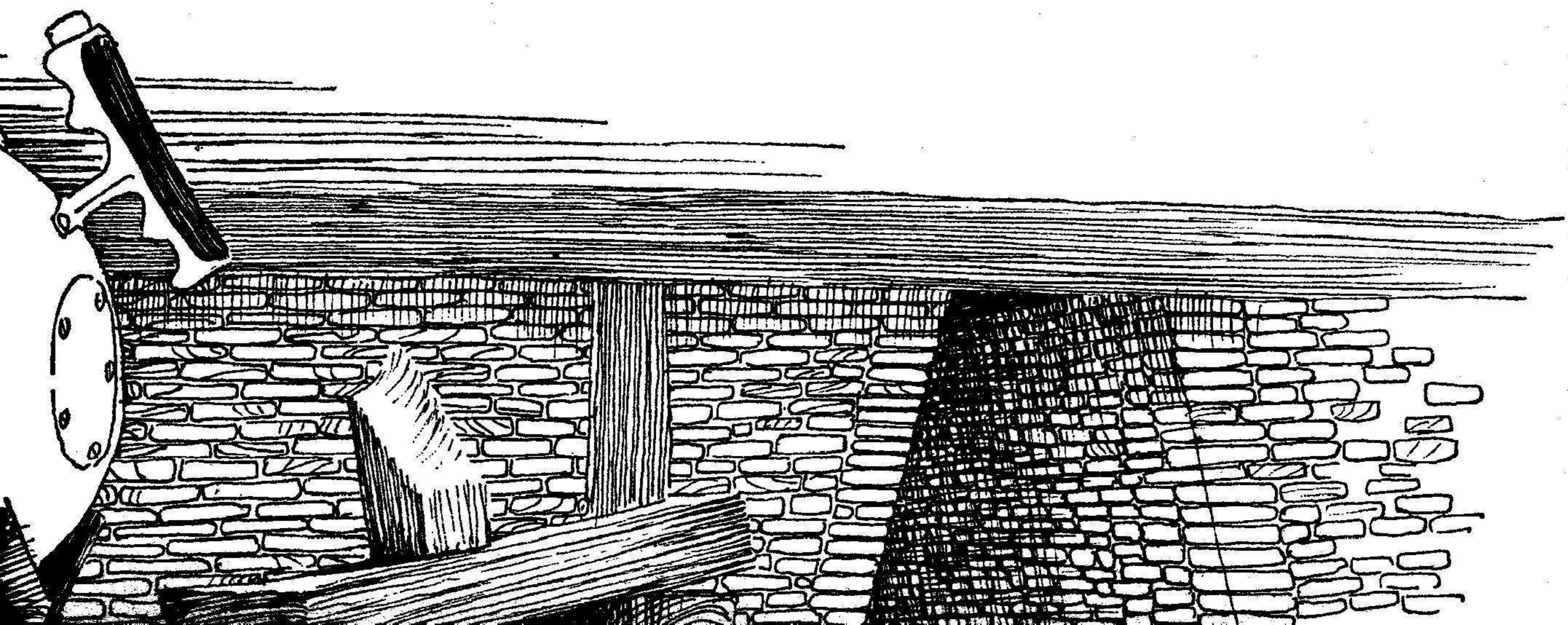
When the track closed for the season, Burke bought several good suits and a set of bright new luggage, and moved from the Brevoort to the Palmer House. From his suite there, he started a rapid series of speculations, employing Western Union messengers to carry his buy and sell orders to brokers in real estate, the grain market, and Wall Street stocks. He bought just before stock splits were announced, just before new products were marketed. He sold short just before disastrous fires or the death of a key executive. And as his holdings rose in value, he took the rise and liquidated. By the 1st of October he was out of the market again, and his account at the Grain Merchants Trust held over \$300,000. He had half again that sum in negotiable municipal and government bonds salted away in safe-deposit boxes all over the city.

By working whenever possible through intermediaries, Burke had preserved a fair degree of anonymity. Still his rapid accumulation of wealth, his apparently magical ability to time his purchases and sales for optimum profit, aroused interest within the small and powerful group of

men who controlled the Chicago financial community. But Burke tipped well, and the myrmidons of the Palmer House protected him from the curious and all those who smelled quick money and had some scheme for cutting themselves in on it.

Toward the end of September, through an agent who had protected his identity, Burke bought a large, modern house recently built near the lake, along the North Shore. He moved from the Palmer House and started the infinitely complex process of accumulating the machinery and tools for the workshop he needed. With the aid of a young machinist whom he hired—more for his discretion than for any special mechanical ability he possessed—Burke spent the next month seeing to the purchase and installation of such machine tools as he could acquire. He managed to find a fairly good 10" lathe, a shaper, and a vertical mill, all driven from a series of hazardous and noisy belts by a huge one-horsepower motor standing almost three feet high. The Chicago Edison Company ran special power lines to the North Shore house. They did so without question: Burke owned over ten per cent of the young firm's most recent bond issue. Working with his assistant, Burke built a small-gauge wire drawing rig, a vacuum pump and glass chamber, and enough equipment to allow him to furnish one room in the cellar with a controlled atmosphere, suitable for growing fairly complex crystals.

He sent the young machinist out with long and baffling lists of things to buy. There were exotic minerals, like bauxite; there was copper wire—miles of it—and the smallest gauge that could be found; there was lead, and quartz, and platinum—which had to be sent out Railway Express, all the way from a New York jewelry manufacturer. There was bagged cement and copper sheeting, and a special order for silica gel which a pharmaceutical house in Philadelphia processed to Burke's order. There was a ten-carat uncut ruby, and tin plate ordered from a container company. Some things were seemingly unobtainable on the market, but working through an intermediary



—an unscrupulous but friendly racetrack tout Burke had met during his first days in Chicago—he arranged it that a number of rare specimens were stolen from the University of Chicago Geology Department's collection.

By the end of November Burke was ready to start the next phase. He dismissed the machinist with a handsome bonus and increased the security of the house by installing the best locks available and hiring a twenty-four-hour watch of off-duty constables. All this, he hoped, would be chalked up to the doings of an eccentric man of means. And he was right. So long as he paid well, no one felt like indulging his curiosity at the expense of his purse.

With all as secure as he could make it, Burke started constructing the devices that would let him accomplish his final objective silently, swiftly, and without undue risk. First power: Burke fashioned power cells out of the best materials available to him. He would have preferred the cells of his own time, the light cesium-fluoride cells which were to be standard a century later. But cesium was not to be had, nor were the radioactives he would need. He made do: isinglass was hard to work, but its dielectric properties were excellent; he had trouble keeping coil weight down due to the crudeness of his wire-drawing equipment; and the charging rectifier he built—which fortunately did not have to be portable—made him laugh every time he looked at it.

Next circuitry: The key semiconductors were in the precious body packets; the others he grew, slowly and patiently, in the controlled atmosphere of the cellar room. He drew the platinum and copper wire down to acceptable standards in his workshop, the flapping belts and overgrown motor presenting a strange contrast to the sophisticated—although crude to Burke's eyes—devices taking shape on the workbench.

The antigrav sled took the most time. It didn't have to carry much weight, but its own weight—with tempered brass and high-carbon steel instead of titanium and aluminum—was considerable. Burke had to cut corners at every step to save the sled from outweighing its own lift potential. The "Tool"—the all-in-one that was standard equipment in every workshop and laboratory in Burke's time—took the most patience. It had to be highly portable to be useful, and despite his best efforts, Burke wound up with something the size of a soup tureen instead of the palm-sized device he was used to. In fact, he had the casing hand-crafted in silver by a Chicago silversmith; the silver added little more weight than would have more conventional materials available to him, and he was able to have the work done by professionals, saving himself many hours in the workshop.

Even with its greatly increased size and weight, however, the "Tool" didn't perform as well as he had hoped. The tractor section was weak, and the repeller difficult to control accurately. The laser section produced a fat and sloppy beam, and when he tried it, slicing up two-by-fours in the cellar of the North Shore house, it cut much too

wide a seam—nearly an eighth of an inch—and left distinct evidence of charring on the cut ends. Well, it would have to do.

Last came the construction of the crypt. The Tool helped him cut a nearly seamless opening through the masonry of the cellar wall, well below ground level, but the earth he excavated from behind it had to be carried, bagful by bagful, up the cellar steps and into the garden, there to be distributed without trace. After his sedentary life as a financier, the work was hard on Burke, and by the time the crypt was excavated, lined with concrete and copper sheathing, and ready to be resealed, Burke was more than willing to call it quits.

It was now mid-January. It had taken Burke longer than he had expected to make his preparations. And while the nearly five months since he had left Center City had been fantastically busy ones, he had been unable to eradicate the image of that happy village—or of Carrie—from his thoughts. During the day, busy in his workshop, he had been able to forget, briefly. But then each night when he fell exhausted into bed, the faces came back to him, and the heartsickness. In the morning he often had to wrestle with the temptation to hop aboard the Illinois Central for a quick visit to Center City. But he was running late with his preparations, and he was a man of principle—as were all those in his business—and he bested the temptation, burying himself ever more deeply in his work.

The target date was January 22, 1905. On that night, the north wing of the Chicago Pier Gallery would burn to the ground. A Rubens, a Delacroix, several Michelangelo sketches, a Shakespeare First Folio, and a special loan exhibit of Italian Renaissance paintings would perish with the north wing. Burke's only recreation during his stay in Chicago had been weekly visits to the Pier Gallery. He knew the precise location of each valuable art work on his list, and he had drawn elaborate diagrams of the soon-to-be-destroyed north wing. His job was to get them out before they were destroyed, to deposit them securely in the crypt he had fashioned under the North Shore house where, one hundred eight years later, they could be exhumed, undamaged.

They were priceless art objects, a lost heritage of the past rendered even more valuable by the nuclear holocaust of the Eighties which would destroy so much that could never be recovered, even by time probe. Priceless art was fished from the past by experts like Burke to enrich the lives of men and women of the next century. But fished carefully. The time-probers dared do nothing that would perceptibly alter the time they fished in: to do so—to cause scandal, to attract public attention, to change history in any ponderable sense—was to risk the destruction of their own world. Perhaps a bit of judicious tinkering with the past—a political assassination here, a financial coup there—might avoid the holocaust to come, might send the present, Burke's present, down some other branch of time. Perhaps. And yet perhaps the holocaust might

become worse. Perhaps all life would perish instead of just thirty per cent—and most of that not in America. Who was prepared to gamble? Who could be empowered to decide? The gamble was too great; the risk of miscalculation too overwhelming. Hence the tight control of time-probe operations. Hence the probity and principles of the men who did the probing, the men like Burke.

Hence, too, the need for great care and discretion in the time-probe fishing expeditions. Only those artifacts which were to be destroyed by natural causes, in the course of normal human events, could be salvaged, and they had to be salvaged immediately before their destruction. They could not “just disappear.” In 1913, when the Galleries Prévau shipped a number of valuable canvases to the great American dealer, Duveen, aboard the *Titanic*, it was a dream job for the time-probers. The canvases were crated for shipment at the Prévau workshops. One of Burke’s colleagues emptied the crates two hours before they were loaded on the *Titanic*, and when art lovers mourned the loss of these masterpieces, they mourned the loss of twelve crates of newspapers and scrap lumber.

The Chicago Pier Gallery salvage job was no such dream. Thousands had visited the Gallery on the day of the fire—it was a Sunday—and the fire had broken out within an hour after the Gallery had closed for the day. Furthermore, according to contemporary newspaper accounts, the Gallery was heavily guarded due to the presence of the Italian loan exhibit, and the guards made their rounds, inspecting every room in the Gallery, at least every half hour. All this added up to the fact that thousands had seen the paintings within an hour of their destruction, and that at least one guard would have seen them within a half hour of the fire. It meant that Burke had less than thirty minutes to enter the building clandestinely, collect some three hundred pounds of canvases, and get himself and the canvases out of the building before he was discovered or trapped by the fire, which, according to the newspapers, had “raced through the newly-built structure in a few minutes.”

Burke employed the three days remaining to him in additional visits to the Gallery, charting again the locations of the paintings, surveying window heights and access routes.

He bought a black turtle neck sweater and a black cap, and painted the antigrav sled and the Tool a dull black. He used stove blacking for this and found it admirable for his purposes. He consulted with an Evanston lawyer and left an elaborate will which directed that in the event of his death, the North Shore property would

. . . Revert to the Chicago Recreation Department, to be used as a meeting place for civic organizations, and that when said property was deemed by competent authority to be no longer suitable for this purpose by reason of age or state of decrepitude, it be leveled and the property be used in perpetuity as a playground or other place of public recreation without building or structure of any sort.

The wealthy eccentric again, perhaps, but Burke did not want to risk any excavations in the area of the crypt.

As soon as it was dark on the evening of the 21st, Burke towed the antigrav sled into the garden, and dressed in his dark clothing, mounted it and went up to five hundred feet immediately. He followed the shore line down until he spotted the Gallery pier jutting out into the frozen lake, silhouetted against the lights of the city. A chill wind was blowing in off the lake, and there was snow in the air.

He dropped down to twenty feet and came in on a level with the second story of the darkened north wing. It was 1815 hours; the museum had been closed for just fifteen minutes.

He set the antigrav at hover when it stood within inches of the gray stone of the Gallery wall. Holding the Tool in both hands, and cursing its clumsy size, he cut in through sash, glass, and latch of a window facing the lake, and eased the window upward. He hoped no alert guard would smell the charred wood. He stepped across to the sill from his perch on the sled, ducked through the window, and dropped silently to his belly behind a large, ornate statue of the “Three Graces.” No guards in sight. He checked his watch. 1822 hours. The best estimate from the newspaper stories had been that the fire had started sometime around 1845 hours.

He padded down the second floor hallway and hid the Tool beneath the glass case containing the Shakespeare Folio. He wore no shoes, only heavy woolen socks which were silent, but slippery. He spotted the guard on the stairwell leading down to the first floor and the Rubens long before the guard could see him, and he hid behind a crude plaster reproduction of the “Laocoon,” fortunately for him, a life-size one. The guard passed by, his eyes dazed with boredom, whistling softly to himself.

Burke slipped out of his hiding place, padded noiselessly down the stairs to the first floor hallway, and ran back to the room containing the Rubens. He flipped the frame out from the wall to release the hangers and slid the heavy painting to the floor. Turning it around, he quickly jimmied off the inner frame and slipped the edge of his straight razor—the same one he had shaved with nearly every day since his arrival in Center City—between the inner and outer frames. Once around the frame and the painting was cut free. He hastily hung the frame back in its place and broke a small glass vial against the wall within the frame. A dark, multicolored fluid spread out to fill the startling whiteness showing through the frame. “Wouldn’t fool anyone who really looked at it,” thought Burke, “but what gallery guard really looks?” Then he rolled up the stolen Rubens and stepped back to admire his work.

Then to the stairwell, where he hid in a janitor’s closet until the guard came back down from the second floor and headed off into the south wing. Burke checked his watch again. 1829 hours. “Too long,” he thought. “Have to work faster upstairs.” He bounded up the stairs silently,

and ran to the glass case containing the First Folio. He retrieved the Tool from its hiding place, and with a quick circular motion cut a wide oval out of the side of the case. He caught the severed oval of glass with the tractor and then instantly noticed that the depth setting of the laser was off. He barely managed to catch the larger glass oval on the opposite side of the case before it fell noisily to the floor. He deposited both pieces of glass inside the case, paused a moment to wipe the perspiration out of his eyes, and then snatched the Folio from its velvet setting and ran off down the hall to the Michelangelos and the Italian collection.

He paused before the sketches and sniffed. There could be no doubt about it; the fire had started. And it was close by. He recognized the smell of burning rubber and tar. "Burning insulation," he thought. He had had first-hand experience with the primitive quality of 1904 electrical wiring. The sketches he sought were mounted in individual frames. He gathered them up, frames and all, and ran with them to the hallway window outside of which the antigrav sled hovered faithfully.

He dashed back to the room containing the Italian collection. He dared not take them frames and all, and he had to go through the elaborate process he had employed with the Rubens. Smoke began to curl along the hall. Any minute and the wall would burst into flame. Working feverishly, he managed to get all six of the Italians unframed, rolled, and delivered to the growing pile under the window. On his way back for the Delacroix he broke a vial of coloring in the center of each empty ornate frame.

The Delacroix itself was immense. Burke found himself momentarily detesting painters of the heroic school. Then he remembered the Gobelin tapestry he had managed to save from the sack of Goncourt on a previous job, and he laughed silently at himself. He eased the weighty frame from the wall, went to work with his razor, and was breaking his last two vials—it took two for the Delacroix—when he heard shouts and the sound of running feet. Quickly he scurried back to the window and crouched beside the pile of pilfered paintings. The smoke was heavy in the hallway, and he could barely make out two men against the lighted stairwell at the opposite end of the hallway. They pointed and gestured, shouting something Burke couldn't hear. Then they started toward his end of the hallway. There was a sudden roar of fire, and flames burst out of the wall along the hallway. The two backed up in confusion, turned, and clattered down the stairwell to summon help.

Burke wasted no time. He slid the window open, this time unmindful of the noise, and started to horse his treasures across the sill and onto the waiting antigrav. As the paintings piled on, the sled sank a bit and then recovered, its low-pitched, scarcely audible whine rising in volume. With all aboard, Burke eased himself across the sill to the sled, lowered the sash behind him, and pulled out over the dark lake away from the building. Behind him he

could hear shouting, and flames were beginning to break through the windows along the hallway he had just left.

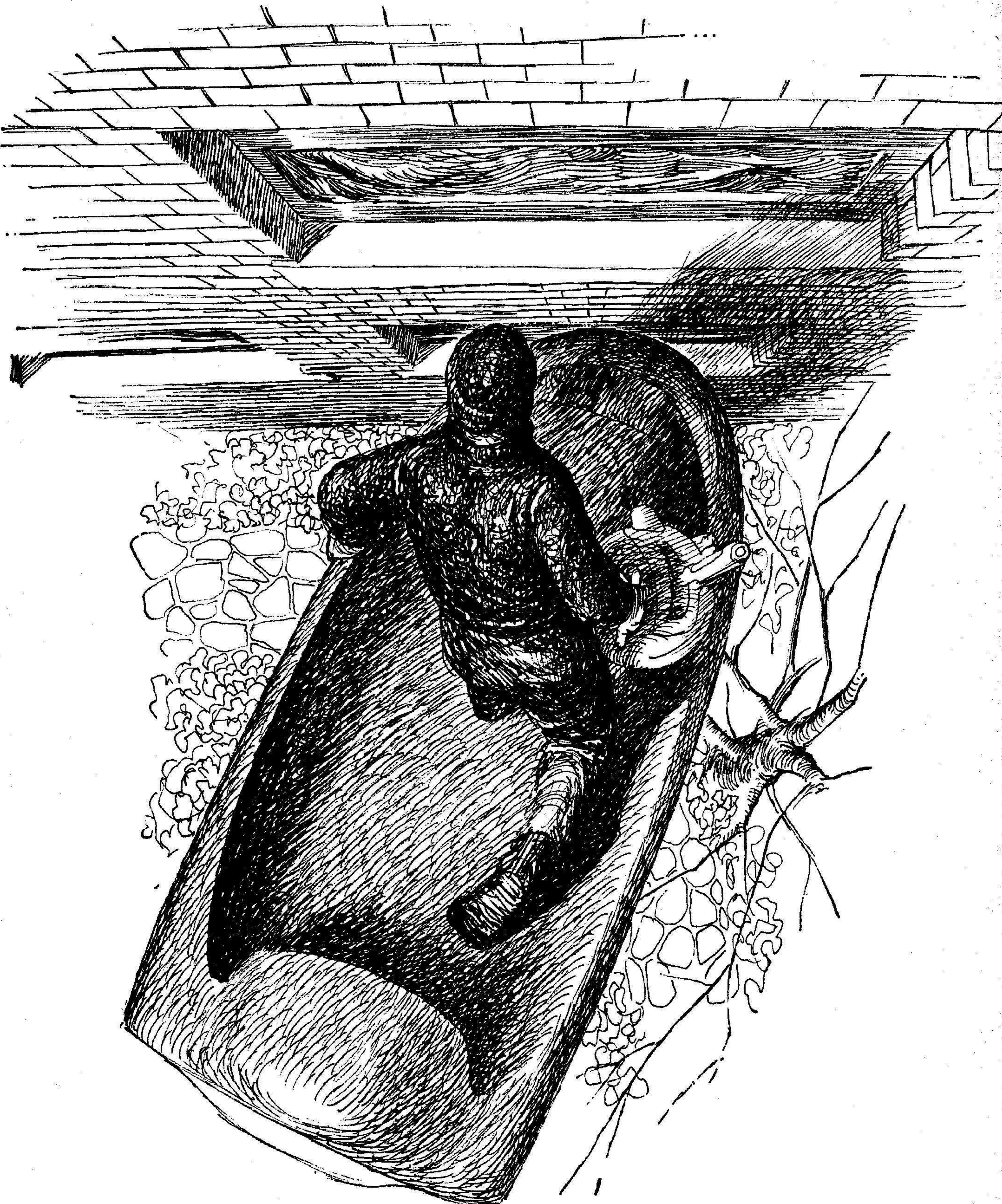
Burke coaxed as much altitude as he could from the laboring antigrav, but more than a hundred feet he could not get. He flitted across the lake in a northerly direction until he picked up the stockyards on his left, and then navigating by odor as much as by sight, he cut out toward the North Shore house, dodging factory chimneys and the Chicago Shot Tower. Ten minutes later, he landed unobserved in his own garden, and shifting the sled to hover, he walked down through the cellar door, towing the antigrav behind him. His watch said 1912 hours. He had been gone just a little over an hour.

With his precious cargo in the cellar, Burke relaxed for a few minutes, poured himself a beer and smoked a Cubeb. He would miss the Chicago beer of 1905. He wondered why no one in his own time could brew beer quite like that. Then rested, he went back to the cellar, loaded the art treasures into the crypt, sealed it with mortar, and primed the thermite grenades in the antigrav sled and the tool, ready for destruction in the morning.

He caught a few hours sleep, and then, before it was light, he set the timers on the thermite for 0800 and left the house on foot, carrying nothing with him but the clothes on his back. When the thermite went off at 0800, the antigrav, the Tool, and the house owned by wealthy eccentric Jonathan Burke—and if he were lucky and the medical examiner careless, Jonathan Burke himself—would disappear from Chicago forever. Only the art would endure.

Burke had little difficulty getting by the sleepy constable in front of his house. He walked to the Loop, had breakfast in the station, and caught a milk train to Kankakee. He got in Kankakee at noon, mooched around town for several hours, and boarded the Memphis Special at 1600 hours. The Memphis Special did not stop at Center City, but it went through Center City, and after dark. Burke locked himself in the toilet as soon as he boarded his car and spent three tedious hours reading and re-reading the sign that said: "Passengers Will Please Refrain From Flushing Toilets While The Train Is Waiting In The Station," and ignoring the angry door rattlings of his fellow passengers. Just outside Center City, he stepped out of his prison long enough to jerk the emergency cord in the vestibule. The train groaned to a halt, and in the confusion of inquiry by the conductor and the brakeman, he slipped unnoticed from the train into the brush along the right-of-way.

It took him another two hours—until 2100 hours—to work his way unobserved into town. Then, instead of proceeding immediately to the courthouse square and digging his way back to the capsule, he convinced himself that it was really too early, and stole quietly along the snowy, deserted streets to Carrie's house. He peered through the front window hoping to catch a glimpse of her, but all he could see was her father sitting before the living room fire reading his evening *Decatur Times*.



Burke moved around to the back of the house, up the narrow alley that separated it from the houses in the next street. He craned his neck over some ash cans, looking toward the kitchen windows. Suddenly a voice behind him said: "Who is it! What do you want!" It was Carrie, out to carry feed to the chickens, and pausing for a moment to savor the clear, cold January night.

Burke didn't stop to think. "It's me, Jonathan."

Carrie wept with happiness. "Oh! Jonathan, I thought you'd never come back."

"I'm back, darling, and I love you so much. I'm back Carrie . . ." And then to his infinite surprise, his decision was made and he heard himself say: "And I'm back to stay. Center City is my home now, and you are mine."

She buried her face in his shoulder, sobbing and laughing at the same time. Then brightly, happily: "Come into the house, Jonathan. Mother and Dad will be so glad to see you."

He held her out from him at arms length. "Carrie, I can't explain, but I can't come in now. There's still something I must do."

Carrie looked at him, her level gray eyes fixed on his. "All right, Jonathan, if you can't. But when?"

"Oh soon, Carrie, very soon. Tomorrow. Sometime tomorrow. Then you must forget all this—strangeness."

He worked his way quietly, invisibly, to the square. He paced to the spot where the capsule was buried and hacked at the frozen soil with his pocketknife. It took him nearly an hour, but he finally got the hatch clear. He pushed it inward, disrobed, and slid shivering down the hole onto the dirt and gravel which had fallen into the machine the previous June. He pushed the hatch shut behind him, slid the protective shield back from the instruments, and surveyed them carefully. Then he threw a toggle, heard the familiar three beeps, and held his breath for the wrench of the time warp. It came and passed, and he drew the hatch inward again to stare up toward the smiling face of Dr. Emerson's young assistant.

"Looks like you've changed a bit, Mr. Burke," she said. "Did they give you any of that sulphur and molasses?"

Burke was suddenly aware of his long sideburns and bushy mustache. He smiled back at her. "No, they didn't. What's the elapsed time?"

"Twelve minutes, 46 seconds," she said, consulting the chronometer. "What was it subjectively?"

Burke checked the recorder in the capsule. "Two hundred forty-six days, 21 hours, 23 minutes and 10 seconds." The girl noted the figures on her clipboard.

Burke climbed out of the capsule and mounted the ladder into the prefab. Someone handed him his coveralls, and he absently zipped them on as he walked over to the table in the corner where Dr. Emerson was plotting figures on a sheet of paper.

Emerson looked up, caught the expression on Burke's face, and gave him a long, appraising look. Burke grinned,

feeling a little foolish, and said: "Emerson, something happened this trip. Center City is an unusual place. And then there's this girl—" He stopped, oddly embarrassed.

Emerson held up his hand. He had a bitter-sweet smile on his face. "I know," he said patiently. "You've found the third alternative."

It had been a little more than twelve minutes for Emerson, but over seven months for Burke since their last conversation. Burke was puzzled. "Third alternative?"

"Yes. When you left, you didn't know whether to leave time-probing for the Assistant Director's job, or to stay in time-probing and give up the Assistant Directorship. It's quite a decision, and you're lucky. You found a third alternative. You want to go back to 1905 and this girl."

"Yes, that's right. But it's not just the girl—"

"I know. I've been in this business a long time, ever since the Louvre recoveries. I know." He paused a moment, lost in recollection. "You don't think you're the first, do you?"

Emerson left the question, and his face grew stern. "You understand, don't you, there won't be any body packets this time. No help. And if the monitors pick up any sudden wealth, any big power plays or a rash of new inventions, we'll come after you?"

"Yes, I understand."

"All right. Did you get the stuff?"

"Sure, I got it. It's in the crypt at the North Shore property. All of it."

"Just for the record, any idea how the fire started?"

"Faulty wiring. I could smell insulation burning when I was collecting the stuff."

"Good," said Emerson. "What are the co-ordinates of the crypt. We can't waste the Gallery's money digging all over Chicago."

Burke penciled them on a map.

"O.K.," said Emerson. He turned to the girl standing by the pit. "You got a reflex timer along?" The girl stared curiously at Burke for a moment. "Yes," she said. "I always pack one."

"All right, set it for thirty minutes." He turned back to Burke. "Is that enough time for you to get clear, Burke?"

"Plenty. The ground's frozen solid. I left the hole."

"Yes," said Emerson, chuckling, "I expect you did. Pretty hard to pull one in on you, even if you aren't in love." He fumbled some papers out of a briefcase and handed them to Burke. "Here. Here's a standard release. We'll forward it to the Gallery, and they'll settle up your affairs. You'll note you have to affirm you have no debts in excess of your estate nor any action before the courts."

"No, nothing," said Burke, signing.

"O.K., just remember, no shenanigans, or we'll come after you."

Burke unzipped his coveralls again. "I'll remember."

As he went down the ladder to the capsule, Emerson called after him: "Good luck, Johnny. And best wishes. Name the first one after me!"

Burke did. ■

Clouds, Bubbles and Sparks

continued from page 16

chamber cycles eleven times per minute. Thus the Bevatron can be operated at almost its maximum pulse rate with good assurance that the bubble chamber will be sensitive when each burst arrives. In actual practice, the pulse rate of the Bevatron depends upon the type of experiment being performed and may be much lower than the maximum.

In cosmic-ray research with cloud chambers, it was common to obtain only one or two photographs of interesting events per day. Normally, a full day was also required for a physicist to properly classify the event. It was slow and tedious work, but the supply of events was about on a par with the physicist's ability to cope with them.

The bubble chamber changed all that. The 72-inch chamber alone is capable of catching between 70,000 and 100,000 strange particle events per year. Obviously some type of data reduction system is essential to handle

the great mass of information that these events represent. Much effort has been made to develop computer programs capable of providing an analysis and identification of most interesting events. Such programs can serve to weed out the more routine events so that the physicist has more of an opportunity to concern himself with the rare or unexplained event.

Even though it has been in existence for less than twelve years, the bubble chamber has so many advantages as a track detector that it is safe to say that today more than half of all experimental research in elementary particle physics makes use of it

The comparatively newest track detector—the spark chamber—is based on one of the more spectacular methods known for making ionization trails visible—the electric spark.

If a series of thin metal plates are spaced from 2 to 10 mm apart and the

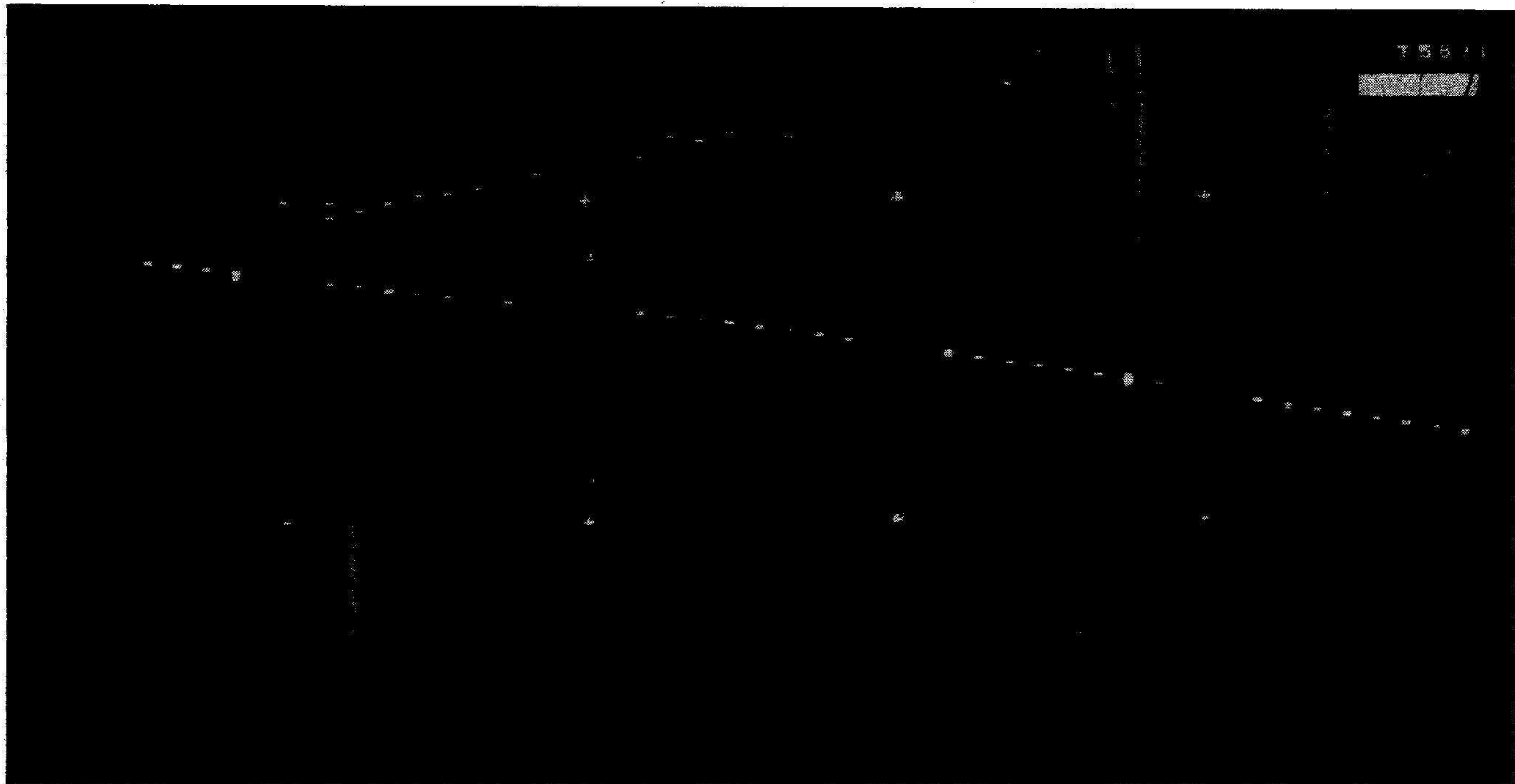
Photograph of a neutrino collision in the Columbia University 10-ton aluminum spark chamber installed at the 33-BeV Alternating Gradient Synchrotron at Brookhaven National Laboratory. The long straight track is that of a mu-meson created by an incident neutrino. The other track is thought to be that of a gamma-ray.

gaps between filled with air, neon, or argon, passage of a high voltage pulse through the plates will cause sparking in the gaps. The sparks will tend to pass along the paths of least resistance—such as the ionized paths of charged particles. Thus a chamber of this type should be a suitable track detector for high-energy charged particles.

Well it is, but not as good as a bubble chamber. The one real advantage that a spark chamber possesses over a bubble chamber is that it can be very discerning, whereas the bubble chamber records the passage of any and all charged particles. The built-in discernment of a spark chamber results from the fact that the pulsing of a high voltage to the plates can easily be governed by counters used in conjunction with the chamber.

Through the use of so-called logic circuits that analyze the output of the counters, an interesting event caused by one entering particle out of many thousands, all arriving within a few thousandths of a second, can be singled out and photographed. The logic circuits ordinarily have a time of about 100 nanoseconds—100 billionths of a second—in which to decide whether or not to pulse the electric field and thus sensitize the spark chamber. This may seem like an uncomfortably short time in which to make

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a decision, but circuits are available today which can do it in less than 20 nanoseconds.

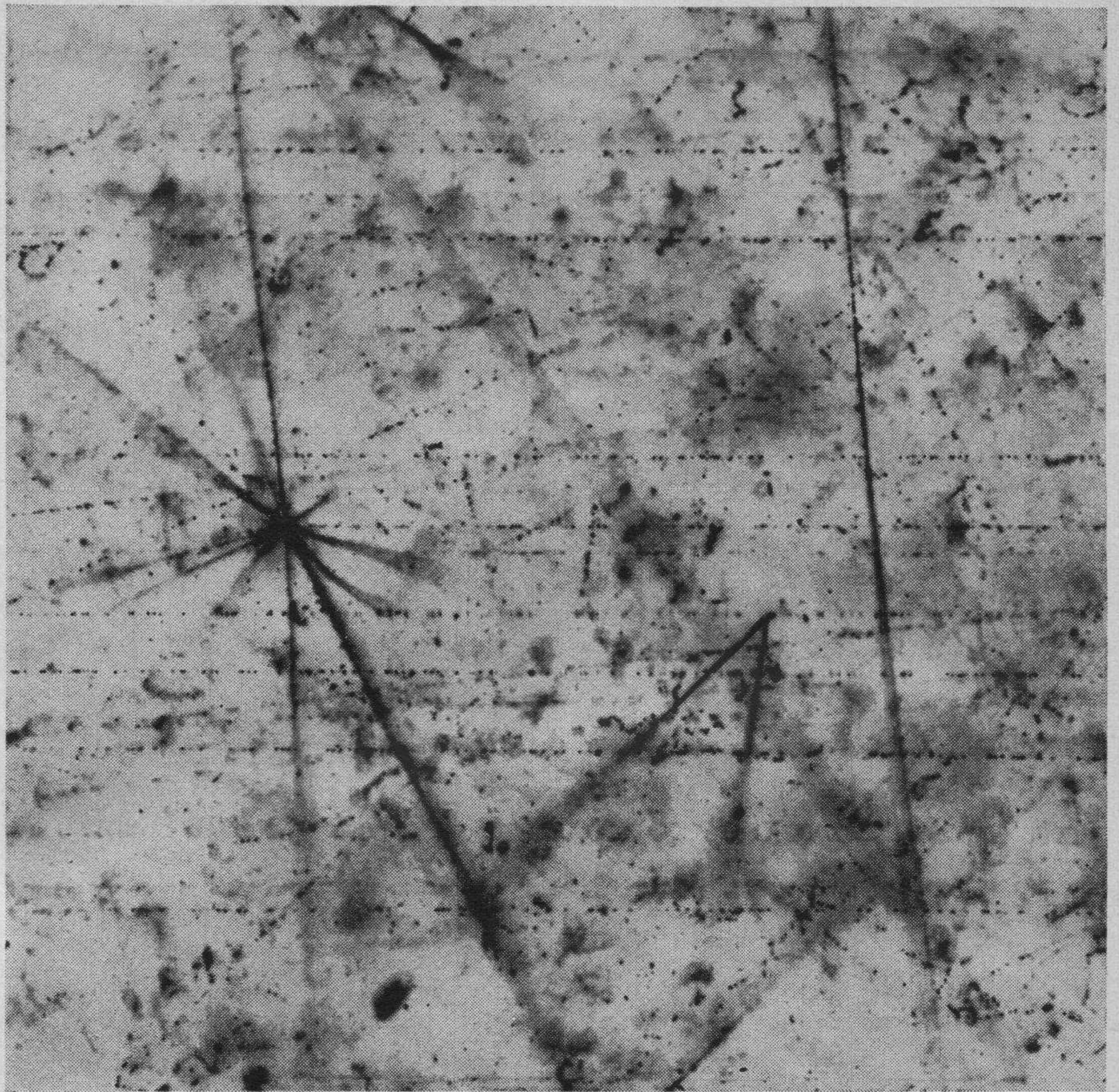
The spark chamber is actually a hybrid which has some of the features of a track detector and some of those of a particle counter. The time resolution is comparable to that of other electronic detectors—counters—and the recovery time of about 10 milliseconds—depending on the type of chamber—is much better than that of other track detectors. While the spark discharges do not reproduce in detail the trajectory of the particle, the sparks do serve to define the spatial features of the event.

The only other track detectors used to any great extent are the nuclear emulsions. These are highly refined photographic emulsions which are particularly suited for the study of high-energy particle interactions such as those produced by cosmic rays.

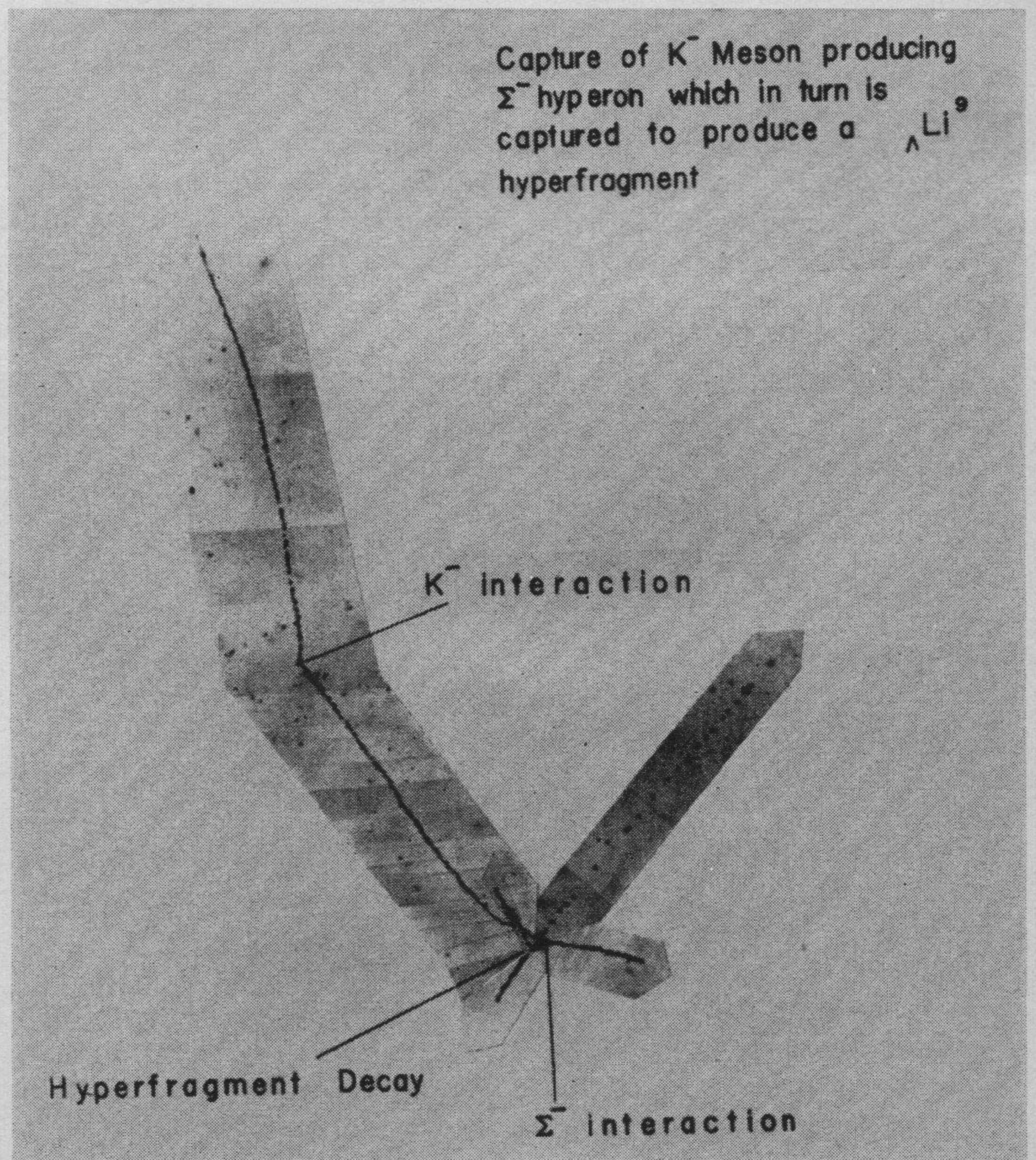
The fogging of photographic plates was the means by which radioactivity was discovered in 1896, but not until 1911 was the blackened area of film

(Above) Emulsion exposed to 1-BeV protons. The dotted lines moving in parallel course, left to right, were made by protons. The star to the right is the disintegration of an atom (such as bromine or silver) in the emulsion. The prong in the left center is an event in which an incoming particle caused two heavy particles to fly out of a nucleus. The prong is the same shape as tracks made by the much more rare V-particle decaying in flight. The decay products of the latter, however, are mesons, which are lighter and faster than heavy particles, and thus leave tracks much less dense than the prong shown here.

Tracks produced by strange particle interactions in a nuclear emulsion.



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exposed to alpha particles—helium nuclei, one of three types of radiation given off in radioactive decay—shown to be related to the path of the alpha particles. In due course it was found that all ionizing particles record their tracks in a photographic emulsion as a series of closely spaced black specks of silver. Because of the relatively high density of the emulsion as compared to that of a gas, the tracks produced by charged particles are very short compared to those in a cloud chamber. As a consequence, microscopes are required to evaluate tracks produced in emulsions.

Nuclear emulsions are perhaps the most convenient of all track detectors to use. They are prepared as thin sheets called pellicles and stacked one on another to form a block of photosensitive material as large as desired. When evaluating tracks through such a block of pellicles, distance can be measured to thousandths of a millimeter.

The high density—and resultant stopping power—of nuclear emulsions makes them particularly appropriate for the study of high-energy particles, since it almost guarantees that such particles will interact with the material of the emulsion. Nuclear emulsions are also continuously sensitive. These two features are among the chief reasons why they have been used so extensively in the study of cosmic rays. Five elementary particles have been discovered as a result of such studies using nuclear emulsions.

What is an advantage from one point of view can be a distinct disadvantage from another, however. That high density, for instance, normally makes particle tracks so short that it is difficult to almost impossible to use the magnetic-deflection method of particle identification. Also the fact that nuclear emulsions contain an assortment of atoms such as silver, bromine, oxygen, carbon, hydrogen, et cetera, makes it extremely difficult to evaluate the interactions that do occur. Continuous sensitivity is also nice, except for the fact that background radiation is always around as are stray energetic cosmic rays.

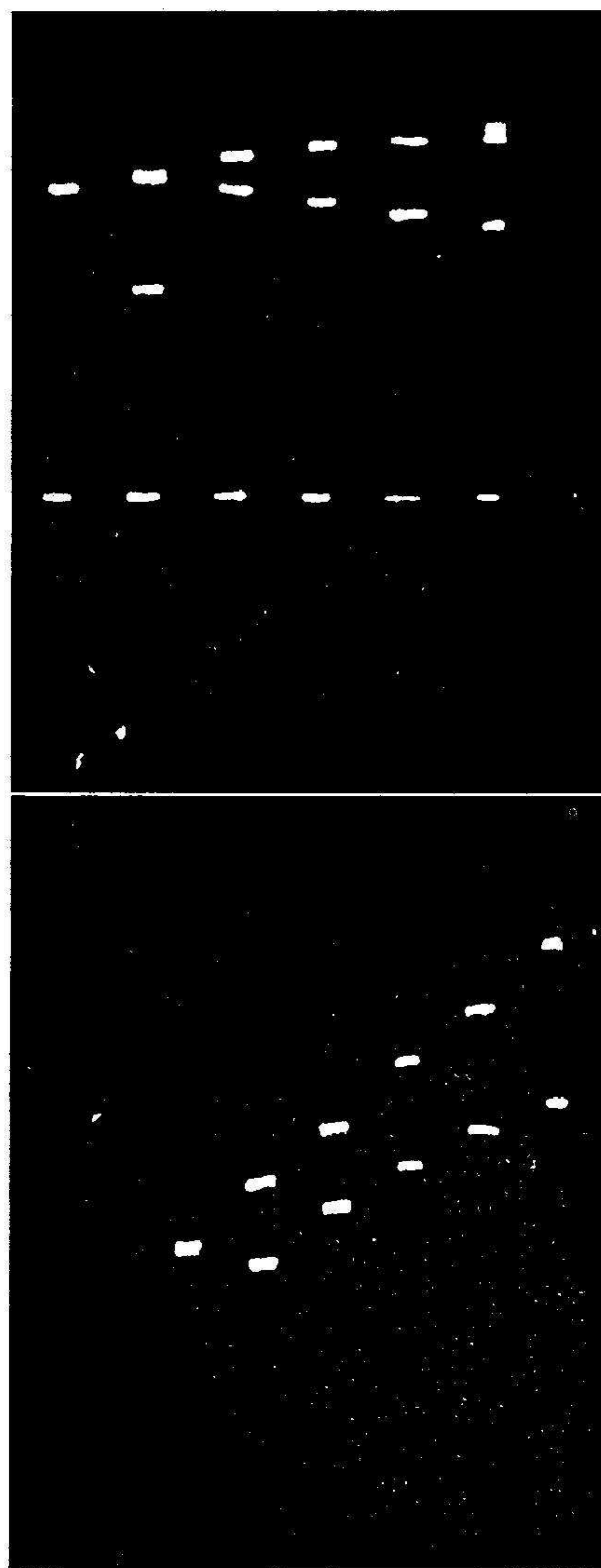
Thus extraneous tracks may be picked up during shipping and storage of emulsions. Nuclear emulsions also have no time resolution; that is, there is no way of telling exactly when any particular track was formed.

The track detectors normally have excellent spatial resolution—i.e., the exact path of a particle can be determined—but poor time resolution. On the other hand, counters—the second class of particle detectors—generally have excellent time resolution but poor spatial resolution. The precise moment that a particle passes through a counter may now be known with better than 1-nanosecond accuracy. Time resolution such as this helps physicists to unscramble particles produced by high-energy accelerators and also enables them to accurately determine the decay times of unstable particles.

Counters are also important as safety devices. As the name implies, counters sense quantitatively the number of charged particles that pass through their sensitive volume. Since they detect quickly and accurately the number of particles in a certain well-defined area, the level of radiation in a particular region can be easily determined.

The ionization chamber, the proportional counter, and the Geiger-Muller counter were originally developed to detect the products of radioactive decay—alpha, beta (electrons and positrons), and gamma (electromagnetic radiation) rays. They are still used for this purpose, but recently a new field known as space physics has also made rather spectacular use of them.

These three counters—the ionization chamber, proportional counter, and the Geiger-Muller counter—are based on the same general concept. In their basic forms they consist of a cylinder filled with gas—most often argon—with a wire positioned along the axis of the cylinder. The cylinder itself serves as one electrode and the wire as the other. An electric field is produced in the counter when the wire is attached to a high-voltage supply. Whether the instrument functions as an ionization chamber, proportional counter, or



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Typical photos obtained with a spark chamber. (Above) Two particles pass through the chamber from the left. One has interacted in a plate of the chamber. (Below) Two particles pass through the chamber at different angles.

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Geiger-Muller counter depends on the voltage supplied to the wire electrode.

Presuppose that some small voltage is applied to the central wire. Now when a charged particle enters the counter, it ionizes some of the gas between the electrodes. The electric field causes the negative ions (or electrons) formed in this process to migrate toward the positively charged central wire while the positive ions migrate toward the outer cylinder which is negatively charged. When the ions reach their respective electrodes a pulse of current is detected by means of an electrometer or other detecting instrument. However, when the voltage applied to the central wire is less than approximately 100 volts, the ions move slowly and there is time for many of them to recombine into neutral atoms before reaching the electrodes. As a result, the pulse registered will be less than if all the ion pairs formed by the charged particles had reached the electrodes.

At about 100 volts, however, all primary ion pairs—those formed by the charged particle—reach the electrodes. This situation remains essentially the same as the voltage is increased to around 500 volts. It is in this region roughly between 100 and 500 volts that the counter functions as an ionization chamber. The pulse of current detected is dependent on the number of ion pairs formed by the charged particle and remains constant for any particular particle species.

As a consequence, an ionization chamber should be able to differentiate heavily ionizing alpha particles—which form many ion pairs—and weakly ionizing beta particles—which form only a few ion pairs. In practice, however, ionization counters are

normally used only for counting the heavily ionizing alpha particles since ionization from beta particles, as a rule, generates pulses that are too feeble to be adequately amplified and counted.

At about 500 volts the sizes of the current pulses produced by the ion pairs are no longer independent of the voltage applied to the central wire. As the voltage is increased, the counter enters the proportional region which extends to about 800 volts. In this region, electrons enroute to the central wire become energetic enough to ionize other gas atoms. A cascade of secondary electrons, called a Townsend avalanche, is formed and reaches the central electrode. This results in much higher current pulses which require less external amplification to be read.

In a proportional counter, if a charged particle produces N ion pairs by ionization, aN electrons will be collected at the central wire. The quantity a , called the gas amplification factor, is independent of N and, as a result, the pulses formed by heavily and weakly ionizing particles, although internally amplified, are proportional to each other in the general range of 500 to 800 volts. In this sense, the ionization chamber can be thought of as a proportional counter with $a = 1$ —no internal amplification. The gas amplification factor—which is dependent on the type of gas used and the geometry of the counter—may be as high as 10,000 in the upper portions of the proportional region.

When the voltage to the central wire is in roughly the 800 to 1500 volt region, the counter functions as a Geiger-Muller or Geiger counter. Unlike the proportional counter, the Geiger counter cannot differentiate particle species by size of pulse. In a proportional counter, an electron from an ion pair probably produces an avalanche at only one point, whereas in a Geiger counter the avalanche spreads along the whole central wire. The amplification is thus so great that the pulse formed is almost independent of the number of primary ions.

This is the reason why particle species cannot be discriminated by this type of counter.

The Geiger-Muller counter has been widely used in the counting of radioactivity because the gas amplification factor can be very high under the proper conditions—as high as 100 million for a weakly ionizing particle—and hence little external amplification is required.

A basic problem with Geiger counters is that the pulse formed by the avalanche from a charged particle may last for some time. This period is, for all intents and purposes, dead time. If another particle enters the counter before the discharge is completed, the pulse it produces is confused with the preceding one and accurate counting is impossible.

Consequently, strenuous efforts have been made to find means by which to suppress or quench the discharge and thus improve the resolving power of the counter. At the present time, both internally and externally quenched Geiger counters are in use.

In the internally quenched type, a few per cent of a quenching gas or vapor, such as methane, ethane, ethyl alcohol, chlorine, or bromine, is added to the argon in the counter. These materials quench the discharge because some of the energy which normally causes the emission of electrons is instead used to decompose the molecules of the quenching material.

The externally quenched Geiger counter makes use of an external resistance or an auxiliary vacuum tube circuit for the quenching process.

When properly quenched, and with particles arriving at a uniform rate, a Geiger counter can count a maximum of about 5,000 pulses per second. This, however, is an optimum condition which can never be attained since radioactive decay is a random process. There is also the probability of two or more particles arriving almost simultaneously and not being counted separately, so that the practical counting rate is somewhat below the 5,000-pulse maximum.

For very fast counting, an elec-

tronic scaler is included in the circuit. A common form of scaler allows one pulse in every 2, 4, 8, 16, et cetera, to be recorded, depending on the rate at which particles enter the counter.

The resolving time of Geiger counters— 10^{-4} second—is such that they have found very little application in high-energy physics laboratories. While 10^{-4} second may seem like a very short time for the pace at which we live, on the nuclear time scale it is a tremendously long time. One of the unstable elementary particles, for example, has a mean lifetime of 10^{-19} second. That's less than one billion billionth of a second.

Because of their much better resolving times, physicists today make use of the scintillation counter and the Cerenkov counter—both of which depend on the evolution of light to detect particles. The counting of scintillations—flashes of light—produced by the interaction of charged particles with the material of a fluorescent screen was one of the earliest quantitative methods. The scintillations produced on a fluorescent screen by a beam of electrons were instrumental in the proof of electrons as elementary particles.

Counting scintillations, however, normally required a microscope and was slow and tedious work. As a result, the Geiger counter was developed. In turn, the development of the photomultiplier tube—with a response time of 10^{-8} to 10^{-9} second—enabled electronic circuitry to replace the human eye—with the result that the scintillation counter is now the most used counter in particle physics.

Materials which produce scintillations on interaction with charged particles are called scintillators or phosphors. Characteristics of scintillators vary widely, but some of those which must be taken into consideration in the design of a particular counter are: (a) sensitivity of the type of radiation to be detected, (b) the amount of light produced by a particle of given energy, (c) the characteristic time for the light pulse to form and die away, (d) ability to measure the amount of energy lost in the scintilla-

tor itself, and (e) physical properties.

Scintillators are often grouped according to type of material such as inorganic crystals, inert or noble gases, organics—either liquid or crystalline—and plastics. Probably the most commonly used are the organic and plastic scintillators.

Anthracene ($C_{14}H_{10}$), transstilbene ($C_{14}H_{12}$), and p-terphenyl ($C_{18}H_{14}$) are organic crystal scintillators most often used. Their usefulness arises from their very short light decay times, 10^{-8} to 10^{-9} second. This, combined with the 10^{-8} second response time of the photomultiplier tube, is what makes scintillation counters so useful in high-energy physics.

Organic liquid scintillators are produced by solutions of p-terphenyl in either xylene or toluene. These liquids give scintillation pulses with decay times comparable to p-terphenyl itself. Organic liquids are highly transparent to the passage of their own scintillation light. Consequently, liquid scintillation counters of very large size can be constructed. This feature was particularly useful in the discovery of the elementary particle known as the antineutrino.

The neutrino and the antineutrino were hypothesized for almost twenty-five years before the antineutrino—and by imposition, the neutrino—was actually shown to exist. Since these elementary particles travel at the speed of light, and have no mass and no charge, getting them to interact with matter such that the products of the interaction could be detected was something of a problem. (Neutrinos and antineutrinos have no trouble whatsoever in passing completely through the earth without interacting.)

It was thought that in rare instances an antineutrino would interact with a proton to produce a positron and a neutron. This reaction should occur with some frequency around large fission reactors which produce heavy fluxes of antineutrinos. The detection experiment made use of the fact that gamma rays are produced by cadmium capture of neutrons and by positron

annihilation. The time delay between the gamma pulse from positron annihilation and that from neutron capture is typically about five microseconds.

By an arrangement of large liquid scintillation counters sandwiched between target tanks containing cadmium chloride and water, just such a time delay between gamma-ray pulses was discovered at the Savannah River Plant of the AEC. Fourteen hundred liters of liquid scintillator were used in the experiment together with 330 photomultipliers.

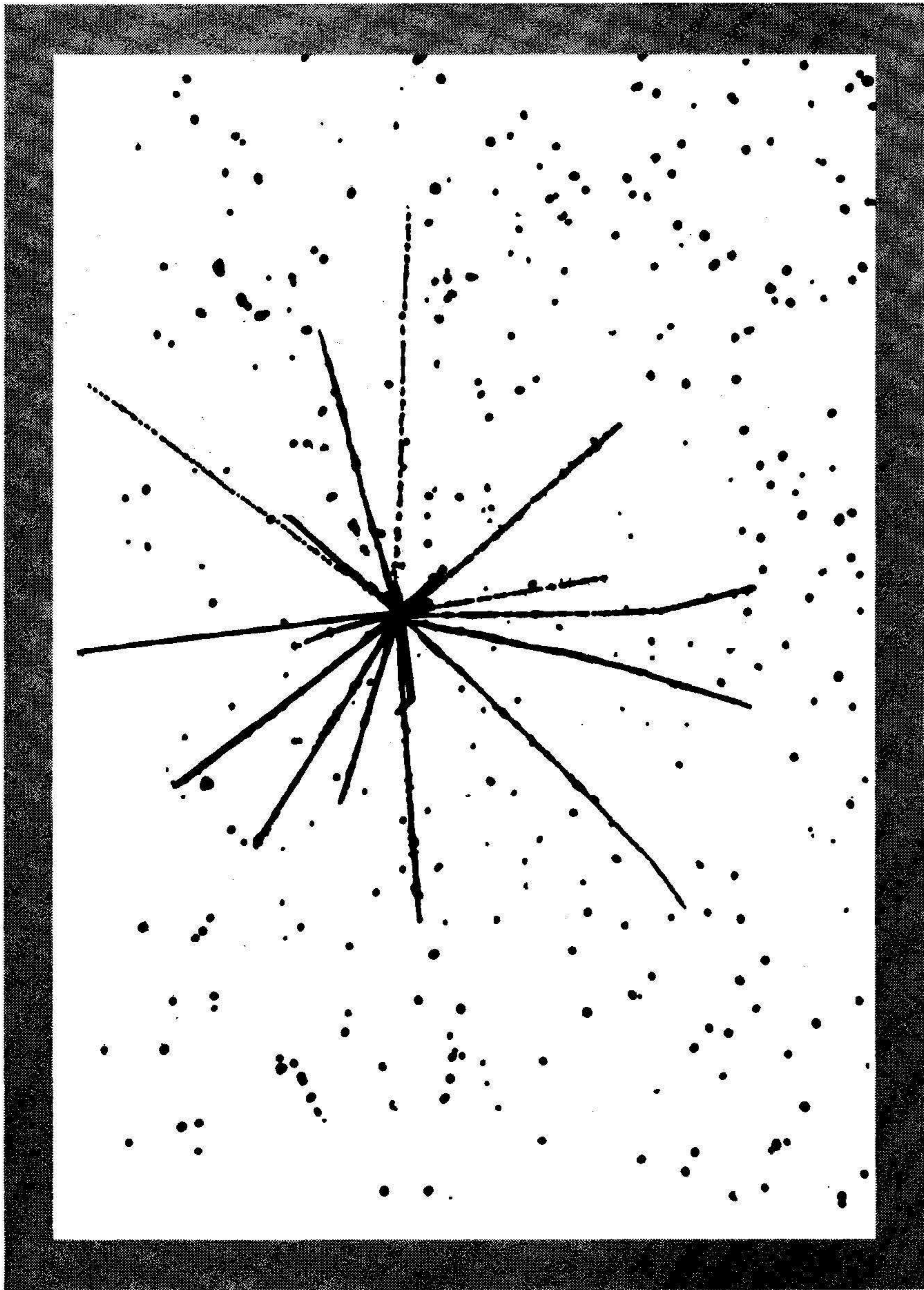
Fortunately, not all detection experiments require such large detection equipment. Many make use of the much more versatile plastic scintillators. These are made by the addition of an organic scintillator, such as terphenyl, to a plastic medium such as polystyrene. They retain essentially all advantageous features of the crystalline scintillators, their size and shape is not critical, and they can be fabricated easily. As a consequence, plastic scintillators have become the most popular scintillation material now in use. Light pipes made of Lucite are commonly used in conjunction with plastic scintillators. These light pipes can be made into any shape as required by the geometry of the experiment so long as they remain internally light reflective—i.e., light from the scintillations follows the shape of the light pipe and is not lost at curved surfaces.

We all know—or at least have been taught—that the speed of light is the limiting speed in the universe. We assume that nothing can travel faster than light. Yet the principle of the Cerenkov counter is based on the fact that in certain instances particles do travel faster than light—and in so doing can be detected.

This seemingly paradoxical situation results because it is possible for a variety of particles to travel faster than the speed of light. It all depends on the medium through which they travel. True, the speed of light is the ultimate speed attainable in air or vacuum, but it isn't necessarily so with respect to certain liquids or solids.

Water serves as a good example. The

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A photomicrograph of a nuclear emulsion exposed to a beam of 2-BeV particles. In this case the incoming particle was presumably a neutron, and therefore left no track. It hit the nucleus of an atom of the emulsion, exploding it into 17 different visible particles which flew out forming tracks in a star-shaped pattern. In general, the heavy lines are made by slow particles (protons) and the light lines by fast particles. The black spots in the background are grains in the emulsion which appear with enlargement. When reproduced on an 8 x 10 inch print, the tracks are 200 times actual size.

speed of light in water is given by c/n , where c is the speed of light in vacuum and n is the index of refraction of water. As it turns out, the speed of light in water is considerably less than in vacuum so that high-energy particles traveling through water may easily exceed the speed of light in this medium. However, in so doing, charged particles emit a bluish-white glow. This is the so-called Cerenkov radiation. Such radiation is particularly noticeable in the water surrounding certain pool-type nuclear reactors.

The Cerenkov counter makes use of this luminous radiation to count individual charged particles. Because the radiation in a given medium is produced only when the speed of the charged particles is greater than the velocity of light in that medium, the Cerenkov counter is useful as a threshold detector, that is, one which records only particles whose speed—or energy—exceeds a certain value.

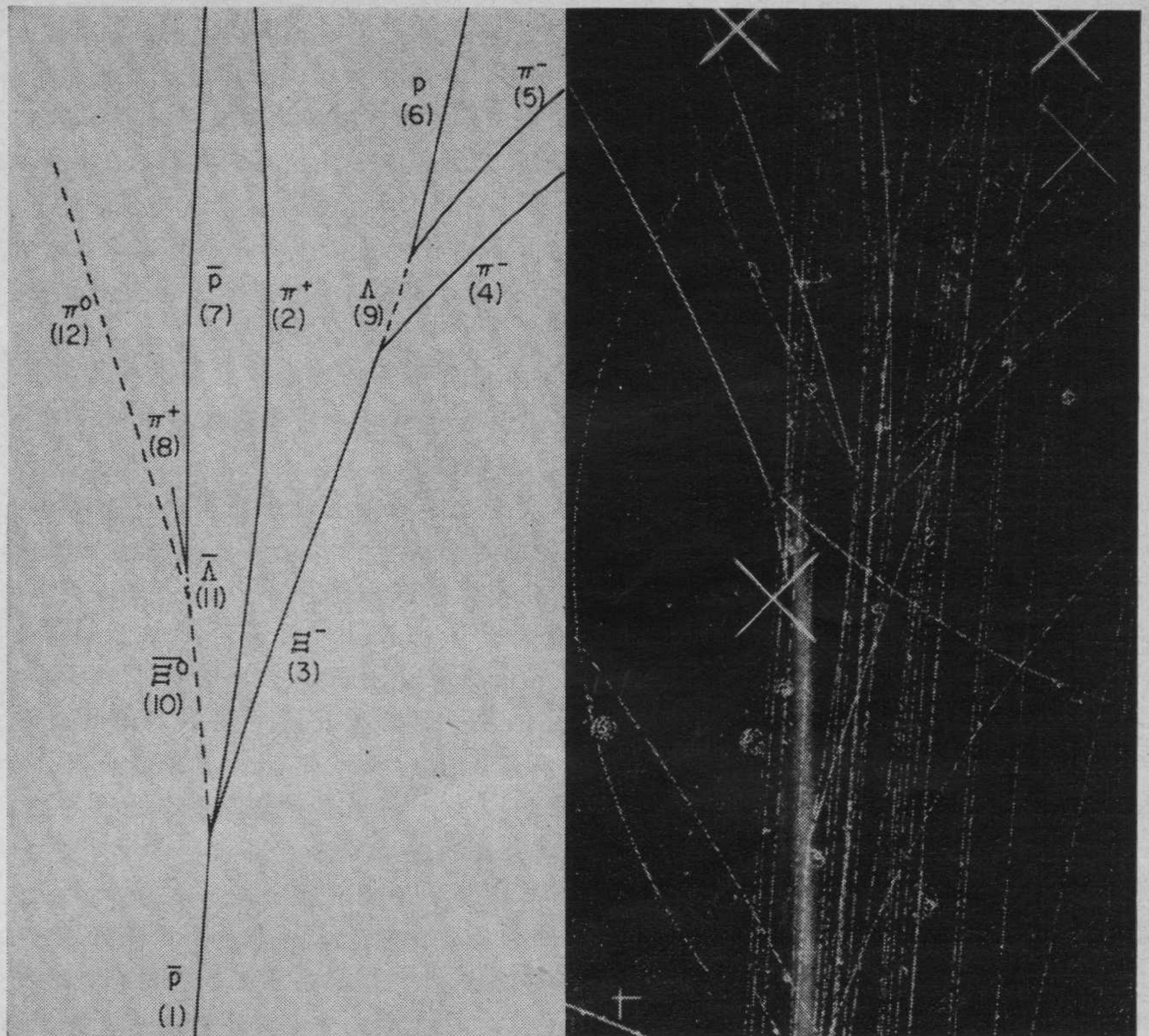
Materials most commonly used for Cerenkov radiators are water, Lucite, and flint glass, which have indexes of refraction of 1.3., 1.5, and 1.59, respectively. Like the scintillation counter, the Cerenkov counter uses a photomultiplier tube to sense the light pulse and to convert it into a usable electrical pulse. Since the intensity of the Cerenkov light is usually much less than that of light emitted by scintillators, extreme care is taken to use radiators which do not scintillate. The light pulse from a Cerenkov counter depends on the size of the counter but is usually shorter than 10^{-9} second.

Cerenkov light from particles traveling at a certain velocity is emitted in a rather well-defined cone. The angle of this cone is established by a very simple relationship, but one which has made the Cerenkov counter almost indispensable as a particle detector in high-energy physics, namely:

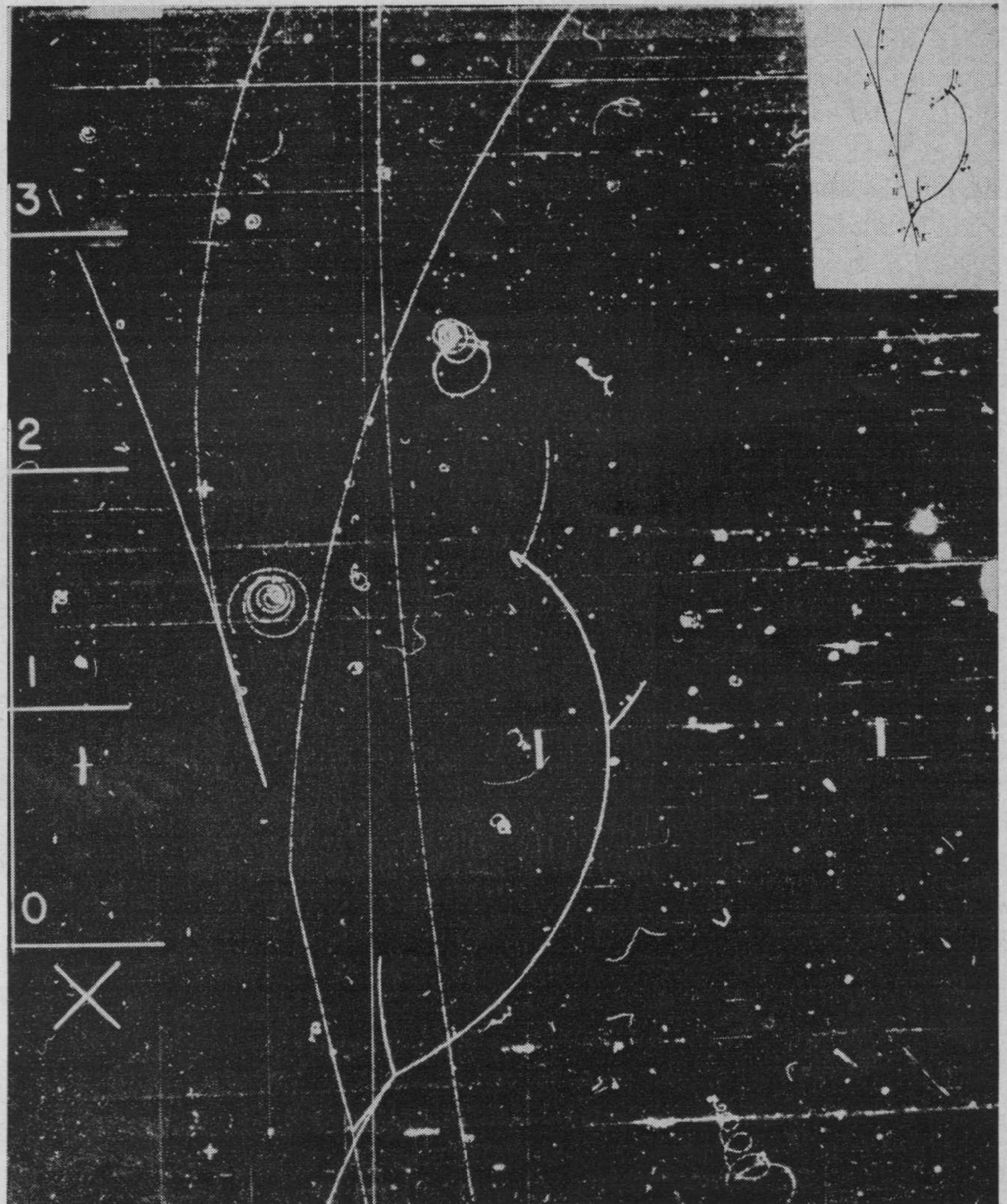
$$\beta = \frac{1}{n \cos \theta}$$

In other words, the angle θ of the emitted Cerenkov radiation depends only on the index of refraction of the radiator and the velocity B of the particle. This implies that

The recent discovery of the 34th elementary particle (the neutral anti-cascade hyperon) is documented in this liquid hydrogen bubble chamber photograph of an anti-proton ($-p$) colliding with a proton (p) to produce a pair of cascade hyperons, one charged and one neutral, and a charged pi-meson. The sketch beside the photograph shows the proper assignments of a particle to each track. Track 1 is the trajectory of the incoming anti-proton ($-p$) which collides with an unseen, stationary proton (p) in the liquid hydrogen. Track 3 is the trajectory of the negative cascade hyperon which decays into a negative pi-meson (π^- , track 4) and a neutral lambda hyperon (Λ , track 9). The trajectory of this neutral particle is not visible in the bubble chamber but, after traveling a few centimeters, the lambda particle decays into a negative pi-meson and a proton whose trajectories are seen as tracks 5 (π^-) and 6 (p). A positive pi-meson (π^+ , track 2) is also produced in the initial collision. From calculations of the properties of the collision, a particle of mass equal to that of the cascade hyperon is predicted to travel in the direction indicated by track 10. This particle decays into a neutral pi-meson and a neutral anti-lambda hyperon. Although neither of these particles gives a visible trajectory in the bubble chamber, the anti-lambda hyperon decays into an anti-proton ($-p$, track 7) and a positive pi-meson (π^+ , track 8). This allows the calculation of the trajectories of the anti-lambda hyperon ($-\Lambda$, track 11) and the neutral pi-meson (π^0 , track 12), and confirms the trajectory and identification of the neutral anti-cascade hyperon ($-\Xi^0$, track 10), the particle which had not been previously observed.



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Production and decay of a XI minus and a K plus Tau decay. An event in the 72-inch liquid-hydrogen bubble chamber. The diagram in the upper right hand corner shows to which particles the tracks are attributed.

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the Cerenkov counter is velocity selecting, that is, it can be used to detect particles having only certain velocities. Just such a velocity-selecting Cerenkov counter was used in the experiment that led to the discovery of the antiproton.

The following is a much-simplified description of the role played by the Cerenkov counter in that experiment. A beam of negative particles from a target bombarded by the proton beam from the Bevatron was allowed to impinge on a Cerenkov counter containing a Lucite radiator. It was known that the beam would consist primarily of pi mesons—one of the more abundant elementary particles—which would produce Cerenkov radiation at an angle θ of about 48° . If it existed, calculations showed the antiproton should produce Cerenkov light at an angle of about 31° .

A light baffle and a series of plane mirrors were arranged such that light from the counter would reach photomultipliers only when Cerenkov radiation within $\pm 5^\circ$ of the desired 31° angle was produced. In the experiment, fewer than 100 light pulses were produced which were picked up by this arrangement. Nonetheless, the experiment was thought to be sufficiently accurate for this to be considered evidence that the antiproton had been detected.

The examples given thus far of the uses to which particle detectors have been put have been limited to events that have taken place within the earth's atmosphere. On January 31, 1958, however, a simple cosmic-ray counter began to send signals back from the first American satellite, Explorer I, and a whole new, extremely important, field of physics came into being.

It might aptly be called space physics.

The first counting rates telemetered back from the satellite in its eccentric orbit varied between 50 and 60 counts per second at a 200 to 300 mile altitude. To the waiting physicists below, this was what might reasonably be expected from cosmic rays. At a 600-mile altitude over the equator, however, the counting rate dropped to nearly zero. Being rather unwilling to accept this apparent evidence of no cosmic rays in this region, and suspecting that faulty circuitry was to blame, the physicists from Iowa State sent up an improved counting arrangement in Explorer III. This data confirmed the earlier data. There appeared to be no cosmic rays at all over the equator.

A close examination of the data from Explorer III revealed that the fault in the data lay not in the telemetry but in the Geiger counters used in the counting arrangement. When exposed to an intense flux of particles, a Geiger counter fails to function properly because it does not have time enough to respond to individual particles. In effect, it becomes saturated and fails to show the presence of *any* particles. This apparently was what had happened in the satellites. Instead of a region where cosmic rays had vanished, the satellites had entered a region of intense radiation. Thus was discovered the first of the Van Allen radiation belts.

Since that time a majority of the satellites and space probes have carried radiation detection instruments. A second Van Allen radiation belt and a so-called solar wind have been discovered. Nuclear emulsions recovered from satellites have given an indication of the energies of the various particles trapped in the Van Allen belts as well as an idea of the tremendous energies which some primary cosmic rays carry. (The initial discovery of high-energy protons in the lower Van Allen belt was made with emulsion detectors recovered from orbit in 1959.)

Until recently, emulsion detection techniques trailed behind electronic counters as the favored method for

studying particles in space. This was primarily due to the fact that emulsions, unlike counters, must be recovered from space and returned to the laboratory for analysis. Recovery methods have become more sophisticated and reliable in the past couple of years, however, so that nuclear emulsion packs are now frequent packages in orbiting satellites.

For example, in one series of experiments designed to determine whether an "east-west asymmetry" exists in the flux of protons in the inner Van Allen belt, six separate emulsion packs have been successfully orbited and recovered from polar satellite flights since September 1962. (Interestingly enough, it is only as this is being written that the Air Force has admitted that it has been regularly recovering packages from orbiting satellites during the past several years. Prior to this, the only information released about the so-called "secret" satellites launched into polar orbit was the launching dates and nothing else. Even now no mention has been made of how many packages have been recovered from orbit.)

The study of radiation in space is not limited to the immediate vicinity of the earth. The Mariner II Venus probe carried an ionization chamber and three Geiger-Muller counters on its successful trip. The purpose of these particle detectors was threefold: (a) to detect the variation of cosmic rays with distance from the sun, (b) to detect the variation in cosmic-ray intensity with time, and (c) to determine the amount of radiation, if any, trapped around Venus.

The accurate detection of radiation in outer space is of extreme importance to the welfare of the manned spaceflight program. Radiation from solar flares in particular can be extremely damaging. Not only does it destroy communications but it also represents a definite hazard to any living creature exposed to it.

Hence the role of radiation detectors in space physics is a significant one, not only from a scientific viewpoint but from a very practical engineering and human one as well. ■

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continued from page 5

answerable unless you choose to call me mistaken, deluded or a liar.

Dr. Menzel, by the way, has warned quite properly about dogmatic pronouncements by scientists operating outside their own fields of competence—and then fallen into the trap himself. Of the alleged mummy of a “saucer man,” found in Wyoming in 1932, he says: “Paleontologists recognize it as *Hesperopithecus*, an anthropoid denizen of earth during the Pliocene period.” But *Hesperopithecus* is itself a classic boner, built on one supposed ape tooth found in Nebraska in 1922. It turned out to belong to a Pliocene pig—a peccary. So far as I know, North America had no Pliocene apes. A proposed explanation of the Wyoming mummy, by the way, is that it was a premature fetus, neither Pliocene nor saucerian, but Indian.

IS THERE LIFE ON OTHER WORLDS

By Poul Anderson • Crowell-Collier Press, New York • 1963 • 223 pp. • \$4.95

I suppose it should surprise no reader of Analog—nor any regular follower of science fiction, for that matter—that Poul Anderson has written the best evaluation of the chances of life on other worlds that we have had. His stories have always shown the broad span of his interests, and the fact that he writes from an understanding of technical concepts and not merely by skimming the generalizations off the surface.

The first half of the book is a conservative yet open-minded summary of what is known and thought about the prevalence of planets and the likelihood that life will develop on many of them. He is talking here about protoplasmic life based on carbon chemistry—not the weirder hypotheses of some stories. But he is using the newest scientific information and conjecture, such as the possibility that the stereotype of a frigid Jupiter may

be wrong, with a super-greenhouse effect maintaining moderate or high temperatures at the hidden surface.

The last part is by far the most thought-provoking anyone has contributed to this theme in a long time. For, granting life on myriads of other planets, Anderson goes on to explore the likelihood that intelligence will develop as inevitably as life, and that intelligent life will develop a science and technology capable of interstellar communication—with us. Finally, he examines pragmatically the reasons why Man will eventually go to other worlds among the stars, and what he will do there.

Poul Anderson's book is a far better answer to the current reaction against the Man-in-Space program than all the defensive generalizations that have been coming out of the official agencies. Send a copy to your Congressman, if you think he can read.

ALL THE COLORS OF DARKNESS

By Lloyd Biggle, Jr. • Doubleday & Co., Garden City, N.Y. • 1963 • 210 pp. • \$3.95

The science-fiction Pinkertons at *Science Fiction Review* attest this as an original novel, and a good one. We can hope that Lloyd Biggle has other adventures of his future detective, Jan Darzek, up his sleeve or in his typewriter. For Darzek makes the book, especially in the second half.

In 1986 the backers of the first matter-transmission company, Universal Transmitting Company, have broken through to successful instantaneous transmission of people from any transmitting to any receiving station. Accidents, sabotage, just about every possible misfortune has blocked them, but now they are an overnight success, thanks to a combination of good science and engineering and very smart merchandising.

And then women start disappearing in transit. Gorgeous blondes, old ladies with umbrellas—they step through the gate of the transmitter in New York, but nobody comes out in Chicago or Paris or Brussels. Darzek, an industrial detective, is put on the trail and follows the blonde through—into

a buried station on the Moon, where creatures from another star are trying to keep mankind from bursting out among the planets.

Darzek's escape and efforts to stop the extraterrestrials are, of course, the rest of the story—a familiar enough gambit. But Darzek himself emerges as a rememberable, if not yet memorable character, and the story moves fast and smoothly, especially in the earlier part.

A STRESS ANALYSIS OF A STRAPLESS EVENING GOWN

Edited by Robert A. Baker • Prentice-Hall, Inc., Englewood Cliffs, N.J. • 1963 • 188 pp. • \$3.95

The thirty-two pieces in this collection are technical fun—parodies, poker-faced pastiches, a few rather heavy-handed satirical bits—which are best when they are most technical. Dolton Edwards “Meihem in Ce Klasrum” is reprinted from *Astounding* of 1946—Isaac Asimov's classic study of thiotimoline should have been—and Francis P. Chisholm's “The Chisholm Effect” acknowledges the discussion here of Murphy's Law and the Finagle Factor, which the author has taken unto himself and tagged with his own name in best scholarly fashion. On the other hand, the Parkinson who reports an extension of Parkinson's Law to the field of medical research is the original—no imitation.

Two other science fiction magazines are represented: *Fantasy & Science Fiction* with the brief farce, “Cosmic Sex and You,” by Nils Peterson and *Fantastic Universe* by a bitter little variant on the Twenty-Third Psalm, by Lester del Rey. The other sources are impeccably scientific and/or literary, ranging from *Harper's* to the *Journal of the American Statistical Association*, and not passing over *The Journal of Irreproducible Results* or *The Worm-Runner's Digest*. Non-scientist Robert Nathan has coyly and ham-handedly satirized archeology in “Digging the Weans,” but anthropologist Horace Miner has done a far better job on his colleagues in “Body Ritual Among the Nacirema” from *American Anthropologist*. The illus-

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trator—otherwise quite in the mood of the book—has muffed the schematics for the title paper: incredible as it seems, he either did not read or could not follow the text.

Your favorites in this treasure chest will probably depend on your own scientific background: the biochemist who is thrown into hysterics by "Hiawatha's Lipid," contributed by Oxford biologist Hugh Sinclair, may be left cold by Joel Cohen's "On the Nature of Mathematical Proofs." But there's certainly something for everybody.

THE ASTRONAUTS MUST NOT LAND

By John Brunner

THE SPACE-TIME JUGGLER

By John Brunner • Ace Books, N. Y. • No. F-227 • 1963 • 138 + 84 pp. • 40¢

This Ace Double is another Ace bargain and a gift from our good friends in England, where editor John Carnell has made himself the Campbell, if not the Gernsback, of English science fiction.

A stupid title may put you off the better of the two completely unlike stories; don't let it. John Brunner is becoming a more and more accomplished yarn-spinner, and it's only a question of time before he moves into some other field—perhaps the out-of-fashion adventure novel that only a few other English writers like Hammond Innes have kept alive since the grand old days of Mundy and Buchan. The first starship has come back, after taking a short-cut to the Centaurian worlds through hyper-space—and its crew have turned into monsters. Other monsters are peering wraithlike out of the heavens, the U.N. and the world's scientists are in a flap, and the newsman hero, whose brother is on the ship, is convinced that he has seen the man on Earth. The plot turns several flips before it's done, in a very satisfactory way.

"The Space-Time Juggler" is pure sword-and-sorcery, with two men from the future moving human pieces

around in the feudal society of a far planet. It's never as believable as its flip companion, but the people of the story are interesting and the plot intricate. Pieces or pawns they may be in the story, but they have a life of their own. As it should be.

ISLAND OF FEAR

By William Sambrot • Pocket Books, Inc., New York • Permabook No. M-4278 • 1963 • 166 pp. • 35¢

The publisher calls William Sambrot "the master of the field." The field is apparently *Saturday Evening Post* science fiction; most of these eleven short stories appeared there in the 1950s when Bradbury and Heinlein were also selling the *Post* an occasional story. Sambrot's variety is far more typical of slick-paper fiction than theirs.

The distinguishing feature throughout is the professional smoothness and easy flow without which none of the stories would have passed a *Post* first reader. They are all gimmick stories, and the gimmick may double as a blackout at the end of the story. That is about as far as *Post* science fiction had come before it stopped publishing the stuff. Obvious as the final revelation would have been—and is—to a seasoned SF reader, it was novel to slick readers, and one story probably paid Mr. Sambrot more than a year's product in the science-fiction magazines, with the possible exception of this one.

The title story is a fantasy: the ancient Greek Gorgons are imprisoned on an island. "The Second Experiment" is a kind of tabloid version of C. S. Lewis' "Perelandra." "Nine Days to Day" is a good, mildly brutal documentary about what happens to a farmer who is accidentally showered with waste from a nuclear reactor—it may have scared some complacent *Post* readers in 1960, though it came rather late. "Deadly Decision" is the by now familiar one about the man who has to decide whether to press That Button—but it has a good twist ending.

Two stories—one a quietly sentimental nature story, one a sports

comedy—deal with the Sambrot model Abominable Snowman. "Controle Somnambule," from a post-*Post Playboy*, has been reprinted elsewhere: it's the one about the astronaut who disappears from his capsule for six hours. "Invasion" is another documentary, reassuring this time, about the bomber headed for Their Capital and invincible every bit of the way. The rest are minor league—and I've just realized that a running head calls the book "Space Secrets" all the way through.

FEE, FEI, FO, FUM

By John Aylesworth • Avon Books, N.Y. • No. G-1166 • 1963 • 158 pp. • 50¢

The publisher calls this science fiction, and maybe at one time it would have been, but the entrance exams have grown tougher with the years. This is the old Ray Cummings pill—or Alice's bit of mushroom—muddled with Thorne Smith. The author may look at it as an up-dated "Gulliver." The result is disappointing.

It seems that the venal Dr. Leon Grist has invented a pill that makes things grow larger. Advertising man Judd Morrow takes one or two and wakes up in the morning, stark naked and three hundred and fifty feet tall, lying in Madison Avenue. After some amusing and mildly bawdy furor, he is removed to Flushing Meadows, and there he sits and/or stands and/or lies stolidly for the rest of the book, while New York and the rest of the country get in a tizzy over him. Dr. Grist promptly gets himself subsidized, at a pretty price, to find an antidote. A couple of dim-witted juveniles who want literally to be the big men around the block kidnap the scientist, who sees a chance to make even more money. And so it goes.

For fantasy, it is fun—but by this time we know that the square/cube relationship would make a three-hundred-and-fifty-foot giant too massive to stand up without cracking his leg-bones. The added mass comes from nowhere. The antidote is pure magic.

Call it a fairy tale, and then read the Ballantine reprint of H. G. Wells' "The Food of the Gods"—No. F-725;

50¢—for a far better, if equally impossible treatment of the same theme: the food that makes giants.

SIGN OF THE LABRYS

By Margaret St. Clair • Bantam Books, New York • No. J-2617 • 1963 • 139 pp. • 40¢

The strange cover illustration predisposes you to like this original novel of an even stranger future. I had hopes of another "Dark Universe" from another writer who, like Daniel Galouye, hasn't had half the acclaim she deserves. But it catches a case of the Van Vogts and goes all complicated.

This is, indeed, another underground world to which mankind has retreated after a nuclear holocaust. In this case a virulent fungus has been set loose and stripped the world of life. Hidden away underground the survivors live a fungoid existence of their own, in constant fear of contamination and in perpetual servitude to the regimentation of their multi-layered world. One by one the mechanized habitation layers have gone out of commission; little by little the population has dwindled away. If the water or the food or the light gives out, you move to another cell in another level. You go through the motions of daily work, moving boxes back and forth or bulldozing plague victims into a mass grave.

But if you are Sam Sewell, you have strange unexplained cravings, you are uneasy and restless, you question where questioning is not permitted. And soon you find yourself on a weird quest for the mysterious priestess of an unknown cult, deep in levels you never knew existed—laboratories where white rats run like a stream in flood—a command level where nobody is left to command—a VIP level with child-people and a strange two-brained dog. You become gifted with strange powers and are challenged by a strange symbolism that leads you to the deepest level of all, and to the red-haired witch, Despoina.

I have an idea this is a "sleeper" that will hang on over the years, growing with rereading.

3 IN 1

Selected by Leo Margulies • Pyramid Books, New York • No. F-899 • 1963 • 144 pp. • 40¢

The "Three" of the title are "There Is No Defense," by Theodore Sturgeon; "Galactic Chest," by Clifford D. Simak; and "West Wind," by Murray Leinster. The Sturgeon and Leinster stories first appeared here in *Astounding* in 1948; the Simak is from *The Original Science Fiction Stories* of 1946.

Only the Leinster story is worth reading twice, and it is minor Leinster. It's the one about the Middle European country which has been evacuated at the demand of its big neighbor to the east. The enemy marches in—and then the West Wind fulfills its traditional obligation.

Sturgeon was doing an interplanetary invasion yarn, of all things. It's clever, and you may be able to guess the explanation of the invincible alien ship, especially if you remember this magazine as it was in 1948. It certainly isn't the Sturgeon we know today.

And Simak? Well, last year we were invaded by bowling balls. In 1946 it was brownies. Yep. Short, light, folksy, and I must say pretty believable while the protagonists—a couple of the author's fellow newspapermen—are coping with the story they have let loose on the world.

NOVELETS OF SCIENCE FICTION

Edited by Ivan Howard • Belmont Books, New York • No. L92-567 • 1963 • 173 pp. • 50¢

A striking cover, which has nothing whatever to do with any of the eight stories, introduces a pretty good anthology from *Thrilling Wonder* and possibly *Startling Stories* of 1951-1954. The point-blank statement that "Not a single one has ever appeared in paperback form before" is not true, but the new public relations chief has promised that there will be no more wild claims in the future. James Blish's "Testament of Andros," a striking and confusing story, was in "So Close to Home," a paperback Blish collection. Clifford D. Simak's "... And the Truth Shall Make You Free" was in his

"Strangers in the Universe" as "The Answers," and I am pretty sure that L. Sprague de Camp's "Ultrasonic God," Arthur C. Clarke's "The Possessed," and possibly at least one other have also been in anthologies which were reprinted as paperbacks.

The de Camp story is one of his Viagens adventure yarns, this time on Vishnu. Hero prevents villain from civilizing natives, with appropriate bloodshed and repartee. Poul Anderson's "The Chapter Ends" is a mood piece, weaving the web that binds a man to his homeplace. Milton Lesser's "A as in Android" is a take-over of Earth story in which the baddies come disguised as android dancing girls. Simak's story is a far-world pastoral which serves as a kind of companion-piece to Anderson's.

Frank Belknap Long is represented by a very short, almost Clarke-like story, "Night Fear," that is quite unlike his usual themes or treatment. Lester del Rey's "I Am Tomorrow" is a tricky time-paradox story. Blish's strange offering shows us the end of the world through the eyes of a man who is all men or many men who are one man who is you. Clarke's "The Possessed" is a trivial gimmick bit. Maybe he *hasn't* wanted it reprinted before, after all.

Recent Reprints

THE HUGO WINNERS

Edited by Isaac Asimov • Avon Books, New York • No. S-127 • 1963 • 320 pages • 60¢

This is a distinct bargain, since it contains all the short stories and novelettes which had won "Hugo" awards up through the Seattle Science Fiction Convention of 1961—best stories of 1960. The publisher should have shown a bit more imagination and added the Chicago short-fiction winner—or held off a little and had both Chicago and Washington.

THE ISLAND OF DR. MOREAU

By H. G. Wells • Ballantine Books, N. Y. • No. F-761 • 126 pp. • 50¢

Wells' horror story of the conversion of beasts to men.

THE REFERENCE LIBRARY

OUT OF TIME'S ABYSS

By Edgar Rice Burroughs • Ace Books, N. Y. • No. F-233 • 1963 • 125 pp. • 40¢

The third and last part of the "Caspak" series, usually combined in the fat novel, "The Land That Time Forgot." Ace has reprinted the serial versions of the three parts as separate paperbacks. There is a good Krenkel cover.

THE LOST CONTINENT

By Edgar Rice Burroughs • Ace Books, N. Y. • No. F-235 • 1963 • 123 pp. • 40¢

A new title for "Beyond Thirty," one of Burroughs' rarest stories until fans published a hard-cover edition in 1957, and one of his few stories laid in the future. The original magazine version dates from 1916. An American submarine commander goes beyond the thirtieth meridian to rediscover an England and Europe lost from American for two centuries. Frazetta's cover is also especially good.

TOWER OF ZANID

By L. Sprague de Camp • Airmont Books, New York • No. SF-2 • 1963 • 128 pp. • 35¢

This reprint of the 1958 Avalon hardcover edition of the Viagens adventure yarn has been out for about a year, but it did not reach Pittsburgh until after Election Day. A typical de Campian reluctant hero attempts to become a king on Krishna.

FIRST ON THE MOON

By Jeff Sutton • Ace Books, N. Y. • No. F-222 • 1958 • 192 pp. • 40¢

A new printing.

From Fandom

"The Reference Library" is not—repeat, not—a fanzine review department. However, when a fan publication of special interest comes along, I think it is worth a note. The ones that make it are generally (a) bibliographical publications that will be valuable to any student of science

fiction, (b) news of the annual World Science Fiction Convention, and of regional cons if I get the announcement on time, (c) special articles in the regularly published fanzines. Some day, I hope, someone will put together an anthology of the best of the latter. Herewith, some random data.

IN MEMORIAM: CLARK ASHTON SMITH

Edited by Jack L. Chalker • The Editor, • 5111 Liberty Heights Ave., Baltimore 7, Maryland • 98 pages • \$3.50.

A limited edition of four-hundred fifty of this appreciation of the late Clark Ashton Smith were printed. Some parts seem to be mimeographed, others lithoprinted; the quality of the work varies widely and first-comers apparently get the best copies. If you wait, you may get a poor copy at a lower price—or none at all. Contents include poems and one story by Smith and articles by Theodore Sturgeon, L. Sprague de Camp, Fritz Leiber and others; the introduction is by Ray Bradbury. Too bad it couldn't have included a bibliography of Smith's fantasies and occasional science fiction.

SCIENCE FICTION REVIEW

Published biweekly by Robert W. Franson, Box 1568, San Diego, California 92112 • \$1.00 for 10 issues • \$2.00 for 22 issues • \$4.00 for 45 issues.

The first seven issues of this well printed four-page news-and-review sheet have been excellent. Especially useful have been the listings of all stories, in both magazine and book versions, of various authors' series: for example, Murray Leinster's "Med Service" series in No. 1, Andre Norton's "Time Traders" books in No. 2, Poul Anderson's stories about Nicholas van Rijn in No. 3. Capsule reviews of books and current magazine contents are fair, even though I don't always agree. California seems to get both books and magazines some two weeks ahead of the East, and the *Review* comes out every other week, so it is the most timely report on what's new and what it's like that I have seen.

AMRA

The official journal of The Hyborean Legion, aficionados of sword-and-sorcery or heroic fantasy and especially of the "Conan" stories by Robert E. Howard • Published irregularly by G. H. Scithers, USA R&D Group, APO 757, New York, N. Y. • \$2.00 for 8 issues.

Reproduction is excellent; art work is exceptionally good; content is totally unpredictable. Issue No. 26 contains, for example, a review of Ivar Lissner's "The Silent Past," by L. Sprague de Camp, Fritz Leiber's "Fafhrd and Me," reprinted from the *Proceedings* of the Chicago SF Convention, and a poem translated from the ancient and heroic Scandinavian by Poul Anderson.

THE GRIDLEY WAVE and THE BURROUGHS BULLETIN

House of Greystoke • 6657 Locust, Kansas City 31, Missouri.

These are the official publications of The Burroughs Bibliophiles, the organization of Edgar Rice Burroughs collectors and enthusiasts. They are published by Vernell Coriell, one of the more active Burroughs collectors, and sent free to Bibliophiles members and other Burroughs collectors. *The Gridley Wave* is primarily a news bulletin; the *Bulletin* has longer bibliographical and biographical material. *Bulletin* 14, for example, described and reproduced maps of Burroughs' Mars—Barsoom—made by Frank J. Brueckel and R. H. Schlutter. A third map is in *The Reader's Guide to Barsoom and Amtor*, published by Richard Lupoff, 210 East 73rd Street, New York 21, N. Y.—this by Larry Ivie. Price for the *Guide* is \$2.00 from the publisher—if there are any left, which I doubt. A fourth attempt to map Burroughs' Mars is in Vol. 1, No. 6 of *ERB-dom*, published by Camille Cazedessus Jr., 2350 E. Contour Drive, Baton Rouge 9, Louisiana, at \$1.00 for four issues—one of the several individual 'zines put out by Burroughs fans with topnotch bibliographical information on Burroughs and his work. O yes—\$1.00 to C. B. Hyde, 454 Elaine Drive, Pittsburgh 36, Pa. makes you a Burroughs Bibliophile.

assassination

continued from page 7

However, there are certain slight objections to that idea. It's the President elected at twenty-year intervals that has been hit—but Lincoln wasn't assassinated in his first term, and Roosevelt wasn't struck down during the term for which he was elected in 1940. There seems to be some major variable here other than the twenty-year period.

Moreover, if the astrological prediction is valid, we won't be able to check it, actually, until whoever is elected to the presidency in 1980 survives his second term—because according to the astrological prediction, the Jupiter-Saturn conjunction must be in an "earth" sign—and the next conjunction will be in Ares, an "air" sign, which should have a different effect.

It's the old proposition of the rooster who claimed that it was his crowing that made the Sun rise in the morning. Or the proposition that Harry Stine proposed: Experience shows that beating on tom-toms invariably causes the Sun to come back after an eclipse.

The test requires that we see what happens when the rooster doesn't crow—when the tom-toms aren't beaten—and when there's a Jupiter-Saturn conjunction that's *not* in an "earth" sign.

That there is a roughly-twenty-year cycle is certainly true; personally, I wouldn't be anxious to run for President in 1980. Whether it's a matter of that Jupiter-Saturn business, or the fact that twenty years is about one human generation, or it's all sheer coincidence . . . I'd prefer to stand aside and watch the experiment, myself.

Because something very really does seem to be causing a twenty-year cycle of death for U.S. Presidents.

It's been pointed out that among modern major nations, the United States, Czarist Russia, and Japan hold

the record for assassinations of heads of state, but that statement overlooks a very important factor. In the United States, assassination of the President has always been a strictly do-it-yourself, rugged-individualist affair. Historically, it has never been done for political motivation, by a political group, for a political purpose.

What happened in Dallas last November beautifully demonstrates that no man can be protected from assassination if he is exposed to large groups of people—as any head of state must be. He can be protected against a terrorist organization; it is impossible to protect him against a psychotic individual.

There are two possible methods by which a fanatic individual can kill a public figure; one of the remarkable things about the Dallas affair was that *both* methods were demonstrated and both succeeded in killing the public figure attacked.

The long-distance telescopic-sights method was the one Oswald used. It's ideally adapted to the egomania of a fanatic who is of the brooding-hate type, who will practice the use of his weapon. Modern really high-power rifles are quite accurate up to a mile—and you can't search all the high points for a mile on each side of a public figure's parade route.

The other method is, of course, that used by Ruby, or Rubinstein, to assassinate Oswald himself; the close-up approach. Typically, the fanatic isn't really concerned with whether he gets away or not—usually he doesn't want to remain unidentified, in fact—so that close-up approach has the advantage of not requiring any skill with firearms on the part of the crackpot. The commonest type of fanatic is a basically undisciplined personality, rarely adapted to the self-discipline involved in learning a physical skill such as accurate shooting. (Oswald learned his in the Marines—and proved to be precisely the undisciplined type of personality the Marines don't want.)

The two types of assassination are both adapted to the fanatic attacking a public personality; Oswald became a public personality, of course, by assas-

sinating President Kennedy. That he was assassinated is, however, purely the fault of the Dallas police department; the political personage *must* be exposed to the crowd. It's essential for his operation as an important political personage. John F. Kennedy could not be kept isolated and insulated from the people.

But it was absolutely unnecessary to expose Oswald to the mob-scene the Dallas police arranged for him that morning. The inexcusable exposure was due to the political needs not of Oswald, but of the Dallas police; they wanted the publicity the mass of reporters on the scene represented. With such a mass of human beings jammed into the entranceway of the Dallas police building, the addition of one extra individual was more-or-less overlooked. With scores of reporters, still-photographers, movie photographers, TV reporters, TV cameramen, TV technicians, international press representatives and all personal strangers to the Dallas police, the rapid movement of one individual wasn't going to attract much attention.

It is, of course, magnificently ironic that it was not a Federal offense to assassinate the President. This left the entire situation in the hands of the police force of a medium-size town.

Lincoln's assassination took place in Washington; it was automatically a Federal matter. Nevertheless, the tensions of the time being as high as they were, his assassin was quite predictably assassinated in turn. (And the quasi-collaborators were duly railroaded; justice didn't seem too important at that moment.)

It's typical, however, of the motivations of assassination. John Wilkes Booth sought to achieve his own immortality—which he, of course, did. His name will not be forgotten so long as American history books are printed. It's typical of the crackpot that he doesn't care *why* he's remembered, so long as he *is* remembered.

It's a shame that the Dallas police made it possible for Ruby to kill Oswald; I would have been most interested in seeing what the sob-sister battalions did about his trial. The

usual penalty for murder in the United States today seems to run about four to five years in a comfortable jail, if the "poor, misguided individual" is "vengefully" punished at all. I'm sure the sob-sisters would have told us how this poor boy, Lee Oswald, never had a chance, that it wasn't his fault at all, that really he was a victim of society which had denied him the opportunities he should have had. That it was because his father died, and his mother was busy working, and really he shouldn't be blamed . . .

I think it is, indeed, the fault of the society. The fault, however, is not quite the one the sob-sister crew would agree with; the fault I see is a society that talks loud and long about the Dignity of the Individual . . . and forgets, or shushes any mention of the Responsibility of the Individual.

What does that term "dignity" mean in the phrase "the dignity of the individual"? Basically, as defined-in-action, it means the individual has authority to direct himself as he chooses. It means simply *authority*, but we can't use that word, of course, because "authority" is now one of those nasty-wicked words, and too closely linked with *authoritarian* and *dictatorial* to be nice. So we say not the Authority of the Individual, but the Dignity of the Individual.

But authority without responsibility is something nearly everyone would like to have—and generates hell-on-Earth when it arises. The concept of the Dignity of the Individual has, however, become very much a concept of authority without responsibility—because holding anyone responsible for his acts automatically limits his authority, his "dignity." It involves forcing him, against his will, to accept debts he doesn't want. The "Dignity of the Individual" philosophy as currently widely preached amounts to a child's idea of what "Charge it!" means. Mama says "Charge it!" and walks out with anything she wants

. . . so Junior tries it. It's so much more satisfactory than having to pay out money you want yourself!

Every man wants respect, admiration, wants to have his ideas, his actions, affect and influence those around him. He wants to be important and effective. He wants *them* to pay attention to him because of what he thinks, he does not particularly like having to learn what *they* think and feel in order to establish mutual understanding.

If he is, moreover well convinced that his ego is important—the don't-harm-his-precious-little-ego school of child psychology is a great help there—and that he ought to have and be freely granted that Dignity of the Individual as a Natural Right—nothing is said about earning it, notice!—then a deep sense of frustration and injustice builds up.

He *wants* people to recognize his importance. He's assured he has a *right* to have authority. And when he doesn't get what he wants and is assured he has a natural-born right to—why that's injustice!

A generation of sob-sisters who insist that it's always Society's fault—that the individual has Dignity, like the Divine Dignity of a King, and has no responsibility—have established a proposition that is extremely satisfying to the inherently incompetent individual.

How come the United States didn't have a law making it illegal to assassinate the President?

There are some things that seem sufficiently clear to any rational, or even semirational mind, that they don't need to be spelled out.

Shall we, therefore, excuse Oswald from moral responsibility because "Nobody explained to him it was illegal to shoot the President?"

A culture which holds that the individual has no responsibilities if his early environment has been a little rough is, in effect, holding just that sort of proposition.

Oswald, we are told, believed himself to be a brilliant individual, and evidently believed himself to be an Important Individual who wasn't

being given the recognition he deserved.

Yes, what happened to him *was* the fault of the Society. The Society that *taught him a false lesson!* It not only did not teach him the responsibility of the individual, it specifically taught him the *irresponsibility* of the individual.

He tried becoming Important in several ways. The Grand Gesture of renouncing American citizenship and becoming a Russian citizen flubbed egregiously. His Grand Gesture wasn't noticed by anyone outside the U.S. Embassy in Moscow; it got none of the publicity he wanted. Moreover, the Russians took a look at him, listened to him . . . and came to the intelligent conclusion "Thanks—but we don't want you. And moreover, we don't have to take you; America is stuck with you."

A Grand Gesture of a would-be Important Individual could hardly have fallen flatter.

He tried to be an Important Person for Cuban Castroites by infiltrating the anti-Castro forces on the basis of his Marine record. The anti-Castroites apparently agreed with the Russians completely in at least one respect; they didn't want him either.

You can see how his Natural Right to the Dignity every Individual should have was being unjustly frustrated. Nobody was giving him the respect and acceptance he had a clear right to; they all demanded that he earn it, instead of giving it to him as they should. They wouldn't let him have the importance he *knew* he had a right to.

John Wilkes Booth had, at least, earned considerable fame quite honestly as an actor—but, at twenty-six, he was already fading. (A great deal of ego is essential to an effective actor—but ego under limitation and control, or he becomes impossible to work with.)

Both men found the way to being Important that could not be denied.

It's possible to protect a President against an inimical organization; any organization, to be effective, must have leadership of men who can work

together. They must be reasonably sane men; it's all very well to say that Hitler and his Nazis were insane, but it is clearly a false-to-fact statement. They weren't insane; they simply had settled on an impractical course, and gone about it very effectively.

An organization normally has dissents within it; John Wilkes Booth had, originally, gotten into an organization, or started an organization, with the idea of kidnaping President Lincoln and taking him away to the South. When the others in the group recognized the wild impracticality of the idea, Booth changed the plan to assassination . . . at which point the others were having no part of any such plan. Booth's plan to assassinate Lincoln was then leaked to the Government by the ex-members of the organization.

This sort of thing is typical; it's why organizations don't assassinate American Presidents. By the time the organization is big enough to have any effective power to act, it has internal dissents that moderate its actions. It also, by that time, has some police agents planted among the membership.

The problem of the insane fanatic is that while he can always find a dozen other insane fanatics, if he looks around a bit, by the nature of things the other twelve won't be insane fanatics in the same way he is. It's just impossible to organize the insane; men who can't agree that the real Universe is what it is, can't be induced to agree on anything else either. What Booth wanted, moreover, was that he should have personal immortality-of-fame; obviously getting a dozen who agreed on that idea was more than slightly impossible. It would have been easy enough to get a dozen who wanted the same thing for themselves, of course—but this wouldn't make an organization!

Czarist Russia had several organizations that did work to assassinate the political leaders. When a situation exists in which there is no legal recourse, where government is personal-property, then it becomes possible for rational men to organize for murder.

The point at which that situation is reached depends on a number of things. An absolute tyranny administered with dictatorial authority from which there is no legal recourse may be administered with wisdom and high ethical standards. Under such a regime, there will be no reason for rational men to organize for tyrannicide; the men who are fanatically violent in their hatred of the "injustices" done them will be the crackpots who can't co-operate with anyone.

On the other hand, in a society which holds human life relatively cheap, and has a tradition of politics-by-assassination, even a moderate degree of injustice will cause an organization determined to change the government by assassination to form.

The Japanese had such a tradition; a culture that holds ritual suicide a proper part of politics can, quite understandably, include political assassination.

The American culture is subject to neither of those problems; there has never been an organized politically motivated assassination of a United States President; I know of no instance wherein a State Governor was assassinated for organized political motives. (Typically, Huey Long was assassinated for personal motivations.)

America's assassinations may be influenced by some extraterrestrial forces we don't understand.

But they seem to be more massively influenced by the typically American insistence on individual rights. Only . . . some individuals don't accept that their "rights" have limitations.

Lincoln died because a crackpot wanted fame he could not earn and maintain.

Garfield was killed by a man who had been directly commanded by God to destroy him. The poor are not the only ones we have always with us.

McKinley was shot by a would-be anarchist. (Rather like Oswald; the anarchists of the time didn't want that crackpot in their organization, in much the same way that no genuine religious group would have accepted the religious nut who killed Garfield.)

Franklin Roosevelt was not assassinated, because Mayor Cermak of Chicago threw himself on the crackpot who was trying to kill the then president-elect. The man who tried to kill Roosevelt belongs in the collection; he failed in his effort, but at the cost of Mayor Cermak's life. Another individual crackpot; no organization would have had him.

Maybe there's a roughly-twenty-year cycle in America because that's about the length of time it takes to bring up a new generation of crackpots. But the pattern is quite clearly an American pattern.

Incidentally, Oswald's refusal to admit guilt was the modern maneuver for maximum publicity. I doubt that there are many Americans who didn't see him on TV during the two days the Dallas police were seeing to it that adequate news coverage was provided—and few who didn't see the self-satisfied smirk with which he greeted the press. The modern JD knows the maneuver; it's based on the proposition "Sure I did it, and you know I did it, but you can't do a thing to me! Yah! Yah! And you gotta prove I did it!" This leads to glorious days and weeks and months of being The Important Person in trials and appeals and press dispatches.

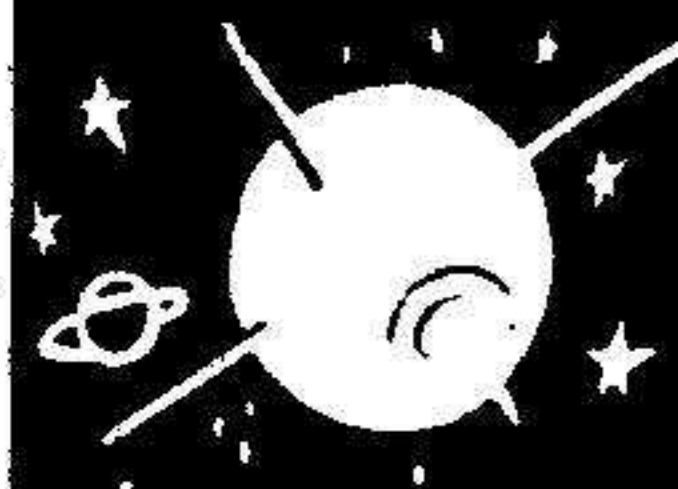
Confession would simply cut the possibilities of all those glorious months of world-wide acclaim and fame down to a few days.

Betcha the police could have gotten a complete, detailed confession, with all sorts of evidence to prove it, if they'd just arrested Oswald for the murder of the cop he killed, thrown him in a back room, called him a cheap punk cop-killer, explained they were too busy on an *important* case to bother with a stupid bum like him, and ignored him studiously. And absolutely refused to believe him when he claimed he was the assassin they were looking for.

After all, he *couldn't* have let them rob him of the fame he'd earned, could he? To be robbed again of the Importance he *knew* he deserved . . . ? That would have been utterly intolerable!

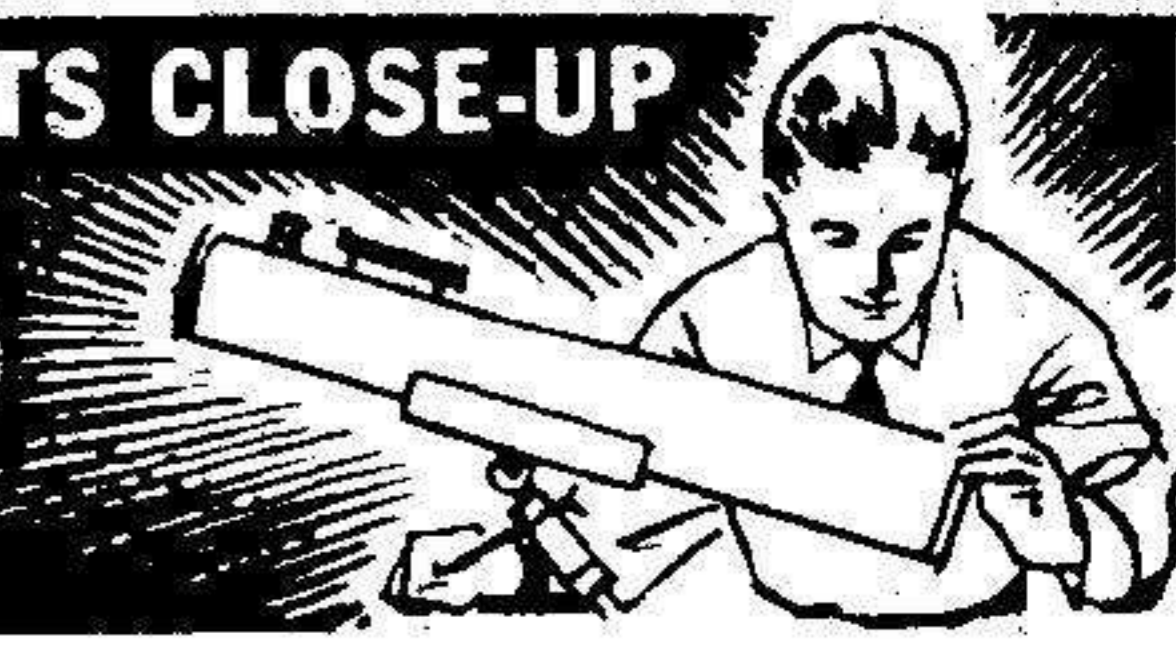
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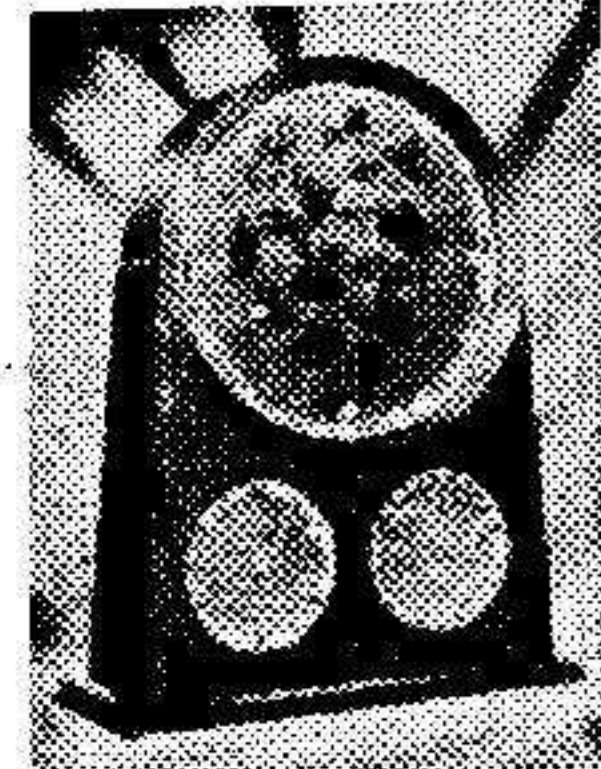


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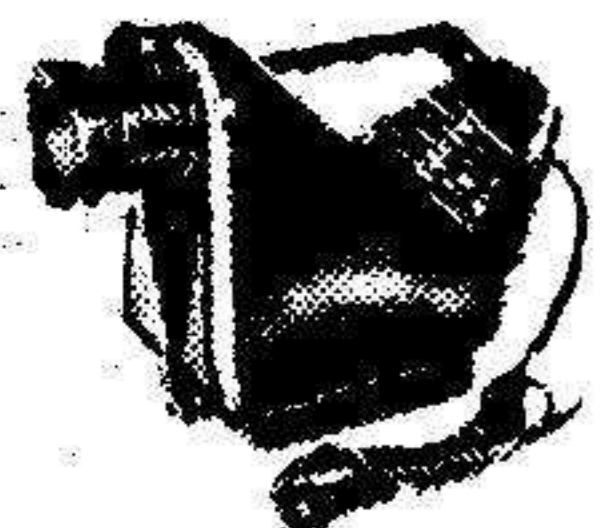


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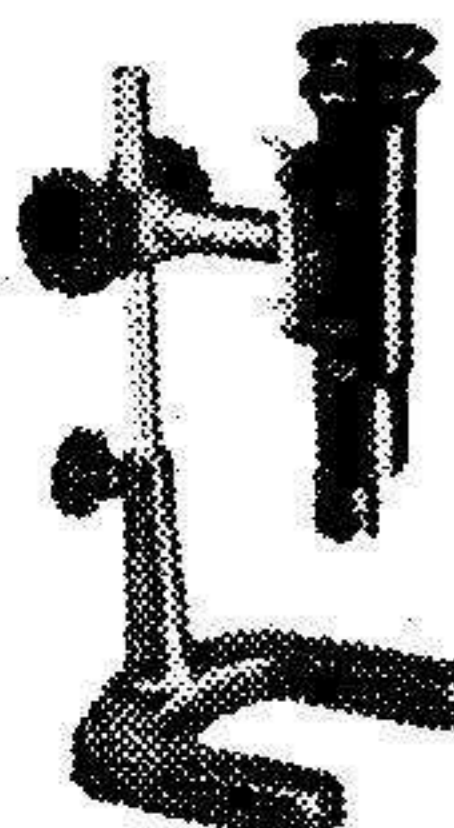
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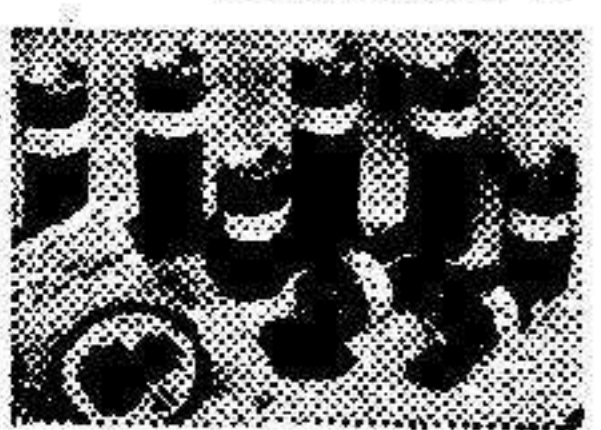
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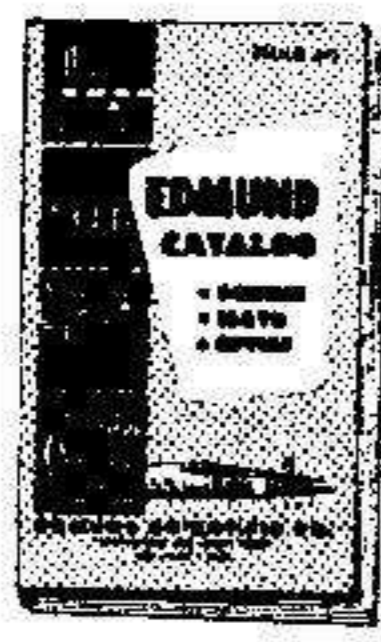
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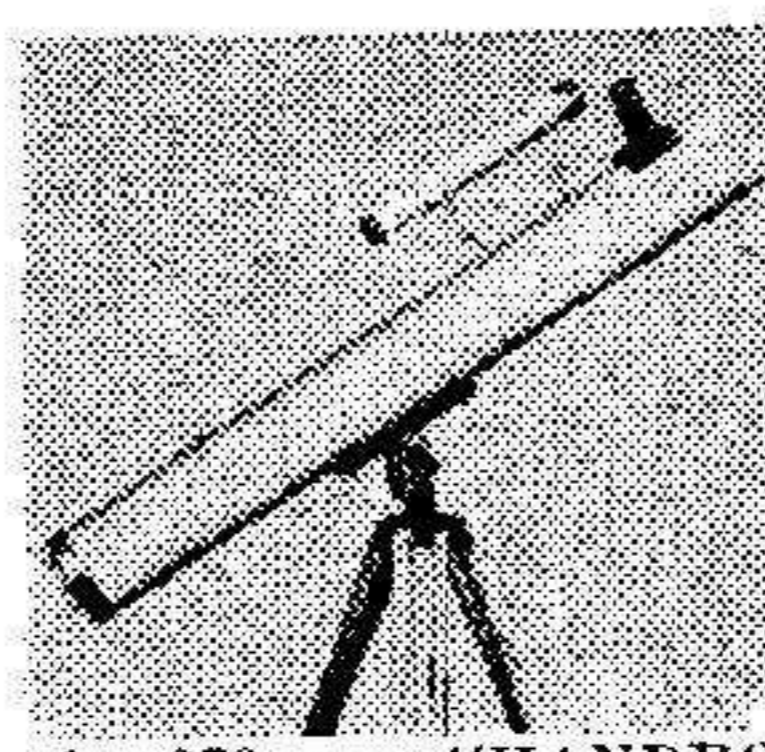
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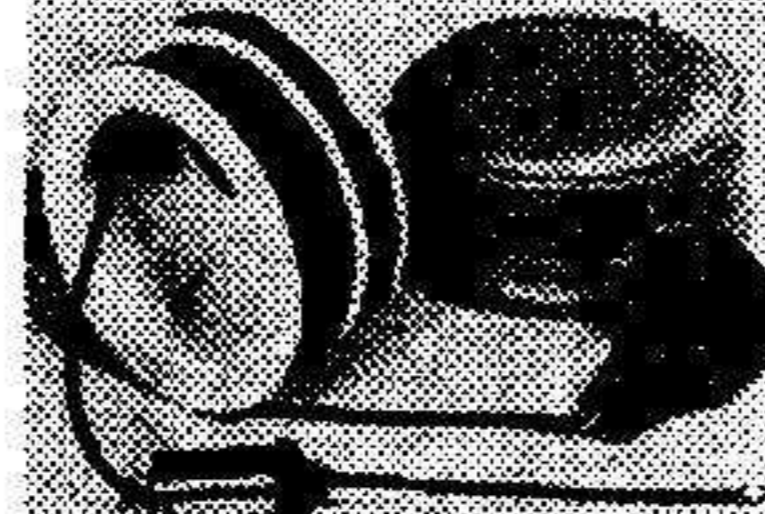


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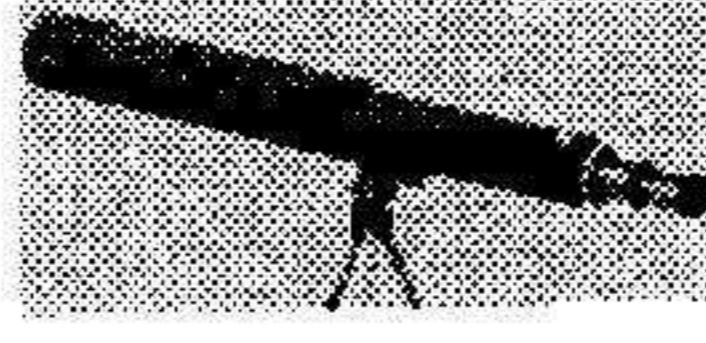


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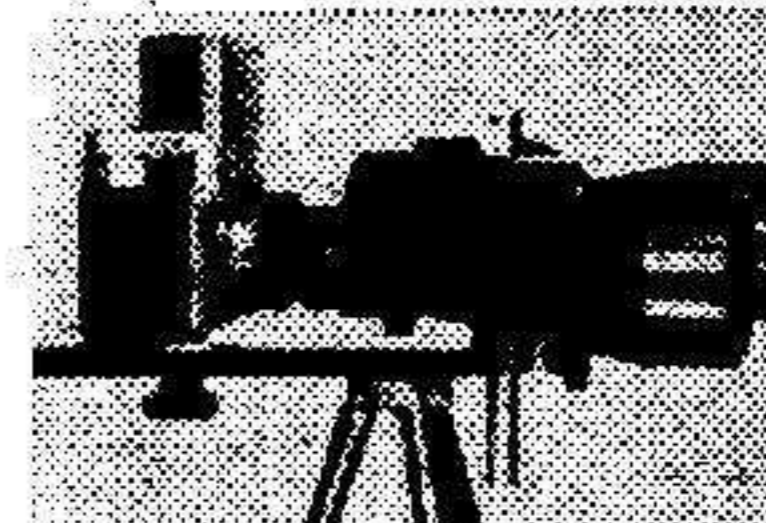


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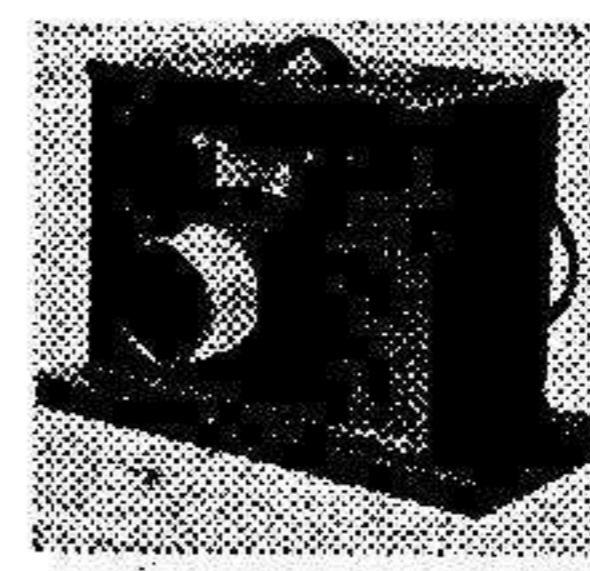
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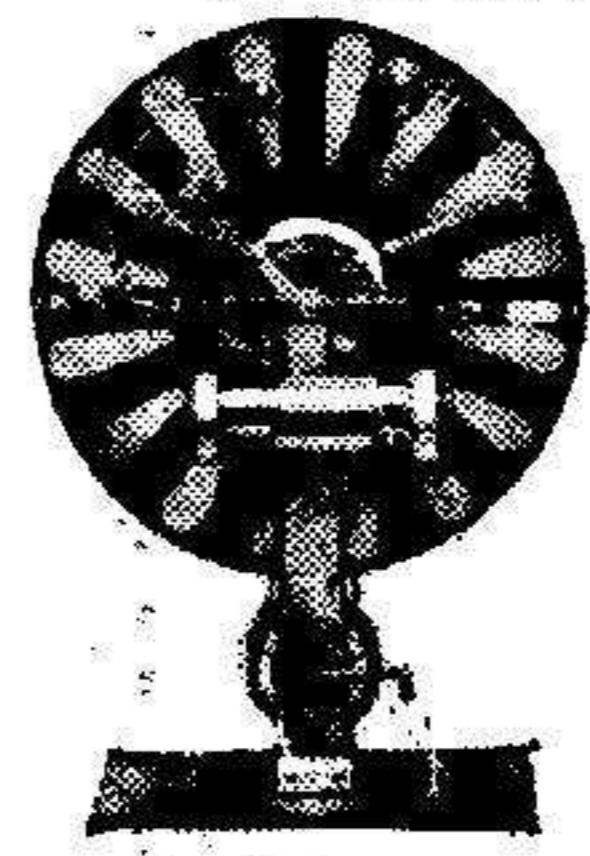
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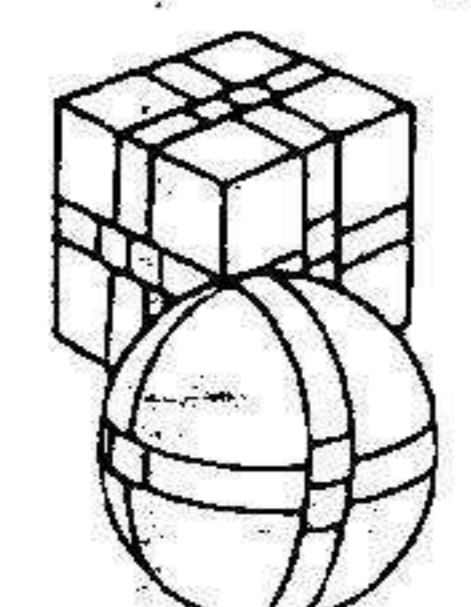
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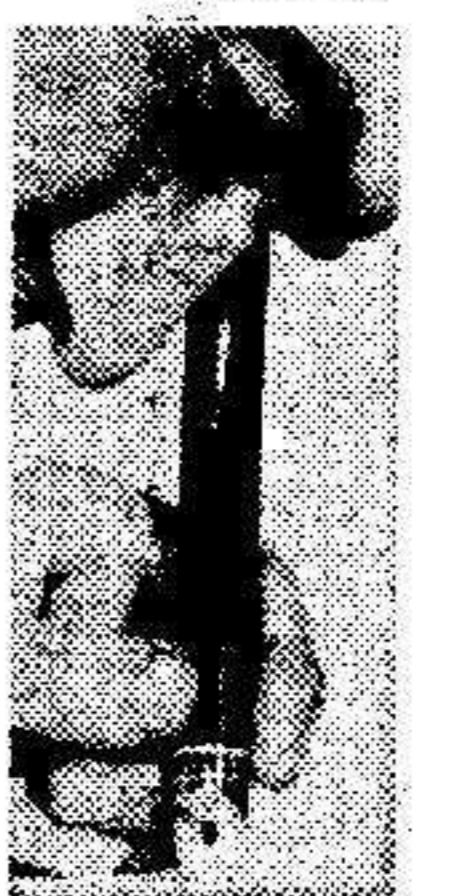
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