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# JOURNAL OF THE
# British Interplanetary Society

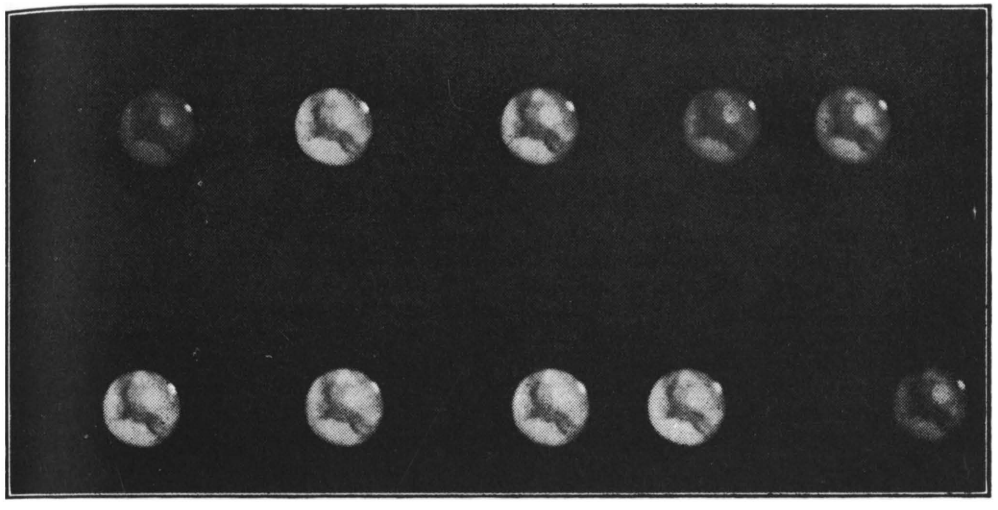

*Photo :* **MARS** *Yerkes Observatory*

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# EDITORIAL

## By P. E. CLEATOR.

In a recent issue of the *Journal*, I mentioned the possibility that the publications of the three leading English-speaking societies might, in the not too distant future, be merged. The proposal, upon investigation, was reluctantly abandoned on the count of cost, and so the position remains today. In the meantime, however, matters have progressed in a slightly different direction. At the time of writing, I have just concluded an agreement with the leading members of the Fortschrittliche Verkehrstechnik, E.V., whereby they will receive a supply of each issue of the *Journal* in exchange for a like supply of *Das Neue Fahrzeug*, the official publication of the German group. And should arrangements proceed according to plan, all members will receive a copy of the latest issue of *Das Neue Fahrzeug* with this issue of the *Journal*.

Nor is this all. A similar agreement is being sought with the American Rocket Society, whose Board of Directors will shortly come to a decision in the matter. With the next issue of the *Journal*, therefore, each member may receive copies of *Astronautics* and *Das Neue Fahrzeug* in addition. Members will agree, I think, that such an interchange of society publications is an arrangement conducive to general satisfaction. Members, for their part, will receive three publications instead of one, and at no extra cost, while the added expense to the societies concerned is but slight, for the cost of publishing a few extra copies of each issue is negligible. I shall be glad to hear from other societies interested in astronautical research, with a view to arranging a similar interchange of publications with them.

About two years ago the Society approached the Air Ministry in an endeavour to interest them in the possibilities of rocket propulsion in the stratosphere. The result was a polite intimation that, although experimentation abroad was watched with interest, the Air Ministry did not consider such a method of propulsion could be a serious competitor to the air screw-engine combination, and that they were not disposed to spend time or money on it themselves. Or words to that effect.

But now, as is reported elsewhere in these pages, it would appear that the Air Ministry have revised their opinion to the extent of secretly constructing a rocket-propelled vessel capable of carrying passengers! No doubt the report will be officially denied, and no doubt such reports have incorrectly been circulated before. But in the present instance, although I am not in a position to reveal the source of the information, I am able positively to state that its authenticity would seem to be beyond question.

# THE 1935 RESEARCH PROGRAMME OF THE AMERICAN ROCKET SOCIETY

By PETER VAN DRESSER
(Editor of *ASTRONAUTICS.*)

The American Rocket Society's experiments with liquid-fuel rocket flights—four complete rockets (Fig. 1) were built and tested in preceding seasons—while serving to arouse interest in rocketry, and to demonstrate that the new science was worthy of extensive practical study, also emphasised the lack of adequate scientific control over this type of research, and exposed the desirability of attacking the key problem of reaction motor construction under laboratory conditions. Accordingly, during the winter of 1934-35, a proving stand was planned and built by John Shesta, C.E., Chairman of the Experimental Committee. This proving stand was designed to supply propellants to rocket motors under substantially the same conditions of quantity and pressure as would obtain in a rocket, while at the same time subjecting the developed thrust, chamber pressure, and propellant pressures to exact photographic record, and permitting a thorough study of the general behaviour of the motor.

The apparatus (Fig. 2) consisted of two vertical propellant tanks, measuring 2¾" × 2' 4", mounted within a framework in such a manner as to permit a rocket motor to be attached to the top (nozzle upwards). The motor was connected with the tanks through suitable feed lines, check valves, and quick-operating valves operated by lanyards from behind the observer's barricade. The oxygen tank was fitted with a safety valve, and the whole system was mounted on a hydraulic plunger piped to a pressure gauge for recording thrust. On the panel with this thrust gauge were also gauges for recording the pressures in the two tanks, and in the combustion chamber. A seconds dial was also mounted on the panel. During the firing period, the whole panel was photographed with a motion picture camera, and the data transferred to graphs after the film was developed.

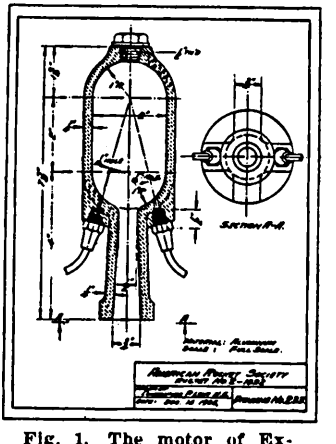

Fig. 1. The motor of Experimental Rocket No. 2.

Pressure on the fuel was produced by nitrogen from a flask, though the oxygen, as is the usual practice, was allowed to develop its own gas pressure by vaporisation. Ignition was by a gunpowder fusee placed in the nozzle of the motor, fired electrically immediately after the propellant valves were opened.

During the summer of 1935 four series of tests were made with this equipment under the supervision of the Experimental Committee, which consisted of John Shesta, Alfred Africano, G. Edward Pendray, Nathan Carver, Carl Ahrens, and the writer. Twenty-five separate motor runs were made, and the data from them recorded. Varying propellant pressures, methods of injection, combustion chamber lengths, throat diameters, and materials of construction were tried. *

The best results were obtained with the third series (August 25th) which were planned especially to study the action of fuel alcohol. A graph of one of the most satisfactory runs of this series is reproduced (Fig. 3 ). While the alcohol yielded no higher impulse per pound of propellant mixture, despite its lower calorific content, it almost equalled the best results obtained with gasoline, and at the same time gave smoother burning and had considerably less destructive action on the nozzles. (The nichrome nozzle used in these two runs had been used on three previous occasions).

The endurance of the nozzles seems also to have been aided by the use of more elongated combustion chambers ($6\frac{1}{2}$" × $4\frac{1}{2}$") than in the previous runs. Combustion took place more effectively within the combustion chamber, rather than in the nozzle itself. This was confirmed when the $6\frac{1}{2}$" chamber was tested again at 450 pounds pressure. A small blow-out, as a result of fusion, occurred at one of the gasketed joints near the nozzle end of the chamber, indicating that higher temperatures than were developed with shorter chambers were being produced at this point.

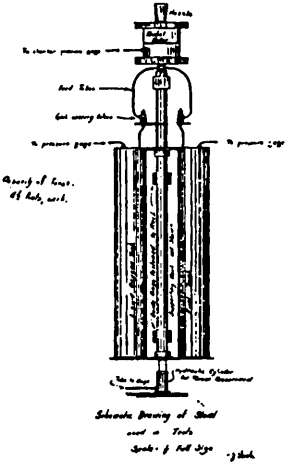

Fig. 2. The proving stand used in the 1935 motor tests. The gauges were mounted on a separate panel. It is now being rebuilt, with improvements.

In the course of the third series of tests, a motor of spun aluminium, $\frac{1}{8}$" thick, was used. It exhibited the same general inside proportions and arrangments as a "throat feed" motor of the second series. But although it was surrounded by a water jacket, it burned through almost immediately. Such motors are said to have been used in the German experiments, but far superior cooling arrangements must have been employed to make them feasible.

The fourth series of tests confirmed the average performance characteristics of motors of this general form, and emphasised the necessity of a more refined testing technique. Two nichrome nozzles (an old one, and a new one with especially massive walls, $\frac{3}{8}$" thick) were burned out completely in the course of firing periods of average duration. This was

* For detailed reports of these tests, see *Astronautics* Nos. 31, 32, and 33.

taken as an indication that an excess of oxygen was present in the propellant mixture, and that more accurate metering methods were necessary.

The conclusions drawn from the season's proving stand tests are as follows:

(1) Rocket motors of the general type tested (Fig. 4 ) can be expected to burn alcohol in combination with liquid oxygen at an average efficiency of about 8.5 per cent., delivering exhaust gases, at average velocities, up to 4000 feet per second. The efficiency when burning gasoline will be somewhat lower. Approximately 120 pounds of thrust will be delivered per pound of propellants burned per second.

(2) Since such motors during several seconds of their runs developed an exhaust velocity as high as 4430 feet per second (11 per cent. efficiency) it may reasonably be expected that if the propellants were injected at constant pressure, the overall efficiency would be considerably higher.

(3) Such motors will burn without damage for at least 16 seconds, providing the propellant mixture is kept reducing rather than oxidising. To assist in maintaining the proper fuel mixture, it is proposed to equalise the pressures on the propellants by feeding the two tanks with nitrogen, through check valves, from a common source, the boiling of the oxygen being eliminated by means of tank insulation. Proving stands, in future, may be constructed with devices for recording the weight of propellant in each tank, or alternatively with flow meters in the feed lines, for it is difficult to judge exactly how much oxygen boils away in the process of tank filling, what the rate of flow is during firing, and which of the propellants is exhausted first.

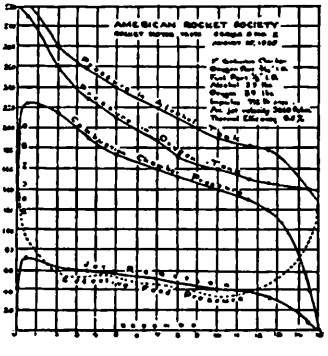

Fig. 3. Curves showing the performance characteristics of one of the most successful of the 1935 motor runs.

(4) There is reason to believe that much energy is lost in motors of this type through combustion in the nozzle rather than in the combustion chamber itself. Injecting the propellants from ports near the nozzle throat, in a direction opposite to that of the exhaust jet (the so-called " throat feed " motor) does not seem to effect this condition materially. A detailed study of various shapes of combustion chamber, fuel port arrangements, mixture and vaporising systems, etc., will be necessary before much light can be thrown on this question. Another source of efficiency loss is probably occasioned by the fact that a satisfactory expansion-nozzle effect was not secured. The maximum jet velocities were about equal to that of sound at the temperature of the ejected gases, according to the calculations of Mr. Africano. A true expansion-nozzle effect should create higher velocities.

[Continued at foot of Page 9.

# I. R. K. A.

## An International Bureau of Information on Rocketry

By Werner Brügel

(Author of *Männer der Rakete*).

It is becoming increasingly evident that rocket experimentation has now reached a stage where the closest co-operation between all concerned is greatly to be desired. Ten years ago space travel presented one vast problem. To-day, this one problem has been resolved into a multitude of lesser problems, and the efforts of experimenters have been correspondingly diversified. As a result, there is a danger of over-lapping, and/or the pursuance of abortive lines of research. Moreover, isolated experimentation is attended by another disadvantage: no research worker, or group of workers, acting alone, can hope to follow with what success the problems of space travel as a whole are being solved. The pooling of the results of individual research is essential in any endeavour. And certainly interplanetary travel offers no exception here.

It will thus be obvious how very desirable, and how very important, it is that each experimenter should be fully acquainted with the nature of work of, and the results obtained by, fellow experimenters. The I.R.K.A. (Internationale Raketenfahrt-Kartei) which I propose is a means to this end.

The success of the proposed international bureau will depend upon the collaboration and assistance of all concerned with, or interested in, astronautical research. The bureau will comprise, among other features, a Personal Card Index, containing complete details of the life, works, etc., of those concerned with rocket research; a Card Index of Publications, wherein all published matter pertaining to rocketry will be listed; and a Card Index of Experiments, containing full details of all rocket flights—both those which have taken place, and those which are planned for the future. Yet another Card Index will be devoted to an exhaustive history of the progress of rocketry in each of the countries concerned. And an important feature of the bureau will be a collection of photographs, books, and other publications concerned with rocketry.

I therefore appeal to all experimenters to forward (via the British Interplanetary Society) full particulars of their work, and copies of their publications. The I.R.K.A., once it is established, will provide a vast fund of accurate information, easily available, and obtainable for the cost of a postage stamp. And not only will it form a vital link between experimenters themselves, but also between experimenters and the general public, upon the interest of whom, ultimately, the achievement of space travel may to a large extent depend.

# WEISBERGER MOON

## A Lunar Logogriph

By P. E. Cleator.

With the possible exception of the sun, it may be safely assumed that the moon has commanded the awe, wonder, and admiration of man to an extent far greater than that accorded all other phenomena of an extra-terrestrial nature. And it may be supposed, with no little plausibility, that moon gazing has been a popular pastime ever since our anthropoidal ancestors descended from their arboreal haunts, and began to degenerate forthwith into specimens of *homo* so-called *sapiens* made in the image of God.

Exactly how our tail-swishing progenitors regarded the moon is, of course, a matter of mere speculation. I incline to the belief that they gave one fearful glance, and then promptly hailed it as a god. Here, perhaps, I am guilty of prochronism. But as early man could hardly have suffered the anthropomorphic delusions so symptomatic of his equally, if not more, superstitious descendants of to-day, it is at least possible that the divine afflatus, which is to say, affliction, had a humble beginning in the apotheosis of the most conspicuous object of the night sky.

Be this as it may, a god (and/or a goddess) the moon became. And the earliest known theory which postulated otherwise was not advanced until a mere two and a half thousand years ago. It was then that a philosopher of some intelligence—i.e. a heretic—committed deicide by suggesting that the supposed god was, in common with the sun, merely a hole in the sky through which shone the fires which raged beyond. Intelligent men have been finding holes in theological moonshine ever since.

Subsequently, the earth's satellite (again in company with the sun) was thought to be a mass of flaming cloud, drifting across the heavens. Later still, the moon was classed as one of the so-called "seven stars" in order to satisfy an ecclesiastical yearning for that magic number. And so we might go on.

It was not until about three hundred years ago that the conception of the moon now almost universally held began to be formed. In the meantime, idle speculations gave rise to a belief that the moon, like the earth, supported an abundance of life. Many philosophers conjured up visions of lunar cities akin to those of earth, teeming with intelligent Selenites. Even as late as the last century, belief in the existence of these mythical beings continued to occupy the minds of speculative individuals. J. von Littrow, of the Vienna Astronomical Observatory, even went so far as to suggest that a right-angled triangle, with sides several miles long, should be constructed on the Siberian steppes. He argued that assuming the supposed Selenites possessed telescopes at least equal in power to those of earth, such a figure, when illuminated, could not fail to attract their attention—and its mathematical significance would surely appeal to their intelligence.

This ingenious plan, however, was not carried out. The prevailing scientific opinion of the day—as now—maintained that the moon was so devoid of air, and subject to such extremes of temperature, as to be incapable of supporting even vegetation, let alone animal life of presumed intelligence.

I do not here propose to enlarge upon the conventional view of the moon held to-day. Rather do I wish to draw attention to a theory, recently advanced, which suggests that the moon is just the opposite to what it is commonly supposed to be, a theory which maintains that not only does the moon possess a dense atmosphere, but that, because of it, we do not observe the solid surface of the earth's satellite at all. Nonsense? Do not be too sure. Impossible? Nothing is impossible—though I have heard it argued that if nothing is impossible, it is possible that something *is* impossible. But if something *is* impossible, it is possible that this impossibility is impossibility itself. . . . . .

Josef Weisberger, an amateur astronomer of Vienna, is the author of the new lunar theory, and his views are set forth in two publications entitled *The Riddle of the Earth-moon Double Planet* and *The Mechanics Underlying the Rotation of the Stellar Bodies and Their Prevailing Winds.** Briefly, it is the author's contention that the earth and the moon must be regarded as twin bodies; that each possesses an atmosphere, the lower layers of which (troposphere) follow the rotation of the body it envelopes, while the upper layers (stratosphere) do not—a phenomenon known to occur in the case of the earth.

It is contended that what we see when we gaze at the moon is not a solid surface, seemingly scarred with so-called craters, but merely its outer gaseous envelope. In support of this contention it is claimed that if, on the moon "mountain ranges, higher than any known of earth, really existed, as has hitherto been pretended, they would offer such an angle of incidence to the sun's rays that they would cast on the edge the greatest shadows, and, in consequence, a solid orb would appear *darkest*, and not, as it actually presents itself, *lightest*, at its periphery."

Only a gaseous, shining envelope round a solid body, it is claimed, could show the brightness observable at the moon's edge. Hence we do not see the solid surface of the moon, but its stratospheric envelope, which always presents the same (but constantly changing) face to the earth.

Such is the theory in brief, and I regret that the exigencies of space will not permit the giving of a more detailed account of the various arguments advanced in support of it. Doubtless, with the passing of time, its true worth will be revealed. In the meantime, I presume neither to accept nor reject it.

It may be asked: Is there any justification for believing that a theory so at variance with accepted facts may ultimately prove sound? If past experience be any guide, there is ample justification. The flat and immovable earth of a few centuries ago, as revealed by God to the faithful, has become an ellipsoid of revolution endowed with motion, as disclosed by the Devil to the damned. And the divine error, over which there was much futile frying of astronomers at the time of its exposure, is now so palpably obvious that it is tacitly admitted even by the celestial underlings who claim the exclusive ability to haggle with their deceiver.

Josef Weisberger, indeed, has my deepest sympathy. The fleeting facts of science, though infinitely preferable to the mumbo-jumbo of the professional witch-doctor, can on occasion become no less burdensome and

* Published by the author, Josef Weisberger, 6, Postgasse, Wien (Vienna), Austria.

dogmatic than were the so-called holy truths they have displaced. In these days of pagan enlightenment, even children detect the flaw in the fable which would have us believe that Joshua, that biblical conjurer of celestial proportions and irreparably damaged reputation, brought the sun to a halt, while the account of the gastronomical feat of one Jonah, who swallowed a whale whole and then asked for more, invariably results in loud and appreciative guffaws of youthful cachinnation. To-morrow, the conception of the moon as an airless body may well have been relegated to the fanciful realm of theological make-believe.

My sympathy is enlisted not because I believe in the Weisberger lunar theory (prepared though I am to admit the possibility of its ultimate verification) but because its author, after having gone to the trouble and expense of publishing his ideas in at least two languages, and having gone to the further expense and trouble of sending his publications, free and post free, to all astronomers of note throughout the world, has been received with a complete and disdainful silence. To this day his arguments remain unanswered. One is tempted to question if they *can* be answered!

So the matter rests, and in a manner that is satisfactory to no one. And Josef Weisberger's only consolation is the fact that his probing of the moon's mysteries is occurring to-day, and not three hundred years ago. In days gone by, such perseverance in connection with an opinion so heterodox would inevitably have resulted in his and his ideas going up in smoke. But to-day, he is merely ignored. I suppose it may be considered that we have progressed to some extent in our attitude towards those who commit the unforgivable crime of thinking for themselves.

## The 1935 Research Programme of the American Rocket Society (*Continued*).

(5) A study of the possibilities of various heat-resisting metals (molybdenum, tungsten, and the like) for nozzle construction is indicated, and also of refactory linings for combustion chamber construction.

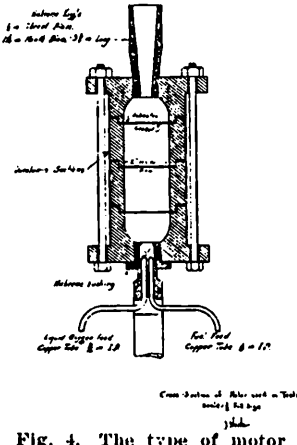

Fig. 4. The type of motor which gave the most success in the 1935 proving stand tests. Note the removable sections, which enabled the effects of different combustion chamber lengths to be studied.

The value of this season's experimental work lies principally in the sharp light it has thrown on the problems of rocket research, and in its noteworthy contribution to the establishment of a technique which experimenters can use as a starting point. The efficiency at which the rocket motors tested operated is low when compared to theoretical estimates, yet for a type of prime mover which is still in the rudimentary stage it is remarkably high. When we consider the performance of the early Newcomen steam engines (which did well to render 1 per cent. of the energy of the coal into useful work) we can understand that efficiencies of 8 per cent. and more promise very favourably for the reaction motor when anything like the amount of study is put into its development that has been expended on that of other types of heat engine. Even at its present stage of development, the rocket motor is capable of driving projectiles well into the stratosphere, despite the great losses due to air resistance and the necessary weight of present-day rocket construction.

## ANALECTA

An American edition of ROCKETS THROUGH SPACE is in the course of preparation. It will appear under the imprint of Messrs. Simon Schuster Inc., of 386 Fourth Avenue, New York. The English edition (Messrs. George Allen and Unwin Ltd.) will be ready on Febuary 25th.

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According to information received, the authenticity of which would seem to be beyond doubt, the Air Ministry is at this moment engaged in the construction of an experimental rocket-ship capable of carrying men. The outer shell of the vessel is said to be nearing completion.

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The American Rocket Society has recently honoured Mr. P. E. Cleator by making him Honorary Member of the society, "in recognition of his contributions to the science of rocketry."

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Pending publication in the *Journal*, a statement showing the receipts and expenditures of the Society may be obtained from the Hon. Secretary on application.

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Herr Willy Ley is planning to launch the world's first liquid fuel rocket mail aeroplane. The flight was originally intended to have taken place in November last, and the vessel was to have conveyed about four pounds of mail from Greenwood Lake, New York, to Hewitt, New Jersey. Shortly before the date set for the flight, however, the amount of mail received for transportation had approached twenty pounds, necessitating the building of a much larger rocket. Work on the new rocket is still proceeding.

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Amazing though it would no doubt be considered if a race of intelligent beings were discovered on Mars, it would not be surprising if in such a case the Martians were found to possess copies of

**CHAMBERS'S TWENTIETH CENTURY DICTIONARY.**

The Dictionary for the Scientist.

# NEW MEMBERS

The following new members have been elected since May last:

## Members

| | |
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| W. A. Gibson, L.R.C.P.E., L.D.S, | Bathgate |
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| E. E. Hewett | London |
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| G. G. Clarke | Brooklyn |

The following members have graduated from Associate Membership to Membership:

| | |
|---|---|
| T. McNab | Liverpool |
| S. Klemantaski | London |

The annual subscription for the three classes of membership which are open to individuals are: Fellowship, £2-2-0; Membership, 10/6; Associate Membership, 5/-.

All classes of membership are open to both sexes, and all members receive free copies of the *Journal* of the Society.

The Officers of the Society are: P. E. Cleator, President; C. H. L. Askham, Vice-President; and L. J. Johnson, Hon. Secretary and Treasurer.

For full particulars, and membership application forms, enquire from:
The Secretary,
The British Interplanetary Society,
46, Mill Lane,
Liverpool, 13,
England.