

AMAZING INVENTION! SEEING YOUR TELEPHONE CALLED

NEWNES

# PRACTICAL MECHANICS

APRIL  
**6<sup>D</sup>**

EXPLORING  
THE  
STRATOSPHERE

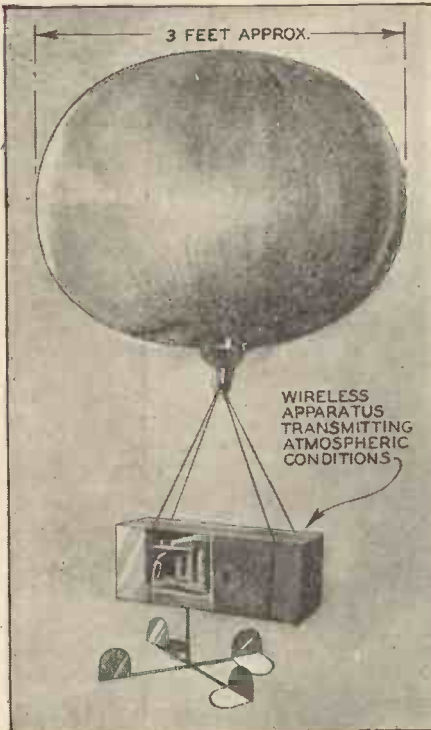


ASCINATING NEW DISCOVERIES



# EXPLORING THE

What has been discovered in this comparatively unexplored and fascinating region, and the purpose of stratospheric ascents.



How some of the stratosphere explorations are conducted. Note the wireless transmitting apparatus.

**T**HE recent spectacular ascents into the specially-constructed balloons into the stratosphere has brought into prominence the higher regions of the atmosphere, the existence of which seems to have been appreciated only by a few people. And yet the nature of the various layers of belts of air, nitrogen, hydrogen, helium and ionised gas, which surround the earth is no new discovery. It may appear to be so because of the new name, or comparatively new name, which has been given to it. Although Professor Piccard was actually the first human being to ascend into and examine the conditions present in that at present unexplored altitude, it may surprise many to know that in 1898 a famous French scientist, M. Teisserence de Borth constructed a special sounding and recording balloon which ascended over 12 miles in altitude, and his pioneer work made possible the recent successful ascents. Forty years ago the layer we know as the stratosphere was referred to as the Isothermal Region, and you will find it so referred to in many of the earlier atlases.

The desire of scientists to ascend into this region is not based on a mere desire to break records. Many may wonder indeed what useful purpose can possibly be served in wishing to explore a region where human life, except under artificial conditions, would be impossible, and whether the world's heritage of scientific knowledge can possibly be enriched, apart from the natural tendency of the scientist to reach out for fresh fields to conquer. Man has conquered the sea and the regions beneath the sea; he has conquered overland travel, and travel through the air. He has not yet conquered the atmosphere. What little knowledge he has of the inter-stellar regions has been gained more by observation and from the results of astronomical research rather than from actual ascents into the regions themselves.

## The Value of the Experiments

Although the recent altitudes attained may seem enormous compared with the

recent altitude records of balloons and aircraft, they must not be considered as opening up the possibility of travelling to the moon, which is the nearest celestial body—250,000 miles away—but if there is any possibility at all of travelling into the Epyrean it is necessary that experiments such as those undertaken by Professor Piccard and the two Russian scientists should be continued.

A diagram next page gives various layers earth's surface regarding the recently achieved stratosphere

given on the details of above the and also data records recorded. It has been ascertained that the consists almost



The gondola of the balloon in which Professor Piccard made his memorable ascent into the stratosphere.

entirely of nitrogen, hence the need for the hermetically-sealed apparatus in which these attempts have been made. It is a tribute to previous investigations from the earth's surface that previous conjecture as to the nature of the stratosphere was, in fact, proved by Professor Piccard. The stratosphere balloon is of necessity equipped with means for providing oxygen and heat, for the air of the stratosphere is unbreathable and the temperature is such that life would be impossible in it.

The three ascents into the stratosphere recently made confirm that the outside temperature is approximately 80 degrees below zero. It was also found that, in addition to this extremely cold temperature, extreme calm and brilliant sunshine prevailed. There are no clouds or winds, and extreme changes in the weather are confined entirely to the lower regions of the atmosphere.

A curious fact has emerged from these experiments, for it has been ascertained

that the deadly cold of the stratosphere extends to about 40 miles above the surface of the earth. Yet higher up a layer of relatively warm air is encountered, with a temperature as high as 30° C. A study of the diagram given on the opposite page shows that in ascending into the stratosphere we first of all pass through a belt of comparatively dense air. Next to the stratosphere, which is, as I have said before, at a temperature of approximately 80 degrees below freezing point, comes the ozonosphere, which is a belt at a slightly higher temperature occupied by rarified oxygen; and, lastly, we come to the ionosphere, which extends to a further altitude of about 150 miles.

It has been discovered that this latter region consists chiefly of oxygen in a diffused state which, under bombardment by the ultra-violet rays emitted by the sun, is separated into free electrons and ozone, which latter is an active allotropic variety of oxygen and having a peculiarly exhilarating smell.

## Effects on Radio Transmissions

It is well known among designers of wireless and transmitting apparatus to have a marked effect on radio transmission, because it reflects the impulses or wireless waves back to earth. It is also well known that this effect enhances the possibilities of long distance reception on the short waves, for reflection on short-wave transmissions is most marked and there is very little absorption due to the Heaviside Layer. A peculiarity worthy of note is that on long waves the reverse is the case—absorption is greater and reflection less.

On the medium waves the effect is about equally balanced. Another important point is that the effect is most marked at night. Long-wave transmissions are thrown sharply back, thus causing a zone of strong reception near to the transmitter, while shorter waves are reflected



The start of Professor Piccard's ascent at 5 o'clock in the morning.



# STRATOSPHERE

By THE EDITOR

at a shorter angle, giving rise to the phenomenon known as skip distance and the creation of areas of poor reception on the waves concerned.

Ultra-short waves, it has been discovered, pass straight through the layer. In spite of the ascents of Professor Piccard and others, we are still without accurate knowledge of the constitution of the Heaviside Layer, for whilst the general scientific belief is that it consists of ionised gas, as previously stated, this belief can hardly be supported when it is remembered that the layer persists at night through about 90 kilometres and only 40 to 50 kilometres in the day time. A modern theory is that it consists of frozen hydrogen in minute particles, which would account for the reflection of radio waves as well as for the Aurora Borealis, for hydrogen in a frozen state has many of the characteristics of a silvery-looking metal. If this theory be correct, it would absolutely account for the Aurora, for the principle of diffraction of light rays setting up a prismatic display of colours would apply.

## The Cosmic Rays

During recent ascents into the stratosphere investigation was made concerning cosmic rays, which are those rays caused by the rising and setting of the sun. Professor Piccard found that cosmic radiation became weaker as altitude increased—the exact opposite to previously accepted theory.

Another surprising fact evinced is that a container of metal having a polished outside surface reflected the sun's rays and maintained an interior temperature equal to that of the surrounding air. Yet a similar container with a black outer surface absorbed the solar rays and the interior temperature increased to 170 degrees above zero. This makes possible the construction of a simple thermo engine which would derive its power from these differences in temperature or by the differences in the

co-efficient of expansion of different metals.

## The Magnetic Effects

The deductions which can be made from these stratospheric ascents are certainly fascinating; everyone knows that the earth resembles a magnet, and like a magnet it has a north and south pole. Correspondingly, there will be the usual magnetic field and the corollary magnetic lines of force extending from the north to the south. If we agree that the ionosphere and the ozonosphere



The Austrian stratosphere ascent. The special prismatic gondola is shown here.

is responsible for the ebb and flow of the tide, and to a lesser degree the sun produces the same effect. It would also account for the phenomenon in wireless reception known as fading.

Considerable colour is lent to the theory expounded when it is remembered that heat cannot travel through a vacuum, yet the sun's heat greets us in spite of the vacuum which exists in space, because the pole electro-magnetic rays from the sun are transformed into heat when they strike the atmosphere enveloping the earth, just as a current travelling a cold metal cable is transformed into heat and light in the electric lamp bulb. It is interesting to reflect that a well-known law of dynamics is that resistance of a body moving through air increases as the square of the velocity. Therefore the velocity of a body for a given power of propulsion should increase as altitude increases, provided that suitable means can be introduced for counterbalancing the decrease in efficiency due to the rarefaction of the air; presuming, of course, that an air-screw is used for propulsion. Should, however, the rocket principle be applied, it would merely be necessary to construct a device which would propel itself to such an altitude that the gravitation of the earth ceased to have effect and the gravitation of, say, the moon took effect. This reasoning is based on solid scientific fact, and there can be little doubt that one day it will be an accomplished fact.

Advanced as is our knowledge of the ether there are still vital missing links, and we are merely on the threshold of our knowledge of rays.

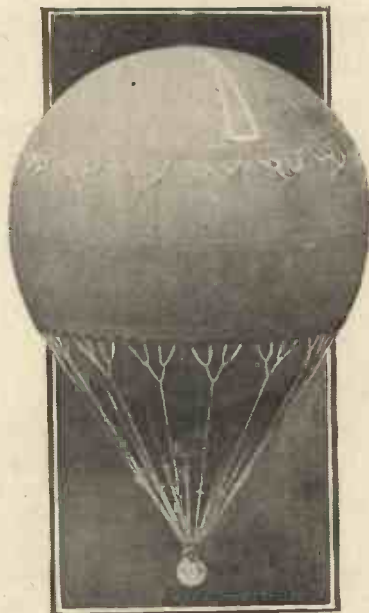
The electro-magnetic rays from the sun, the cosmic rays, ultra-violet rays, and X-rays, are but a few of those embraced by the spectrum from the invisible to the visible limits.

At one end we have the cosmic, gamma, X-ray, and ultra-violet, with wavelengths of .0001 millimeter and below. We then come to the violet, blue, blue-green, green, yellow-green, yellow, orange, and red, which comprise the visible colour spectrum with wavelengths of .00043 millimeters to .000644 millimeters, and finally to the infra-red and radio with wavelengths of .00077 millimeters and upwards. The effect of some of these rays was first discovered by Herschel, and the scientific world now relies upon those whose urge it is to explore the stratosphere to complete our knowledge of this fascinating subject.



Diagram illustrating the various details of the belts surrounding the earth.

are conductors, a current must be induced when any conductor passes through them. Hence, if these ionised layers pass through the magnetic field of the earth an electric current will be generated, and such might explain some of the atmospherical disturbances and other upheavals which have up to the present awaited satisfactory explanation. It is beyond all dispute that the moon



A model of the next Piccard stratosphere balloon. The proportions between the gondola and the balloon should be noted.



# What the Clubs are Doing

Club Reports for inclusion in this feature should not exceed 250 words in length, and should be received not later than the 10th of each month for inclusion in the subsequent month's issue.

**WEST MIDDLESEX AMATEUR CINE CLUB**  
Headquarters: 105 Uxbridge Road, Ealing, W.5.  
Hon. Secretary: Hugh P. B. Davies, 105 Uxbridge Road, Ealing, W.5

ALTHOUGH this is the first report we have made in these columns of "Practical Mechanics," it is not because we are a newly-formed society, so let us introduce ourselves forthwith.

The Club was formed in October 1929, and has since that date held regular weekly meetings, at which we have always had good attendances. The main object of our existence being the furtherance of amateur cinematography in all its branches, we cordially invite visitors to our meetings which are held every Tuesday at 8.15 p.m. at the above address. Anyone who is interested should communicate with the Hon. Secretary as we still have vacancies for new members, having set ourselves no fixed maximum membership, and our Secretary welcomes correspondence with fellow enthusiasts throughout the world. All the films the Club has so far produced have been made on 16 mm. stock, but a 9.5 mm. section of the Club has recently been formed, who are now making preparations for their first production, the shooting of which they hope to be able to embark upon in the near future.

**STREATHAM COMMON MODEL RAILWAY CLUB**

MEETINGS are held every night of the week at 201 Gleneldon Mews, Streatham High Road, S.W.16, from 6.30 p.m. to 10 p.m. We shall welcome any readers or friends to any one of our meetings. Meeting March 14th: "Talks and Demonstrations." Mondays, Wednesdays (except 14th) and Fridays are Track Nights; Tuesdays, Thursdays and Saturdays are Workshop Nights. The track has now been started upon, being laid with steel rail and cast chairs to replace the existing tin-plate. A portion of it is hoped to be on view at our Exhibition. The Club's Magazine, "The Rocket," for March, is now on sale: Price 5d., post free. Enlarged Number. A very interesting lecture was given at the Club Room recently by Ian Macnab, Esq., assisted by L. T. Catchpole, Esq., on "The Liverpool Overhead Railways." The lecture was illustrated by some very interesting slides.

Club Exhibition.—This year, as in previous years, the Club is holding its Annual Exhibition at 70 Conyers Road, Streatham, on April 27th (6.30 p.m. to 8.30 p.m.) and April 28th (3 p.m. to 8.30 p.m.). Admission 3d. All readers are very welcome. Attractions include a Passenger-carrying Railway, Exhibition of Members' Work, a Fun Fair, etc., etc. A special ticket competition is being arranged by the Club. Holders of tickets will notice a number on them. The lucky number, which will entitle the holder to a year's free supply of "The Rocket," will be drawn on Friday, and the holder is requested to show his half-ticket with that number on it at the Sweet Stall on either day. Tickets can be obtained from any member or through the Secretary. Will You help to make this exhibition a success?

To those who bring up models for testing. We are very pleased for you to do this, but as our track is laid to one standard, the New Alloy Wheels, some models may not be able to run upon the track.

Secretary: L. J. Ling, Brooke House, Rotherhill Avenue, Streatham, S.W.16, who will, on request, forward a copy of "Concerning Ourselves," post free.

**THIRD ANNUAL EXHIBITION, at 70 Conyers Road, Streatham.**

April 27th (6.30 p.m. to 8.30 p.m.) and April 28th (3 p.m. to 8.30 p.m.). Admission (both days) 3d. (inc. tax). The Exhibition includes the members' work during the last year, a ride on a 5-inch passenger-carrying railway, ticket competition for the lucky number on the ticket, various competitions, etc., etc. Tickets can be obtained now, price 3d. from any member, or through the Secretary, L. J. Ling, Brooke House, Rotherhill Avenue, Streatham, S.W.16, who will be glad to supply full particulars of the Club to anyone interested.

**THE MODEL RAILWAY CLUB**

OUR approaching exhibition at the Central Hall, Westminster, during Easter week, April 3rd to 7th, occupies the attention of all our members. Track night, February 8th, gave an indication of the amount of work being put in on new models, when a large array of most interesting items was on view. An electrically driven L.M.S. eight-coupled freight engine (4-mm. scale) attracted special attention amongst the many models in this smallest size. This loco. has a very low gearing of 32:1, and pulled a total weight of some 19 lb. An "Underground" station in 34-mm. scale was shown complete with concealed lighting and posters. The new L.M.S. "Pacific" is receiving the

attention of three members at least. Probably the most interesting model of the evening was, however, a 7-mm. scale motor coach of the late L.B.S.C. railway type, in which the reversal of the pantograph is effected by remote control, all the necessary electrical mechanism being secured to the underside of the roof. A very novel item was a display card showing various types of chain slings as used in the goods yards on the Southern Railway.

A most interesting evening was spent on January 25th, when a lecture on "Locomotives of the Southern Railway" was given by Mr. J. Clayton, M.B.E., M.I.M.E., from the Chief Mechanical Engineer's Department of the Southern Railway. Copious lantern slides were shown, as also films showing track details and a run to Brighton on the new electric line as additional matters of interest.

Hon. Sec. Mr. J. C. Watts, 85 Wood Vale, N. 10.

**THE BRITISH INTERPLANETARY SOCIETY REPORT**

MEETINGS were held on January 19th and February 2nd. At the former meeting the President, Mr. P. E. Cleator, had just returned from Berlin where he had been visiting the German rocket experts, notably Herr Willy Ley and Herr Nebel. During his stay he visited the Raketenflugplatz and was shown the experiments in progress, and given a description of the progress that is being made in the science of rocketry in Germany. Experiments, said Mr. Cleator, are being made on a very sound basis and with a view to their ultimate practicability. The results are tabulated, so that if eventually any exploit is contemplated there will be little difficulty in determining the factors involved.

A list of rocket experts throughout the world was obtained from Herr Ley, and it is anticipated that they will co-operate with the British Society.

At the meeting on February 2nd, considerable progress was reported. Various technical journals had interested themselves in the project of a rocket car, while much publicity had been given to the Berlin visit. Evidently the importance of this has been realised both from the point of view of co-operation in a common scientific object and also of international friendship.

An informal talk was given by the Secretary on "The Mysteries of Venus and Mars," and led to considerable discussion. The Society was also informed of the very great possibility of a considerably bigger and better Journal.

A notable addition to the membership of the Society is the famous French engineer, M. Esnault-Pelterie. This promises closer co-operation between the British, French and German engineers.

Meetings continue to be held at 81 Dale Street, Liverpool, 2. The office is on the Second Floor, Room 15, and the meeting starts at 6.30 p.m. Meetings are held fortnightly on Fridays, every other Friday from February 16th, 1934. Leslie J. Johnson, Hon. Secretary.

**THE BIRMINGHAM MODEL RAILWAY CLUB**

THE Annual General Meeting was held at Christ Church Schools, Gt. Charles Street, on January 16th, at which the progress of the Club was reviewed and its programme for the present session discussed.

The first Club Night took place on February 1st, and was well attended. The attraction of the evening was a hauling competition: clock work *versus* steam.

Other Club Nights were arranged as follows:— Tuesday, February 13th. March 1st: Track running, and also a talk by Mr. B. H. K. Wickham, entitled "What the Railways Have Done Since 1929." March 13th: Electric Loco. Haulage Competition.

**THE PARK MODEL AIRCRAFT LEAGUE**

A MOST interesting evening was spent on March 2nd last, when Mr. Jordan, Vice-president, read a very instructive paper on "Flying Scale Models." To many of us some quite new methods of construction were introduced, and we are expecting to see some experimental models in the near future as a result.

The next meeting will be held on April 6th.

The following is a list of P.M.A.L. open competitions for the season at which we shall be pleased to welcome any aero-modellist.

April	15	Duration . . . . .	Mitcham
	29	Distance . . . . .	Tooting
May	6	Seaplane . . . . .	Wimbledon
"	13	Duration . . . . .	Mitcham
"	27	Aerial Golf . . . . .	Tooting
June	3	Scale and Semi-scale . . . . .	Tooting
	17	Duration . . . . .	Mitcham
July	15	Duration . . . . .	Mitcham
	22	Speed . . . . .	Mitcham
	29	Weight Carrying . . . . .	Tooting
August	28	Duration R.O.G. . . . .	Mitcham
September	9	Climbing . . . . .	Tooting
	23	Duration . . . . .	Mitcham
October	7	Steering . . . . .	Mitcham
	21	Duration . . . . .	Mitcham

Full details may be obtained from the Hon. Secretary: Mr. F. H. Dillistone, 112 Rodenhurst Road, Clapham, S.W.4.

Place an Order with your Newsagent for "PRACTICAL MECHANICS" to be regularly delivered!

1934 EDITION of HENLEY'S BOOK of

# 10,000

## MONEY-MAKING FORMULAS, PROCESSES and TRADE SECRETS

At this very moment there are millions of people who want to make more money, but cannot think of an idea; this book will be a wonderful help to such persons—it explains fully how to make and sell almost everything under the sun. **BIG MONEY-MAKING OPPORTUNITIES** are waiting for both men and women. With very little capital and without risk you may exploit thousands of proved ways of amassing wealth easily and quickly.

**BE YOUR OWN MASTER!**

Fortunes have been made through this book, and thousands of people, with very little cash, are launching small business ventures, many of them based upon these formulas. Furthermore, numerous concerns, the owners of which were facing failure, have taken on a new lease of life, simply by seizing upon an idea contained in this vast storehouse of money-making facts and formulas. In many cases the costs of materials for starting a small manufacturing business are practically nil, owing to the utilisation of waste and by-products. There are without doubt hidden sources for profit making which this book will disclose; it will show you how to break fresh ground, how to exploit avenues of money making that at present seem non-existent.

**THIS BOOK IS AN INVESTMENT THAT WILL PAY YOU A THOUSANDFOLD**

No licence or fee whatever is required to use any of these 10,000 Money-making Formulas, Processes and Trade Secrets—for the purpose of making things or using the methods.

**THIS COUPON IS WORTH**

**5!** TO READERS OF "PRACTICAL MECHANICS" 

**--- COUPON ---**

For Free Descriptive Particulars and Special Offer to readers of "Practical Mechanics."

To (Dept. P.M.) The Scientific and Commercial Publishing Co., Artillery House, Artillery Row, London, S.W.1.

Please send Free Descriptive Particulars of your Book of 10,000 Money-making Formulas, Processes and Trade Secrets (complete in one volume).

Name .....

Address .....

If this coupon is sent, *without any other written matter*, and placed in *unsealed envelope*, half-penny stamp only is required.

Please use **BLOCK CAPITALS.** PM925