***Antigravity***

**Antigravity Research**

**The Gravitics Situation**

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Gravity Rand Ltd. 66 Sloane Street London S.W. 1

Theme of the science for 1956-1970:

SERENDIPITY

Einstein's view:-

"It may not be an unattainable hope that some day a clearer knowledge of the processes of gravitation may be reached; and the extreme generality and detachment of the relativity theory may be illuminated by the particular study of a precise mechanism".

CONTENTS

I - Engineering note on present frontiers of knowledge . . . . . . . .3

II - Management note on the gravitics situation . . . . . . . . .. .10

III - Glossary . . . . . . . . . . . . . . . . . . . . . . . .. . . .17

IV - References . . . . . . . . . . . . . . . . . . . . . . . . . . .20

V - Appendix.

Appendix I. Summary of Townsend Brown's original specification for an apparatus for producing force or motion . . . . . . . . . . . . . 22

Appendix II. Mozer's quantum mechanical approach to the existence of negative mass and its utilization in the construction of gravitationally neutralized bodies . . . . . . 30

Appendix III. Gravity effects (Beam's) . . . . . . . . . . . . . . . 37

Appendix IV. A link between Gravitation and nuclear energy (Deser and, Arnowitt).. 39

Appendix V. Gravity/Heat Interaction Wickenden) . . . . . . . . . .. 41

Appendix VI. Weight-mass anomaly (Perl). . . . . . . . . . . . . .. .42

Thanks to the Gravity Research Foundation for Appendix II - VI

I

Engineering note on present frontiers of knowledge

Gravitics is likely to follow a number of separate lines of development: the best known short term proposition is Townsend Brown's electrostatic propulsion by gravitators (details of which are to be found in the Appendix I). An extreme extrapolation of Brown's later rigs appears to suggest a Mach 3 interceptor type aircraft. Brown called this basically force and motion, but it does not appear to be the road to a gravitational shield or reflector. His is the brute force approach of concentrating high electrostatic charges along the leading edge of the periphery of a disk which yields propulsive effect. Brown originally maintained that his gravitators operate independently of all frames of reference and it is motion in the absolute sense - relative to the universe as a whole.

There is however no evidence to support this. In the absence of any such evidence, it is perhaps more convenient to think of Brown's disks as electrostatic propulsion which has its own niche in aviation. Electrostatic disks can provide lift without speed over a flat surface. This could be an important advance over all forms of airfoil which require induced flow; and lift without air flow is a development that deserves to be followed up in its own right, and one that for military purposes is already envisaged by the users as applicable to all three services. This point has been appreciated in the United States and a program in hand may now ensure that development of large sized disks will be continued. This is backed by the U.S. Government but it is something that will be pursued on a small scale. This acceptance follows Brown's original suggestion embodied in Project Winterhaven. Winterhaven recommended that a major effort be concentrated on electrogravitics based on the principle of his disks.

The U.S. Government evaluated the disks wrongly, and misinterpreted the nature of the energy. This incorrect report was filed as an official assessment, and it took some three years to correct the earlier misconception. That brings developments up to the fairly recent past. and by that time it was realized that no effort on the lines of Winterhaven was practical, and that more modest aims should be substituted. These were re-written around a new report which is apparently based on newer thoughts and with some later patents not yet published which form the basis of current U.S. policy. It is a matter of some controversy whether this research could be accelerated by more money but the impression in Gravity Rand is that the base of industry is perhaps more than adequately wide. Already companies are specializing in evolution of particular components of an electrogravitics disk. This implies that the science is in the same state as the ICBM - namely that no new breakthroughs are needed, only intensive development engineering.

This may be an optimistic reading of the situation: it is true that materials are now available for the condensers giving higher k figures than were postulated in Winterhaven as necessary, and all the ingredients necessary for the disks appear to be available. But industry is still some way from having an adequate power sources and possessing any practical experience of running such equipment.

The long term development of gravity shields, absorbers, and 'magic metals' appears at the moment however to be a basically different problem, and work on this is not being sponsored\* so far as is known. The absorber or shield could be intrinsically a weapon of a great power, the limits of which are difficult to foresee. The power of the device to undermine the electrostatic forces holding the atom together is a destructive by-product of military significance. In unpublished work Gravity Rand has indicated the possible effect of such a device for demolition. The likelihood of such work being sponsored in small countries outside the U.S. is slight, since there is general lack of money and resources and in all such countries quick returns are essential.

Many people hold that little or no progress can be made until the link in the Einstein unified field theory has been found. This is surely a somewhat defeatist view, because although no all embracing explanation of the relationship between the extraordinary variety of high energy particles continually being uncovered is yet available much can be done to pin down the general nature of anti-gravity devices.

There are several promising approaches one of them is the search for negative mass, a second is to find a relationship between gravity and heat, and a third is to find the link between gravitation and the coupled particles. Taking the first of these: negative mass, the initial task is to prove the existence of negative mass, and Appendix II outlines how it might be done. This is Mozer's approach which is based on the Schroedinger time independent equation with the center of mass motion removed. As the paper shows, this requires some 100 bev - which is beyond the power of existing particle accelerators: however the present Russian and American nuclear programs envisage 50 bev bevatrons within a few years and at the present rate of progress in the nuclear sciences it seems possible that the existence of negamass will be proved by this method of a Bragg analysis of the crystal structure - or disproved.

If negamass is established, the precise part played by the subnuclear particles could be quickly determined. Working theories have been built up to explain how negative masses would be repelled by positive masses and pairs would accelerate gaining kinetic energy until they reach the speed of light and then assume the role of the high energy particles. It has been suggested by Ferrell that this might explain the role of neutrino, but this seems unlikely without some explanation of the spin ascribed to the neutrino. Yet the absence of rest mass or charge of the neutrino makes it especially intriguing. Certainly, further study of the neutrino would be relevant to gravitational problems. If, therefore, the aircraft industry regards anti-gravity as part of its responsibilities it cannot escape the necessity of monitoring high energy physics or the neutrino. There are two aircraft companies definitely doing this; but little or no evidence that most of the others know even what a neutrino is.

The relationship between electrical charges and gravitational forces however will depend on the right deductions being drawn from excessively small anomalies.\* First clues to such small and hitherto unnoticed effects will come by study of the unified field theory. such effects may be observed in work on the gravithermal, and interacting effect of heat and gravity. Here, at least, there is firmer evidence materials are capable of temperature changes depending on gravity. This, as Beams says, (see Appendix III) is due to results from the alignment of the atoms. Gravity tensions applied across the ends of a tube filled with electrolyte can produce heat or be used to furnish power. The logical extension of this is an absorber of gravity in the form of a flat plate and the gravitative flux acting on it (its atomic and molecular structure, its weight density and form are not, at this stage, clear) would lead to an increase in heat of the mass of its surface and subsurface particles.

The third approach is to aim at discovering a connection between nuclear particles and the gravitational field. This also returns to the need for interpreting macroscopic relativistic phenomena at one extreme in terms of microscopic quantum mechanical phenomena at the other. Beaumont in suggesting a solution recalls how early theory established rough and ready assumptions of the characteristics of electron spin before the whole science of the atomic orbital was worked out. These were based on observation and they were used with some effect at a time when data was needed. Similar assumptions of complex spin might be used to link the microscopic to the macroscopic. At any rate, there are some loose ends in complex spin to be tied up, and these could logically he sponsored with some expectation of results by companies wondering how to make a contribution.

\* See Appendix VI

If a real spin or rotation is applied to a planar geoid the gravitational equipotential can be made less convex, plane or concave. These have the effect of adjusting the intensity of the gravitational field at will which is a requirement for the gravity absorber. Beaumont seemed doubtful whether external power would have to be applied to achieve this. but it seems reasonable to suppose that power could be fed into the system to achieve a beneficial adjustment to the gravitational field, and conventional engineering methods could ensure that the weight of power input services would be more than offset by weightlessness from the spin inducer. The engineering details of this are naturally still in the realms of conjecture; but, at least, it is something that could be worked out with laboratory rigs; and, again, the starting point is to make more accurate observations of small effects. The technique would be to accept any anomalies in nature and from them to establish what would be needed to induce a spin artificially.

It has been argued that the scientific community faces a seemingly impossible task in attempting to alter gravity when the force is set up by a body as large as this planet and that to change it might demand a comparable force of similar planetary dimensions. It was scarcely surprising therefore that experience had shown that while it has been possible to observe the effects of gravity it resisted any form of control or manipulation. But the time is fast approaching when for the first time it will be within the capability of engineers with bevatrons to work directly with particles that it, is increasingly accepted, contribute to the source of gravitation; and whilst that in itself may not lead to an absorber of gravity, it will at least throw some light on the sources of the power.

Another task is solution\* of outstanding equations to convert gravitational phenomena to nuclear energy. The problem, still not yet solved may support the Bondi-Hoyle theory that expansion of the universe represents energy continually annihilated instead of being carried to the boundaries of the universe. This energy loss manifests itself in the behavior of the hyperon and K-particles which would, or might, form the link between the microcosm and macrocosm. Indeed Deser and Arnowitt propose that the new particles are a direct link between gravitationally produced energy and nuclear energy. If this were so it would be the place to begin in the search for practical methods of gravity manipulation. It would be realistic to assume that the K-particles are such a link. Then a possible approach might be to disregard objections which cannot be explained at this juncture until further unified field links are established. As in the case of the spin and orbital theories, which were naive in the beginning, the technique might have to accept the apparent forces and make theory fit observation until more is known.

Some people feel that the chances of finding such a unified field theory to link gravity and electrodynamics are high; yet think that the finding of a gravity shield is slight because of the size of the energy source, and because the chances of seeing unnoticed effects seem slender. Others feel the opposite and believe that a link between nuclear energy and gravitational energy may precede the link between the Einstein general relativistic and Quantum Theory disciplines. Some hope that both discoveries may come together; while a few believe that a partial explanation of both may come about the same time,, which will afford sufficient knowledge of gravitational fields to perfect an interim type of absorber using field links that are available.

\* See Appendix IV

This latter seems the more likely since it is already beginning to happen. There is not likely to be any sudden full explanation of the microcosm and macrocosm; but one strand after another joining them will be fashioned, as progress is made towards quantizing the Einstein theory.

II

Management note on the Gravitics Situation

The present anti-gravity situation as one of watching and waiting by the large aircraft prime contractors for lofting inventions or technological breakthroughs. Clarence Birdseye in one of his last utterances thought that an insulator might be discovered by accident by someone working on a quite different problem; and in 500 years gravity insulators would be commonplace. One might go further than Birdseye and say that principles of the insulator would, by then, be fundamental to human affairs; it would be as basic to the society as the difference today between the weight of one metal and another. But at the same time it would be wrong to infer from Birdseye's remark that a sudden isolated discovery will be the key to the science. The hardware will come at a time when the industry is ready and waiting for it. It will arrive after a long period of getting accustomed to thinking in terms of weightlessness, and naturally it will appear after the feasibility of achieving it in one form or another has been established in theory.\*

The aim of companies at this stage must therefore surely be to monitor the areas of progress in the world of high energy physics which seem likely to lead to establishment of the foundations of anti-gravity. This means keeping a watchful eye on electrogravitics, magnetogravitics gravitics isotopes; and electrostatics in various forms for propulsion or levitation. This is not at the present stage a very expensive business, and

\* But this does not mean that harnessed forces will be necessarily fully understood at the outset.

Investment in laboratory man-hours is necessary only when a certain line of reasoning which may look promising comes to a dead-end for lack of experimental data, or only when it might be worth running some laboratory tests to bridge a chasm between one part of a theory and another or in connecting two or more theories together. If this is right, anti-gravity is in a state similar to nuclear propulsion after the NEPA findings, yet before the ANP project got under way. It will be remembered that was the period when the Atomic Energy Commission sponsored odd things here and there that needed doing. But it would be misleading to imply that hardware progress on electrostatic disks is presently so far along as nuclear propulsion was in that state represented by ANP. True the NEPA men came to the conclusion that a nuclear-propelled aircraft of a kind could be built, but it would be only a curiosity. Even at the time of the Lexington and Whitman reports it was still some way from fruition: the aircraft would have been more than a curiosity but not competitive enough to be seriously considered.

It is not in doubt that work on anti-gravity is in the realm of the longer term future. One of the tests of virility of an industry is the extent to which it is so self confident of its position that it can afford to sponsor R&D which cannot promise a quick return. A closing of minds to anything except lines of development that will provide a quick return is a sign of either a strait-laced economy or of a pure lack of prescience, (or both).

Another consideration that will play its part in managerial decision is that major turning points in anti-gravity work are likely to prove far removed from the tools of the aircraft engineer. A key instrument for example that may determine the existence of negamass and establish posimass-negamass interaction is the super bevatron. It needs some 100 bev gammas on hydrogen to perform a Bragg analysis of the elementary particle structure by selective reflection to prove the existence of negamass. This value is double as much the new Russian bevatron under construction and it is 15 times as powerful as the highest particle accelerations in the Berkeley bevatron so far attained.

Many people think that nothing much can be done until negamass has been observed. If industry were to adopt this approach it would have a long wait and a quick answer at the end. But the negamass-posimass theory can be further developed; and, in anticipation of its existence, means of using it in a gravitationally neutralized body could be worked out. This, moreover, is certainly not the only possible approach: a breakthrough may well come in the interaction between gravitative action and heat theory at the moment suggests that if gravity could produce heat the effect is limited at the moment to a narrow range.\* But the significant thing would be establishment of a principle.

History may repeat itself thirty years ago, and even as recently as the German attempts to produce nuclear energy in the war, nobody would have guessed that power would be unlocked by an accident at the high end of the atomic table. All prophecies of atomic energy were concerned with how quickly means of fusion could be applied at the low end. In anti-gravity work, and this \* See Appendix V goes back to Birdseye, it may be an unrelated accident that will be the means of getting into the gravitational age. It is a prime responsibility of management to be aware of possible ways of using theory to accelerate such a process. In other words serendipity.

It is a common thought in industry to look upon the nuclear experience as a precedent for gravity, and to argue that gravitics will similarly depend on the use of giant tools, beyond the capabilities of the air industry and that companies will edge into the gravitational age on the coat-tails of the Government as industry has done, or is doing, in nuclear physics. But this over looks the point that the two sciences are likely to be different in their investment. It will not need a place like Hanford or Savannah River to produce a gravity shield or insulator once the knowhow has been established. As a piece of conceptual engineering the project is probably likely to be much more like a repetition of the turbine engine. It will be simple in its essence, but the detailed componentry will become progressively more complex to interpret in the form of a stable flying platform and even more intricate when it comes to applying the underlying principles to a flexibility of operating altitude ranging from low present flight speeds at one extreme to flight in a vacuum at the other.

This latter will be the extreme test of its powers. Again the principle itself will function equally in a vacuum - Townsend Brown's saucers could move in a vacuum readily enough - but the supporting parts must also work in a vacuum. In practice, they tend to give trouble, just as gas turbine bits and pieces start giving trouble in proportion to the altitude gained in flight.

But one has to see this rise in complexity with performance and with altitude attainment in perspective: eventually the most advanced capability may be attained with the most extremely simple configurations. As is usual however in physics developments the shortest line of progress is a geodesic, which may in turn lead the propulsion trade into many roundabout paths as being the shortest distance between aims and achievement.

But aviation business is understandably interested in knowing precisely how to recognize early discoveries of significance and this Gravity Rand report is intended to try and outline some of the more promising lines. One suggestion frequently made is that propulsion and levitation may be only the last - though most important - of a series of others, some of which will have varying degrees of gravitic element in their constitution. It may be that the first practical application will be in the greater freedom of communications offered by the change in wave technique that it implies.

A second application is to use the wave technique for anti-submarine detection, either airborne or seaborne. This would combine the width of horizon in search radar with the underwater precision of Magnetic Airborne Detection, and indeed it may have the range of scatter transmissions. Chance discoveries in the development of this equipment may lead to the formulation of new laws which would define the relationship of gravity in terms of usable propulsion symbols. Exactly how this would happen nobody yet knows and what industry and government can do at this stage is to explore all the possible applications simultaneously, putting pressure where results seem to warrant it.

In a paper of this kind it is not easy to discuss the details of the wave technique in communications, and the following are some of theories, briefly stated which require no mathematical training to understand, which it would be worth management keeping an eye on. In particular, watch should be made of quantitative tests on lofting, and beneficiation of material. Even quite small beneficiation ratios are likely to be significant. There are some lofting claims being made of 20% and more, and the validity of these will have to be weighed carefully. Needless to say much higher ratios than this will have to be attained. New high-k techniques and extreme-k materials are significant.

High speeds in electrostatic propulsion of small discs will be worth keeping track of (by high speed one means hundreds of m.p.h.) and some of these results are beginning to filter through for general evaluation. Weight mass anomalies, new oil-cooled cables, interesting megavolt gimmicks, novel forms of electrostatic augmentation with, hydrocarbon and non-hydrocarbon fuels are indicative, new patents under the broadest headings of force and motion may have value, new electrostatic generator inventions could tip the scales and unusual ways of turning condensers inside-out, new angular propulsion ideas for barycentric control; and generally certain types of saucer configuration are valuable pointers to ways minds are working.

Then there is the personnel reaction to such developments. Managements are in the hands of their technical men, and they should beware of technical teams who are dogmatic at this state. To assert electrogravitics is nonsense; is as unreal as to say it is practically extant. Management should be careful of men in their employ with a closed mind - or even partially closed mind - on the subject.

This is a dangerous age: when not only is anything possible, but it is possible quickly. A wise Frenchman once said you have only to live long enough to see everything 'and the reverse of everything;' and that is true in dealing with very advanced high energy physics of this kind.

Scientists are not politicians: they can reverse themselves once with acclaim - twice even with impunity. They may have to do so in the long road to attainment of this virtually perfect air vehicle. It is so easy to get bogged down with problems of the present; and whilst policy has to be made essentially with the present in mind - and in aviation a conservative policy always pays - it is management's task and duty to itself to look as far ahead as the best of its technicians in assessing the posture of the industry.

GLOSSARY

Gravithermals: alloys which may be heated or cooled by gravity waves. (Lover's definition)

Thermisters: materials capable of being influenced by gravity.

Electrads: materials capable of being influenced by gravity.

Gravitator: a plurality of cell units connected in series: negative and positive electrodes with an interposed insulating member (Townsend Brown's definition).

Lofting: the action of levitation where gravity's force is more than overcome by electrostatic or other propulsion.

Beneficiation: the treatment of an alloy or substance to leave it with an improved mass-weight ratio.

Counterbary: this, apparently, is another name for lofting.

Barycentric control: the environment for regulation of lofting processes in a vehicle.

Modulation: the contribution to lofting conferred on a vehicle by, treatment of the substance of its construction as distinct from that added to it by outside forces. Lofting is a synthesis of intrinsic and extrinsic agencies.

Absorber; insulator: these terms - there is no formal distinction between them as yet - are based on an analogy with electromagnetism. This is a questionable assumption since the similarity between electromagnetic and gravitational fields is valid only in some respects such as both having electric and magnetic elements. But the difference in coupling strengths, noted by many experimenters, is fundamental to the science. Gravity moreover may turn out to be the only non-quantized field in nature, which would make it, basically, unique. The borrowing of terms from the field of electromagnetism is therefore only a temporary convenience. Lack of Cartesian representation makes this a baffling science for many people.

Negamass: proposed mass that inherently has a negative charge.

Posimass: mass the observed quantity - positively charged.

Shield: a device which not only opposes gravity (such as an absorber) but also furnishes an essential path along which or through which, gravity can act. Thus whereas absorbers reflectors and insulators can provide a gravitationally neutralized body, a shield would enable a vehicle or sphere to 'fall away' in proportion to the quantity of shielding material.

Screening: gravity screening was implied by Lanczos. It is the result of any combination of electric or magnetic fields in which one or both elements are not subject to varying permeability in matter.

Reflector: a device consisting of material capable of generating buoyant forces which balance the force of attraction. The denser the material, the greater the buoyancy force. When the density of the material equals the density of the medium the result will be gravitationally neutralized. A greater density of material assumes a lofting role.

Electrogravitics: the application of modulating influences in an electrostatic propulsion system

Magnetogravitics: the influence of electromagnetic and meson fields in a reflector.

Bosun fields: these are defined as gravitational electromagnetic, ¼ and r meson fields (Metric tensor).

Fermion fields: these are electrons neutrinos muons nucleons and V-particles (Spinors).

Gravitator cellular body: two or more gravitator cells connected in series within a body (Townsend Brown's definition)

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30. Appendix I (of the Gravitics Situation)

SUMMARY OF TOWNSEND BROWN'S ORIGINAL

PATENT SPECIFICATION

A Method of and an Apparatus or Machine for Producing Force or motion.

This invention relates to a method of controlling gravitation and for deriving power therefrom, and to a method of producing linear force or motion. The method is fundamentally electrical.

The invention also relates to machines or apparatus requiring electrical energy - that control or influence the gravitational field or the energy of gravitation; also to machines or apparatus requiring electrical energy that exhibit a linear force or motion which is believed to be independent of all frames of reference save that which is at rest relative to the universe taken as a whole, and said linear force or motion is furthermore believed to have no equal and opposite reaction that can be observed by any method commonly known and accepted by the physical science to date.

Such a machine has two major parts A and B. These parts may be composed of any material capable of being charged electrically. Mass A and mass B may be termed electrodes A and B respectively. Electrode A is charged negatively with respect to electrode B, or what is substantially the same, electrode B is charged positively with respect to electrode A, or what is usually the case, electrode A has an excess of electrons while electrode B has an excess of protons.

While charged in this manner the total force of A toward B is the sum of force g (due to the normal gravitational field), and force e (due to the imposed electrical field) and force x (due to the resultant of the unbalanced gravitational forces caused by the electro-negative charge or by the presence of an excess of electrons of electrode A and by the electro-positive charge or by the presence of an excess of protons on electrode B).

By the cancellation of similar and opposing forces and by the addition of similar and allied forces the two electrodes taken collectively possess a force 2x in the direction of B. This force 2x, shared by both electrodes, exists as a tendency of these electrodes to move or accelerate in the direction of the force, that is, A toward B and B away from A. Moreover any machine or apparatus possessing electrodes A and B will exhibit such a lateral acceleration or motion if free to move.

In this Specification I have used terms as 'gravitator cells' and 'gravitator cellular body' which are words of my own coining in making reference to the particular type of cell I employ in the present invention. Wherever the construction involves the use of a pair of electrodes, separated by an insulating plate or member, such construction complies with the term gravitator cells, and when two or more gravitator cells are connected in series within a body, such will fall within the meaning of gravitator cellular body.

The electrodes A and B are shown as having placed between them an insulating plate or member C of suitable material, such that the minimum number of electrons or ions may successfully penetrate it. This constitutes a cellular gravitator consisting of one gravitator cell.

It will be understood that, the cells being spaced substantial distances apart, the separation of adjacent positive and negative elements of separate cells is greater than the separation of the positive and negative elements of any cell and the materials of which the cells are formed being the more readily affected by the phenomena underlying my invention than the mere space between adjacent cells, any forces existing between positive and negative elements of adjacent cells can never become of sufficient magnitude to neutralize or balance the force created by the respective cells adjoining said spaces. The uses to which such a motor, wheel or rotor may be put are practically limitless, as can be readily understood, without further description. The structure may suitably be called a gravitator motor of cellular type.

In keeping with the purpose of my invention an apparatus may employ the electrodes A and B within a vacuum tube. Electrons, ion, or thermions can migrate readily from A to B. The construction may be appropriately termed an electronic, ionic, or thermionic gravitator as the case may be.

In certain of the last named types of gravitator units it is desirable or necessary to heat to incandescence the whole or a part of electrode A to obtain better emission of negative thermions or electrons or at least to be able to control that emission by variation in the temperature of said electrode A. Since such variations also influence the magnitude of the longitudinal force or acceleration exhibited by the tube, it proves to be a very convenient method of varying this effect and of electrically controlling the motion of the tube.

The electrode A may be heated to incandescence in any convenient way as by the ordinary methods utilizing electrical resistance or electrical induction.

Moreover, in certain types of the gravitator units, now being considered it is advantageous or necessary also to conduct away from the anode or positive electrode B excessive heat that may be generated during the operation. Such cooling is effected externally by means of air or water cooled flanges that are in thermo connection with the anode, or it is effected internally by passing a stream of water, air, or other fluid through a hollow anode made especially for that purpose.

The gravitator motors may be supplied with the necessary electrical energy for the operation and resultant motion thereof from sources outside and independent of the motor itself. In such instances they constitute external or independently excited motors. On the other hand, the motors when capable of creating sufficient power to generate by any method whatsoever all the electrical energy required therein for the operation of said motors are distinguished by being internal or self-excited. Here it will be understood that the energy created by the operation of the motor may at times be vastly in excess of the energy required to operate the motor.

In some instances the ratio may be even as high as a million to one. Inasmuch as any suitable means for supplying the necessary electrical energy, and suitable conducting means for permitting the energy generated by the motor to exert the expected influence on the same may be readily supplied, it is now deemed necessary to illustrate details herein. In said self-excited motors the energy necessary to overcome the friction or other resistance in the physical structure of the apparatus, and even to accelerate the motors against such resistance, is believed to be derived solely from the gravitational field or the energy of gravitation. Furthermore, said acceleration in the self excited gravitator motor can be harnessed mechanically so as to produce usable energy or power, said usable energy or power, as aforesaid, being derived from or transferred by the apparatus solely from the energy of gravitation.

`The gravitator motors function as a result of the mutual and unidirectional forces exerted by their charged electrodes. The direction of these forces and the resultant motion thereby produced are usually toward the positive electrode. This movement is practically linear. It is this primary action with which I deal.

As has already been pointed out herein, there are two ways in which this primary action can accomplish mechanical work. First, by operating in a linear path as it does naturally, or second, by operating in a curved path. Since the circle is the most easily applied of all the geometric figures, it follows that the rotary form is the important.

There are three general rules to follow in the construction of such motors. First, the insulating sheets should be as thin as possible and yet have a relatively high puncture voltage. It is advisable also to use paraffin saturated insulators on account of their high specific resistance. Second, the potential difference between any two metallic plates should be as high as possible and yet be safely under the minimum puncture voltage of the insulator. Third, there should in most cases be as many plates as possible in order that the saturation voltage of the system might be raised well above the highest voltage limit upon which the motor is operated.

Reference has previously been made to the fact that in the preferred embodiment of the invention herein disclosed the movement is towards the positive electrode. However, it will be clear that motion may be had in a reverse direction determined by what I have just termed 'saturation voltage' by which is meant the efficiency peak or maximum of action for that particular type of motor; the theory, as I may describe it, being that as the voltage is increased the force or action increases to a maximum which represents the greatest action in a negative to positive direction. If the voltage were increased beyond that maximum the action would decrease to zero and thence to the positive to negative direction.

The rotary motor comprises, broadly speaking, an assembly of a plurality of linear motors fastened to or bent around the circumference of a wheel. In that case the wheel limits the action of the linear motors to a circle, and the wheel rotates in the manner of a fireworks pin wheel.

I declare that what I claim is

1. A method of producing force or motion, which comprises the step of aggregating the predominating gravitational lateral or linear forces of positive and negative charges which are so co-operatively related as to eliminate or practically eliminate the effect of the similar and opposing forces which said charges exert.

2. A method of producing force or motion, in which a mechanical or structural part is associated with at least two electrodes or the like, of which the adjacent electrodes or the like have charges of differing characteristics, the resultant, predominating, uni-directional gravitational force of said electrodes or the like being utilized to produce linear force or motion of said part.

3. A method according to Claim 1 or 2, in which the predominating force of the charges or electrodes is due to the normal gravitational field and the imposed electrical field.

4. A method according to Claim 1, 2 or 3 in which the electrodes or other elements bearing the charges are mounted, preferably rigidly, on a body or support adapted to move or exert force in the general direction of alignment of the electrodes or other charge-bearing elements.

5. A machine or apparatus for producing force or motion, which includes at least two electrodes or like elements adapted to be differently charged, so relatively arranged that they produce a combined linear force or motion in the general direction of their alignment.

6. A machine according to Claim 5 in which the electrodes or like elements are mounted, preferably rigidly on a mechanical or structural part, whereby the predominating uni-directional force obtained from the electrodes or the like is adapted to move said part or to oppose forces tending to move it counter to the direction in which it would be moved by the action of the electrodes or the like.

7. A machine according to Claim 5 or 6 in which the energy necessary for charging the electrodes or the like is obtained either from the electrodes themselves or from an independent source.

8. A machine according to Claim 5, 6 or 7, whose force action or motive power depends in part on the gravitational field or energy of gravitation which is controlled or influenced by the action of the electrodes or the like.

9. A machine according to any of Claims 3 to 8, in the form of a motor including a gravitator cell or a gravitator cellular body, substantially as described.

10. A machine according to Claim 9, in which the gravitator, cellular body or an assembly of the gravitator cells is mounted on a wheel-like support, whereby rotation of the latter may be effected, said cells being of electronic, ionic or thermionic type.

11. A method of controlling or influencing the gravitational field or the energy of gravitation and for deriving energy or power therefrom comprising the use of at least two masses differently electrically charged, whereby the surrounding gravitational field is affected or distorted by the imposed electrical field surrounding said charged masses, resulting in a unidirectional force being exerted on the system of charged masses in the general direction of the alignment of the masses, which system when permitted to move in response to said force in the above mentioned direction derives and accumulates as the result of said movement usable energy or power from the energy of gravitation or the gravitational field which is so controlled, influenced, or distorted.

12. The method of and the machine or apparatus for producing force or motion by electrically controlling or influencing the gravitational field or energy of gravitation.

Appendix II (of the Gravitics Situation)

A Quantum Mechanical Approach to the Existence of Negative

Mass and Its Utilization in the Construction of Gravitationally Neutralized Bodies

Since the overwhelming majority of electrostatic quantum mechanical effects rely for their existence on an interplay of attractive and repulsive forces arising from two types of charge, few if any fruitful results could come from a quantum mechanical investigation of gravity, unless there should be two types of mass. The first type, positive mass; (hereafter denoted as posimass) retains all the properties attributed to ordinary mass, while the second type, negative mass (hereafter denoted as negamass) differs only in that its mass is an inherently negative quantity.

By considering the quantum mechanical effects of the existence of these two types of mass, a fruitful theory of gravity will be developed. Theory will explain why negamass has never been observed, and will offer a theoretical foundation to experimental methods of detecting the existence of negamass and utilizing it in the production of gravitationally neutralized bodies.

To achieve these results, recourse will be made to Schroedinger's time independent equation with the center of mass motion removed. This equation is: -h2/2µÆ2ß+Vß = Eß where all symbols represent the conventional quantum mechanical quantities. Particular attention will be paid to the reduced mass µ=(m1m2)/(m1+m2) where m1 and m2 are the masses of the two interacting bodies.

One can approach the first obstacle that any theory of negamass faces, namely the explanation of why negamass has never been observed, by a consideration of how material bodies would be formed if a region of empty space were suddenly filled with many posimass and negamass quanta. To proceed along these lines, one must first understand the nature of the various possible quantum mechanical interactions of posimass and negamass.

Inserting the conventional gravitational interaction potential into Schroedinger's equation and solving for the wave function ß, yields the result that the probability of two posimass quanta being close together is greater than the probability of their being separated. Hence, there is said to be an attraction between pairs of posimass quanta. By a similar calculation it can be shown that while the potential form is the same two negamass quanta repel each other. This arises from the fact that the reduced mass term in Schroedinger's equation is negative in this latter case. The type of negamass posimass interaction is found to depend on the relative sizes of the masses of the interacting posimass and negamass quanta, being repulsive if the mass of the negamass quantum is greater in absolute value than the mass of the posimass quantum, and attractive in the opposite case.

If the two masses are equal in absolute value the reduced mass is infinite and Schroedinger's equation reduces to (V - E)ß - 0. Since the solution ß - 0 is uninteresting physically, it must be concluded that V - E, and, hence, there is no kinetic energy of relative motion. Thus, while there is an interaction potential between the equal mass posimass and negamass quanta, it results in no relative acceleration and thus, no mutual attraction or repulsion while much could be said about the philosophical implications of the contradiction between this result and Newton's Second Law, such discussion is out of the scope of the present paper, and the author shall, instead, return with the above series of derivations to a consideration of the construction of material bodies in a region suddenly filled with many posimass and negamass quanta.

Because of the nature of the posimass-posimass and negamass-negamass interactions, the individual posimass quanta soon combine into small posimass spheres, while nothing has, as yet, united any negamass quanta. Since it is reasonable to assume that a posimass sphere weighs more than a negamass quantum in absolute value, it will attract negamass quanta and begin to absorb them. This absorption continues until the attraction between a sphere and the free negamass quanta becomes zero due to the reduced mass becoming infinite. The reduced mass becomes infinite when the sphere absorbs enough negamass quanta to make the algebraic sum of the masses of its component posimass and negamass quanta equal to the negative of the mass of the next incoming negamass quantum. Thus the theory predicts that all material bodies after absorbing as many negamass quanta as they can hold, weigh the same very small amount, regardless of size.

Since this prediction is in violent disagreement with experimental fact, one must conclude that the equilibrium arising as a result of the reduced mass becoming infinite has not yet been reached. That is, assuming that negamass exists at all, there are not enough negamass quanta present in the universe to allow posimass spheres to absorb all the negamass they can hold. One is thus able to explain the experimental fact that negamass has never been observed by deriving the above mechanism in which the smaller amounts of negamass that may be present in the universe are strongly absorbed by the greater amounts of posimass producing bodies composed of both posimass and negamass, but which have a net positive, variable, total mass.

Having thus explained why negamass has never been observed in the pure state, it is next desirable to derive an experimental test of the existence of negamass through considering the internal quantum mechanical problem of small amounts of negamass in larger posimass spheres. One is able to gain much physical insight into this problem by simplifying it to the qualitatively similar problem of one negamass quantum in the field of two posimass quanta that are fixed distance apart.

Further simplification from three dimensions to one dimension and replacement of the posimass quanta potentials by square barriers, yields a solution in which the ground state energy E0 of the negamass quantum in the field of one posimass quantum, is split into two energy levels in the field of the two posimass quanta. These two levels correspond to even and odd parity solutions of the wave equation where Eeven lies higher and Eodd lower than E0. The magnitudes of the differences Eeven-E0 and E0-Eodd depend on the separation distance between the two posimass quanta, being zero for infinite separation and increasing as this separation distance is decreased.

Since the energy of a system involving negamass tends to a maximum in the most stable quantum mechanical configuration, the negamass quantum will normally be in state Eeven. When the system is excited into state Eodd, the negamass quantum will favor the situation in which the two posimass quanta are as far apart as possible, since Eodd increases with increasing separation distance between the two posimass quanta, and the system tends toward the highest energy state. Thus independent of and in addition to the attractive posimass gravitational interaction, there is a repulsive quantum mechanical exchange interaction between pairs of posimass quanta when the system is in state Eodd. The result of these two oppositely directed interactions is that the two posimass quanta are in stable equilibrium at some separation distance.

Since this equilibrium occurs between all posimass pairs in an elementary particle, a necessary consequence of the existence of negamass is that when in the first excited state elementary particles have a partial crystal structure.

This theoretical conclusion is capable of experimental verification by performing a Bragg analysis of the elementary particle crystal structure through shining high energy gamma rays on hydrogen. Part of the gamma ray energy will be utilized in lowering the system from energy Eeven to Eodd, and if selective reflection is observed, it will constitute a striking verification of the existence of negamass. An order of magnitude calculation shows that, if the equilibrium distance between pairs of posimass quanta is one one-millionth the radius of an electron, 100 bev gamma rays will be required to perform this experiment.

Having discussed why negamass has never been observed, and having derived an experimental test of its existence it is next desirable to develop an experimental method of utilizing negamass in the production of gravitationally neutralized bodies by further consideration of some ideas previously advanced. It has been pointed out that if a source of negamass is present, aposimass sphere continues to absorb negamass quanta until equilibrium is reached as a result of the reduced mass becoming infinite.

Because the sphere thus produced is practically massless and because the gravitational interaction between two bodies is proportional to the product of their respective masses, it follows that the sphere is practically unaffected by the presence of other bodies. And thus, the problem of making gravitationally neutralized bodies is reduced to the problem of procuring a source of negamass quanta. This will be the next problem discussed.

The binding energy of a negamass quantum in a posimass sphere may be obtained as one of the eigenvalue solutions to Schroedinger's Equation. If the negamass quanta in a body are excited to energies in excess of this binding energy by shining sufficiently energetic gamma rays on the body these negamass quanta will be emitted and negamass source will thus be obtained.

To estimate the gamma ray energy required to free a negamass quantum from a posimass body, certain assumptions must be made concerning the size and mass of posimass and negamass quanta. Since these quantities are extremely indefinite, and since the whole theory is at best qualitative, attempting to estimate the energy would be a senseless procedure. Suffice it to say that because of the intimate, sub-elementary particle nature of the posimass-negamass interaction, it seems reasonable to assume that quite energetic gamma rays will be required to break this strong bond.

To briefly review what has been shown a quantum mechanical theory of negamass has been developed based on the assumptions that gravitational interactions obey the laws of quantum mechanics and that all possible interactions of negamass and posimass with themselves and each other follow the well known inverse square law. This theory explains the experimental fact that negamass has never been observed, and outlines plausible experimental methods of determining the existence of negamass and utilizing it in the construction of gravitationally neutralized bodies. While these experimental methods may perhaps be out of the realm of practicality at the present, there is every reason to hope that they will be performable in the future. At that time, the plausibility of the existence of negamass and the theory behind the construction of gravitationally neutralized bodies from it, will meet their final tests.

SUMMARY PARAGRAPH

A quantum mechanical theory of negative mass is developed, based on the assumptions that gravitational interactions obey the laws of quantum mechanics, and that all possible interactions of negative and positive mass with themselves and each other follow the well-known inverse square law. This theory explains the experimental fact that negative mass has never been observed, and outlines plausible experimental methods of determining the existence of negative mass and utilizing it in the construction of gravitationally neutralized bodies.

Prof. F. Mozer

Appendix III (of the Gravitics Situation)

GRAVITY EFFECTS

The order of magnitude of the heat given off by an alloy as a result of the separation by gravity tension can be reliably estimated. Suppose we assume that an alloy of half tin and half lead completely fills a tube 5 meters long and 100 cm2 cross section which is maintained accurately at a temperature 277° C. At this temperature the alloy is liquid suppose next that the tube is raised from a horizontal plane into a vertical position, i.e. to a position where its length is parallel to the direction of gravity. If, then, the alloy is free from convection as it would be if it is maintained at uniform temperature and if it is held in this position for several months, the percentage of tin at the bottom of the tube will decrease while the relative amount at the top will increase.

A simple calculation shows that the concentration of tin at the top is about one tenth of one percent greater than at the bottom and that approximately one calorie of heat is given off in the separation progress. If after several months the tube is again placed so that its length is in a horizontal plane the tin and lead will remix due to the thermal agitation of the atoms and heat is absorbed by the alloy.

Another interesting effect occurs when an electrolyte is subjected to gravity tension. Suppose a five meter glass tube is filled with a water solution of say barium chloride and the electrical potential between its ends is measured first when the length of the tube is parallel to the horizontal and second when its length is vertical. The difference in potential between the two ends is practically zero when the tube is horizontal and approximately eighty five microvolts when it is vertical.

This effect was discovered by Des Coudres in 1892. If a resistor is attached across the ends when the tube is vertical, heat of course is produced. If the tube is maintained at constant temperature the voltage decreases with time and eventually vanishes. The effect is believed to result from the fact that the positively charged barium ions settle faster than the lighter negatively charged chlorine ions as a result of gravity tension.

In conclusion, we have seen that gravity tension effects an alloy in such a way that it gives off heat. This phenomenon results from the alignment of the atoms and from their separation by the gravitational field, the contribution of the latter being larger than that of the former. Also, the gravity tension sets up a potential across the ends of a tube filled with an electrolyte and this potential when applied across an external circuit may produce heat or drive an electric motor to furnish power. Several other small thermal effects possibly may arise from gravity tension in addition to those discussed above but space is not available to consider them in this essay. Also, studies of the effect of gravitational fields and their equivalent centrifugal fields upon matter will no doubt be of great value in the future.

J.W. Beams

Appendix IV (of the Gravitics Situation)

LINK BETWEEN GRAVITATION AND NUCLEAR ENERGY  
by Dr Stanley Deser and Dr Richard Arnowitt

Quantitatively we propose the following field equations:

-kTuv = Ruv +.5Rguv + Cuv(ØÆ)

(.5ÆuÆju + m + LPuvKuv(X))Æ = 0

with a similar equation for Ø. In the above, Æ represents the hyperon wave functions and Ø the K-particle quantized field operators. The first three terms in the first equation are the usual structures in the Einstein General Relativity. The last term, Cuv is the "creation" tensor which is to give us our conversion from gravitational to nuclear energy. It is like Tuv in being an energy momentum term. In the second equation Æju represents the covariant derivative while Æu is a generalized Dirac matrix arranged so that the second equation is indeed covariant under the general group of coordinate transformations. The PuvKuv term will automatically include the higher hyperon levels. Cuv is a functional of the hyperon and K-field variables Æ and Ø.

As can be seen these equations are coupled in two ways first the creation term Cuv depends upon the field variables Æ and Ø while the gravitational metric tensor guv enters through the covariant derivative etc. L is a new universal constant giving the scale of the level spacings of the hyperons. Rigorously speaking the field equations should be, of course, second quantized. For purposes of obtaining a workable first approximation it is probably adequate to take expectation values and solve the semi classical equations. The creation tensor Cuv must be a bilinear integral of the Ø and Æ fields and may have cross terms as well of the form ÆØÆÆ(dx). These equations will indeed be difficult to solve; but upon solution will give the distribution of created energy and, hence, lead eventually to the more practical issues desired.

Appendix V (of the Gravitics Situation)

GRAVITY/HEAT INTERACTION

Let us suppose that we have to investigate the question whether gravitative action alone upon some given substance or alloy can produce heat. We do not specify its texture, density nor atomic structure; we assume simply the flux of gravitative action followed by an increase of heat in the alloy.

If we assume a small circular surface on the alloy, then the gravitative flux on it may be expressed by Gauss' theorem and it is 4¼M,where M represents mass of all sub-surface particles; the question is, can this expression be transformed into heat. We will assume it can be. Now recalling the relativity law connecting mass and energy:

M = m0 + T/c2 (by Einstein)

where:- T = Kinetic energy

m = Initial mass

c = Velocity of Light

we set 4¼M = m0 +T/c2 = m0 + (m0v2)/2c2

But v2/c2 is a proper fraction: hence M = m0 + m0/2k

In the boundary case v=c, M=m0(1+1/k) for all other cases 4¼M=m0((k+1)/k)k kÆ0. Strictly M should be preceded by a conversion factor 1/k but if inserted, it does not alter results. Thus if gravity could produce heat, the effect is limited to a narrow range, as this result shows.

It merits stress that in a gravitational field the flow lines of descent -- are Geodesics.

J.W. Wickenden

Appendix VI (of the Gravitics Situation)

WEIGHT-MASS ANOMALY

There is a great need for a precise experimental determination of the weight to mass ratio of protons or electrons. Since the ratio for a proton plus an electron is known already, the determination of the ratio for either particle is sufficient. The difficulty of a direct determination of the gravitational deflection of a charged particle in an experiment similar to the neutron or neutral atom experiment is due to electrical forces being much greater than gravitational forces. For example, one electron five meters away from a second electron exerts as much force on that second electron as the gravitational field does. Thus stray electrons or ions which are always present on the walls of an apparatus can exert sufficient force to completely mask the gravitational force. Even if the surface charges are neglected, image charges of the electron beam itself and self repulsion in the beam may obscure the gravitational deflection.

An additional problem is the Earth's magnetic field. Electrons of even a few volts energy will feel a force due to the Earth's field a thousand billion times larger than the gravitational deflection. This last problem is avoided in a static measurement of the ratio such as a weighing of ionized matter. However, this last method has the additional difficulty of requiring a high proportion of ionized to unionized matter in the sample being weighed. Of course all these problems can be resolved to some extent; but it is questionable if an experiment of either of the above types can be designed in which all the adverse effects can simultaneously be sufficiently minimized. Probably a completely new type of experiment will have to be devised to measure the weight to mass ratio of the proton or electron.

Such a measurement may detect a deviation from the law of constant weight to mass ratio. If such an anomaly can be shown to exist there is the possibility of finding a material which would be acted upon in an unusual manner in a gravitational field.

Martin L. Perl.

Ultimately, they go back to Einstein's general theory of relativity (1916), in which the law of gravitation was first mathematically formulated as a field theory (in contrast to Newton's "action-at-a-distance" concept).

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