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The man who discovered how UFOs are powered.

THE WIZARD OF ELECTRO-GRAVITY

By William L. Moore

The most illuminating insight into how UFO's are powered can be found in the life and work of an obscure but brilliant American scientist and inventor, Thomas Townsend Brown. Born into a prominent Zanesville, Ohio family in 1905, Brown displayed early in life an interest in space travel—a subject considered sheer fantasy in the days when there were still those who looked askance at the Wright Brothers' flying machines. Nonetheless, young Brown was not so easily dissuaded, and enjoyed dabbling with what was then regarded as "modern" electronics. It was his youthful toying with the then infant ideas of radio and electromagnetism that provided a background which was to be invaluable to him in later years; and it was during the course of this experimenting that Brown somehow acquired a Coolidge X-ray tube—an item that was to lead him to make a startling discovery.

X-rays (or Röntgen Rays) were indeed mysterious forces in those days (in fact, American physical chemist William D. Coolidge had only just invented the "Coolidge tube" itself in 1913), and even legitimate science was only beginning to learn anything about them. Brown wasn't interested in the X-rays per se, however. Somewhere in his head rested the idea that maybe a key to space flight might be found here; and toward that end, he set up an experiment to determine whether there might be a useful force of some sort exerted by the X-rays emanating from his Coolidge tube.

Trying something that no other scientist of his day had thought of, Brown mounted his tube in extremely delicate balance and began "testing" for results. To his disappointment, he was unable to detect any measurable force exerted by the rays regardless of which way he turned his apparatus; but to his amazement, he did note a very strange quality of the Coolidge tube itself: Every time it was turned on, the tube seemed to exhibit a motion of its own—a "thrust" of some sort, as if the apparatus was trying to move! Investigating further, Brown had to spend considerable time and effort before the truth finally dawned. The X-rays had nothing whatsoever to do with this new-found phenomenon—it was the high voltage used to produce the rays which was behind it!

Brown now began a series of experiments designed to determine the nature of the "force" he had discovered, and after much effort finally succeeded in developing a device which he optimistically called a "Gravitor". His invention looked like nothing more than a bakelite case some twelve inches long and four inches square, but when placed on a scale and connected to a one hundred kilovolt power source, the apparatus proceeded to gain or lose about one percent of its weight (depending on polarity). Brown was sure he had discovered a new electrical principle, but he remained unsure of just what to do with it. And in spite of the fact that there were a few newspaper accounts of his work, no scientist of any stature expressed an interest in his discovery—a not entirely surprising reaction when one considers that Brown was only then about to graduate from high school!

Readily recognizing his youth as a handicap, Brown elected to "proceed with caution," and in 1922 he entered the California Institute of Technology (Caltech) at Pasadena, Ca. as a "promising young freshman," and spent his first year courting the favor of his professors—among them the late physicist and Nobel laureate Dr. Robert A. Millikan. His success in being able to convince his instructors of his excellence as a lab man was offset by his complete inability to gain even the slightest measure of recognition for his ideas about electro-gravity. His teachers, steeped to the last in the rigors of 19th century scientific discipline, steadfastly refused to admit that such a thing could exist, and hence, "weren't interested." Undaunted, Brown transferred nearer to home to Kenyon College (Gambier, Ohio) in 1923, remaining there only a year and then transferring to Denison University at Granville, Ohio, where he studied as an electronics resident in the Department of Physics under Dr. Paul Alfred Biefeld, professor of physics and astronomy and former classmate, in Switzerland, of Dr. Albert Einstein.

Unlike Dr. Millikan at Caltech, Dr. Biefeld proved to be interested in Brown's discovery, and together the two of them, professor and student, experimenting with charged electrical capacitors, developed a principle of physics which came to be tentatively known as the "Biefeld-Brown Effect." Basically, the "effect" concerned the observed tendancy of a highly charged electrical condenser to exhibit motion toward its positive pole—the same motion observed earlier by Brown with his Coolidge tube.

Following the completion of his formal education, Townsend Brown joined the staff of the Swazey Observatory in Ohio, where he

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remained for some four years and during which time he married. Opportunity came searching in 1930, and Brown left the staff of Swazey to sign on with the Naval Research Laboratory in Washington, D.C., as a specialist in radiation, field physics and spectroscopy.

It was during this phase of his life that he participated, as staff physicist, in the Navy Department's International Gravity Expedition to the West Indies in 1932, and as physicist in the Johnson-Smithsonian Deep Sea Expedition of 1933. Later that same year, the Depression took its toll and budget cutbacks forced him to leave the Naval Research Lab in search of "greener pastures." Undaunted, he joined the U.S. Naval Reserve, and, finding scientific jobs scarce, landed a position first as a soil engineer for the Federal Emergency Relief Administration and later as an administrator for the Civilian Conservation Corps in Ohio.

Daytime jobs during the thirties, however, did not prevent Brown from continuing his studies of physics in general and the Biefeld-Brown effect in particular during available evening and weekend hours; and with the passage of time, the original "Gravitor" design saw numerous improvements.

In 1939, Brown, now a lieutenant in the naval reserve, went to Maryland as a material engineer for the Glenn L. Martin Company of Baltimore (later Martin Aerospace), but was there only a matter of months when he was called upon by the Navy to become officer in charge of magnetic and accoustic minesweeping research and development under the Bureau of Ships. He served faithfully, presiding over the expenditure of nearly $50 million for research (there were some fifteen Ph.D.'s responsible to Brown at one point), and even consulting with Einstein himself on occasion (the common bond, remember, was Dr. Biefeld), until after Pearl Harbor when he was transferred, with the rank of lieutenant commander, to Norfolk to continue his research while heading up the Navy's Atlantic Fleet Radar School there.

The early years of the War saw Lieutenant Commander Brown deeply involved as a physicist with projects conducted under the National Defense Research Committee (NDRC), and later under its successor, the Office of Scientific Research headed by Dr. Vannevar Bush. Among other things, Brown performed some very valuable high-vacuum work as well as experiments centered on perfecting methods of ship degaussing. However, the combined effects of his having worked "too long and too hard", and of his personal disappointment in the failure of his projects to gain proper recognition resulted in a nervous collapse in December of 1943. Retirement from the service quickly followed and Brown was sent home to rest.

Six months later, the spring of 1944 found him working as a radar consultant for the advanced design section of Lockheed-Vega Aircraft Corporation in California. Colleagues referred to him as a "quiet, modest, retiring man . . . a brilliant solver of engineering problems" and "exactly the sort (of man) one expects to find in important research installations." More importantly, he was still working on his Gravitor, although, interestingly, Brown would not speak in terms of gravity when describing it—preferring rather to use the more scientific but decidedly less sensational term "stress in dielectrics."

Things began to look up just a bit in the post-war years. After leaving Lockheed, Brown went to Hawaii to take up private residence and to continue his research. It was during this time, partly through the efforts of an old friend (A.L. Kitselman) who was then teaching calculus at Pearl Harbor, that Brown's Gravitor device, somewhat improved over earlier editions, came to the interest of none other than Admiral Arthur W. Radford, Commander in Chief of the U.S. Pacific Fleet (later to become Chairman of the Joint Chiefs of Staff under President Eisenhower, 1953-57). As a result of Admiral Radford's interest, Brown was temporarily accorded consultant status to the Pearl Harbor Navy Yard; but in spite of the fact that the former lieutenant commander was well treated by his navy friends, it appears from the evidence that they considered his invention as rather more of an interesting curiosity than any sort of key to space travel. Perhaps, to engage in a bit of speculation, had Brown been more of a salesman than a scientist, things might have been different.

In the meantime, the appearance of UFOs on the American scene at the turn of the decade had succeeded in capturing Brown's personal interest. Eagerly following the controversy as it raged among the military and scientific community in the late forties and early fifties, Brown postulated that perhaps with the proper worldwide scientific approach, question of how UFOs are powered might be solved. In those days, his belief in the abilities of modern science was such that he even dared to speculate on the possibility of a quick solution, given the proper resources and manpower, and, of course, he remained constantly aware of the possibility that he had, through his own efforts at research into electro-gravity, hit upon one of the keys to the mystery.

Moving to Cleveland in 1952, Brown conceived of a project he called "Win-

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terhaven," an idea which he hoped, with proper refinements, could be offered for sale to the military establishment. Through patient research, he succeeded in improving the lift-force of his Gravitor apparatus until it was such that it could lift significantly in excess of one hundred per-cent of its own weight—a success that should have raised the eyebrows of any respectable scientist or pentagon official—but apparently didn't, even though the apparatus involved was quite sophisticated and, as we shall see, the demonstrations most impressive.

According to modern science, everything in the known universe owes its existence to three basic energies or forces: electromagnetism, nuclear forces, and gravity. Whether these three are separate forces, or whether they are each manifestations of some more basic unifying force is still a matter of scientific conjecture. Indeed, Albert Einstein's life work was largely devoted to trying to perfect a theory of Unified Field, and in the process of trying to derive the field equations involved, came to speculate that what we call "matter" is, in reality, only a local phenomenon exhibited by areas of extreme field-energy concentration. Even establishment science does not question the patently obvious relationship between electricity and magnetism, but the relationship of these two fields to the "gravity field" constitutes an area of physics which, more than twenty years after Einstein's death, is still largely incomprehensible to modern science. In general, most of orthodox science in the seventies does tend to recognize a loose linking or "coupling" effect of some sort between electrical and gravitational forces, but precious few scientists have seen fit to speculate that this coupling effect might be at all applicable. At least, such is the case officially, although there exists sufficient reason to suspect that there may have been significant advancements in this area which are still well hidden under that proverbial "brass lid" emblazoned with the phrase "Top Secret."

In any event, Townsend Brown's departure from orthodoxy rests on the above point. Brown firmly believes there is a linking force between gravity and electricity. Whether there may be a further connection between magnetism and gravity, and hence a "unifying" field relationship between all three is yet another question. But to get back to basics; Townsend Brown believes—and his experiments seem to bear him out—that the Biefeld-Brown Effect manifests a proven link between electricity and gravity.

A "dielectric" is defined as a material which has the unique ability of absorbing electrical energy or "charge" without ordinarily passing this energy on to neighboring materials. Some dielectrics are able to absorb enormous quantities of electrical energy (also referred to as "elastic stress") without discharging, providing that the energy is fed into the dielectric slowly and at low potential. Still others can be charged and discharged at extremely high potential at a rate equal to several thousand times each second. Townsend Brown concerned himself principally with this latter type. Using just such a dielectric, Brown constructed disc (or saucer) shaped condensers, and, by applying various amounts of high-voltage direct current, witnessed the Biefeld-Brown effect in action. With the proper construction and electrical potential (in the kilovolt range) the disc-shaped "air foils" were made to fly under their own power, emitting a slight hum and a bluish electrical glow as they did so. More scientifically, perhaps, this process of "flight" might best be described as "motion under the influence of interaction between electrical and gravitational fields in the direction of the positive electrode."

In 1953, Brown succeeded in demonstrating, in his laboratories, the flight of disc-shaped air foils two feet in diameter around a circular course twenty feet in diameter. The process involved tethering these saucer-shaped craft to a central pole by means of a wire through which the necessary D.C. electrical potential was supplied at a rate of fifty thousand volts with a continuous input of fifty watts. The test produced an observable top speed of an amazing seventeen feet per-second (11½ miles per hour).

Working with almost superhuman determination and at great cost to his personal finances, Brown soon succeeded in surpassing even this accomplishment. At his next display, he exhibited a set of discs three feet across flying a fifty foot diameter course with results so spectacular that they were immediately classified. Even so, most scientists who witnessed the demonstrations remained skeptical and generally attributed Brown's motive force to what they called an "electrical wind," in spite of the fact that a veritable "electrical hurricane" would have to be involved to produce the lift-potential observed. Pitiful few gave any credence whatsoever to the idea that the Biefeld-Brown Effect might represent anything new in the world of physics. Government funds were sought to enable the work to continue, but in 1955, seeing that the money was not forthcoming, a disgruntled Brown went to

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Europe in hopes that perhaps he might be able to generate a little more enthusiasm on the continent.

Demonstrations were given first in England, but it was on the mainland under the auspices of a French corporation, La Société National de Construction Aeronautique Sud Ouest (SNCASO), that things really began to look promising. During a set of tests performed confidentially within the company's research laboratory, Brown succeeded in flying some of his discs in a high vacuum with amazing results, thereby proving that, in fact, his discs flew more efficiently *without* air. Also proven during this series of experiments was that the speed and efficiency of the "craft" could be increased by providing greater voltage to the dielectric plates. Contemporary accounts easily visualized speeds of several hundred miles-per-hour using voltages in the range of one to two hundred thousand electron volts, and at least one writer spoke of a "flame jet generator" then in the planning stage, which supposedly would be able to provide power potential up to 15 million volts! In fact, plans had been laid for the immediate construction of a large vacuum chamber and a one-half million volt power supply when disaster struck the project in the form of a corporate merger. SNCASO had agreed to combine with a larger company to form what was termed a "Super Douglass of France": Sud Est. The president of the emerging company proceeded to demonstrate an appalling lack of interest in "these far-out propulsion research efforts" and favored instead an increased interest in "air frame manufacture." All facilities designated and created by the former president to carry on the work on electro-gravity were summarily cancelled and a thoroughly disappointed Brown was forced to return home to the U.S. in 1956.

The summer of that year found him living in the Washington, D.C., area still interested in UFO research and hoping fervently that if scientific evidence could be uncovered suggesting their possible method of propulsion, his own work would be greatly enhanced—an idea which leads us down yet another avenue of Townsend Brown's life.

The key to this phase was a then 67-year-old widow named Mrs. Walton C. John—better known as "Clara" to her friends. Clara John was the occasional publisher of a mimeographed tract known as *The Little Listening Post* which dealt with a variety of novel and esoteric items, not the least of which was the UFO. In the course of her excursions into the netherworld of the bizarre and the novel, she had come into contact with Townsend Brown and by 1955 had managed to maintain an intermittant correspondance with him for several years.

Clara John, however, was far too active a personality to satisfy her interests through mere correspondance. In the spring of 1956, Mrs. John had enthusiastically organized a small circle of friends and acquaintances, all of whom shared a common interest in the UFO, into what came to be called "The Flying Saucer Discussion Group"—an informal collection of the curious and interested which met on a more-or-less monthly basis at the Y.W.C.A. and invited well known figures in the UFO field to speak.

Barely a month later, what was to become the largest, and for a time the most influential, of the UFO organizations was created: "the National Investigations Committee on Aerial Phenomena," more commonly referred to as NICAP. On Aug. 29, 1956, a mere two weeks after final endorsement by the Flying Saucer Discussion Group, Townsend Brown filed documents of incorporation for the new organization in the District of Columbia, listing among the Board of Governors two physicists, two ministers, two businessmen, a former rear admiral and a retired army brigadier general. Clara John voiced the hopes of all concerned by stating her expectations that the "floodgates of confusion" in the UFO field had "at last found a safe and orderly outlet."

Through September and October, Brown, in his capacity as director began to set up shop. The new committee, he felt, should be organized along proven corporate lines so as to insure maximum efficiency in all phases of the operation. Accordingly, an acting treasurer was appointed, office space was acquired, and the services of a secretary obtained. At last, with the final approval on Oct. 24, 1956 of NICAP's corporate charter, Brown's dream became reality. It was, for Brown, to be short lived.

The showdown came at a climactic meeting of the membership in January, 1957, at which Brown was accused of following an irresponsible fiscal policy and leading the group on too radical a course. During the shouting match that followed, Brown's anti-gravity theories were repeatedly referred to amidst allegations that Brown's sole purpose in organizing the group was to further his own research. Faced with bankruptcy or reorganization, the Board of Governors forced Brown's resignation the next day and appointed former Marine Major Donald E. Keyhoe, noted UFO author and investigator, as the new director with virtually unlimited powers.

The loss of the helm following the January confrontation was, at the very least, a severe blow to Brown's hopes for Winterhaven—but the work went on. Within a year, he was busily engaged as chief research and development consultant for the Whitehall-Rand Project, a new anti-gravity venture being conducted under the personal auspices of Agnew Bahnson, president of the Bahnson Company of Winston-Salem, North Carolina.

In 1958, believing he had finally generated enough momentum to "go it alone," Townsend Brown organized his own corporation under the name of Rand International Limited, and set himself up as president. Although numerous patents were applied for and granted both in the U.S. and abroad, and in spite of many patiently given demonstrations to interested governmental and corporate groups, success again eluded him.

In the early sixties, Brown did a brief stint as physicist for Electrokinetics Inc., of Bala Cynwyd, Pa. and upon terminating his employment there, went into semi-retirement. Since then, he has lived on in California, quietly pursuing his research in hopes that perhaps someday, with a little luck, the world will notice.

His most recent involvement is with a project housed largely at Stanford Research Institute with additional assistance being provided by the University of California and the Ames Research Center of NASA. The object of the research, details of which are still largely under wraps, is to try to determine what connection there is, if any, between the earth's gravitational field and rock electricity (petroelectricity).

Which, of course, leads us to the prime question of this article: Why indeed has Townsend Brown's impressive life's work gone so seemingly unnoticed for the past three decades? Even today, Brown is still of the opinion that further research into the Biefeld-Brown Effect could lead to a sensational breakthrough in space propulsion methods, not to mention the more domestic variety—if appropriate funding could be made available. Granted, research is expensive, but—is money the real reason for the apparent lack of interest? Perhaps. Or maybe, as Brown himself suggests, the human race is not yet ready to accept a scientific breakthrough that could place man within reach of the stars. ★

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ELECTROKINETIC APPARATUS

by T. Townsend Brown

Excerpts from U.S. Patent Ser. No. 669,830. Filed July 3, 1951.

MY INVENTION OF AN ELECTROKINETIC APPARATUS is virtually a method and apparatus for utilizing electrical potentials in the production of forces for the purpose of causing relative motion between a structure and the surrounding medium.

Priorly, intervening electrokinetic apparatus has been employed to convert electrical energy to mechanical energy and then to convert the mechanical energy to the required force. Except for the insignificantly small forces of electrostatic attraction and repulsion, electrical energy has not been used for the direct production of force and motion.

Since any conversion of energy from one form to another is accompanied by losses due to friction, radiation or conduction of heat, hysteresis, and the like, as well as serious reductions in the availability of the energy by increases in the entropy of the system, it is apparent that great increases in efficiency may be achieved through the use of the direct production of electrical energy and force and motion made possible by my invention. Likewise, the elimination of the machinery for the intermediate conversions results in great savings in first costs, maintenance, weight and space, the latter two being of great importance in self-propelled vehicles including mobile vehicles such as aircraft and spacecraft.

The specific reasons for designing this electrokinetic device are to provide:

1) An apparatus for converting the energy of an electrical potential directly into a mechanical force suitable for causing relative motion between a structure and the surrounding medium.

2) A novel apparatus for converting an electrical potential directly to usable kinetic energy.

3) A novel apparatus for converting electrostatic energy directly into kinetic energy.

4) A vehicle motivated by electrostatic energy without the use of moving parts.

5) A self-propelled vehicle without moving parts.

6) An apparatus for producing relative motion between a structure and the surrounding medium which apparatus includes a pair of electrodes of appropriate form held in fixed spaced relation to each other and immersed in a dielectric medium and oppositely charged.

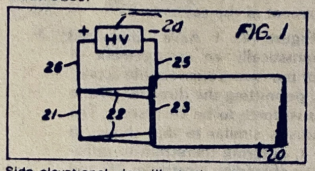
7) Apparatus which includes a body defining one electrode, another separate electrode supported in fixed spaced relation by said body, and a source of high electrical potential connected between the body and the separate electrode.

8) Apparatus having a body which is hollow and a source of potential contained within the body.

9) Apparatus having a body and an electrode connected to the body, which combination comprises a vehicle.

10) Apparatus which comprises a plurality of assemblies, each including a body and an electrode secured in side-by-side spaced relation to each other.

11) Vehicular apparatus which includes a pair of electrically conductive body portions joined by an insulating portion, whereby said electrically conductive portions constitute the electrodes.

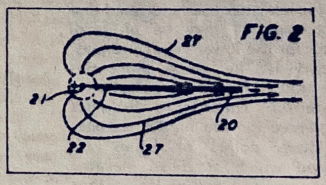


Side elevational view illustrating diagrammatically a simple form of apparatus embodying and functioning in accordance with the principles of my invention.

Referring to the drawings, I have illustrated in Figure 1 a simple form of apparatus which is readily adaptable for use in demonstrating the principles of my invention, and which is utilized in this application as a simplified representation to facilitate an understanding of the principles involved. The apparatus illustrated in Figure 1 constitutes one electrode which is preferably in the form of a body member **20**, said member preferably comprising a relatively thin flat plate. A second electrode **21** in the form of a wire or other suitable form of electrical conductor is held as by means of insulated supports **22** in fixed spaced relation to the body **20**, the wire **21** being disposed in the plane of the body **20** and preferably substantially parallel with a leading edge **23** of the body **20**. A source **24** of high voltage electrical potential is provided and connected as shown at **25** and **26** to the two electrodes **20** and **21**, respectively.

I have discovered that when apparatus of the character just described is immersed in a dielectric medium, as for example, the ordinary air of the atmosphere, there is produced a force tending to move the entire assembly through the medium, and this force is applied in such direction as to tend to move the body **20** toward the leading electrode **21**. This force produces relative motion between the apparatus and the surrounding fluid dielectric. Thus, if the apparatus is held in a fixed position, the dielectric medium is caused to move past the apparatus and to this extent the apparatus may be considered as analogous to a pump or fan. Conversely, if the apparatus is free to move, the relative motion between the medium and the apparatus results in a forward motion of the apparatus, and it is thus seen that the apparatus is a self-propulsive device.

While the phenomenon just described has been observed and its existence confirmed by repeated experiment, the principles involved are not completely understood. It has been determined that the greatest forces are developed when the leading electrode is made positive with respect to the body **20**, and it is accordingly thought that in the immediate vicinity of the electrode **21** where the potential gradient is very high, free electrons are stripped off of the atoms and molecules of the surrounding medium. These electrons migrate to the positive electrode **21** where they are collected. This removal of free electrons leaves the respective atoms and molecules positively charged and such charged atoms and molecules are accordingly repelled from the positive electrode **21** and attracted toward the negative electrode **20**. The paths of movement of these positively charged particles appear to be of the nature represented by the lines **27** in Figure 2.



Plan view of the apparatus shown in **Figure 1.**

It appears that upon reaching or closely approaching the surface of the body **20**, the positively charged atoms and molecules have their positive charges neutralized by the capture of electrons from the body **20** and in many cases, it may be that excess electrons are captured whereby to give such atoms and molecules a negative charge so that they are actually repelled from the body **20**.

It will be appreciated that the mass of each of the individual electrons is approximately one two-thousandths the mass of the hydrogen atom and is accordingly negligible as compared with the mass of the atoms and molecules of the medium from which they are taken. The principal forces involved therefore are the forces involved in moving the charged atoms and molecules from the region of the positive electrode **21** to and beyond the negatively charged body **20**. The force so exerted by the system on those atoms and molecules not only produces a flow of the medium relative to the apparatus, but, of course, results in a like force on the system tending to

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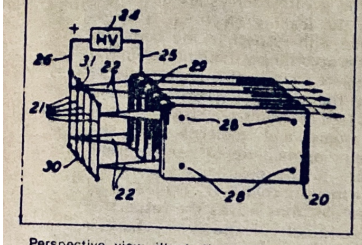
move the entire system in the opposite direction; that is, to the left as viewed in Figure 1 of the drawing.

The above suggested explanation of the mode of operation of the device is supported by observation of the fact that the dimensions and potentials utilized must be adjusted to produce the required electric field and the resulting propulsive force. Actually I have found that the potential gradient must be below that value required to produce a

FIG. 3



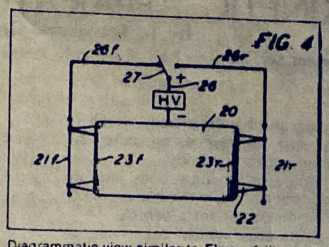
Perspective view illustrating the manner in which a plurality of devices of the character illustrated in **Figure 1** may be interconnected for joint operation.

visible corona since corona is objectionable inasmuch as it represents losses through the radiation of heat, light and molecular charges in the medium.

My experiments have indicated that the electrode **21** may be of small diameter for the lower voltage ranges, i.e. below 125 kv. while above this voltage, rod or hollow pipe electrodes are preferred. These large electrodes are preferred for the higher voltages since sharp points or edges are eliminated which at these elevated potentials would produce losses thus diminishing the thrust. For example, electrodes to be operated at potentials below 125 kv. may be made from small gauge wire only large enough to provide the required mechanical rigidity while electrodes to be operated at potentials above 125 kv. may be hollow pipes or rods having a diameter of ¼ to ½ inch.

In Figure 3, I have illustrated the manner in which a plurality of assemblies, such as are shown in Figure 1, may be interconnected for joint operation. As may be seen from Figure 3, a plurality of such assemblies are placed in spaced side-by-side relation. They may be held fixed in such spaced relation through the use of a plurality of tie rods **28** and interposed spacers (not shown) placed between adjacent plates **20**. The assembly of plates **20** may be electrically interconnected by a bus bar or similar conductor **29** to which the negative lead **25** is connected. In a similar way, the plurality of positive leading electrodes **21** may be held in appropriately spaced relation to each other by fastening their

FIG. 4



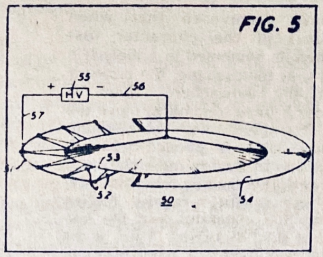
Diagrammatic view similar to **Figure 1** illustrating a modified form of the invention providing a means for reversing the direction of the propulsive force produced.

ends to pairs of bus bars **30** and **31**, to the latter of which the positive lead **26** is connected. The assembly of leading electrodes **21** may be held in spaced relation to the assembly of body members **20** by an appropriate arrangement of the supports **22**.

In Figure 4, I have illustrated diagrammatically an arrangement of parts for producing a reversible action; that is, permitting the direction of the propulsive force to be reversed. The apparatus is similar to that shown in Figure 1, differing therefrom in utilizing a pair of leading electrodes **21***f* and **21***r* spaced by means of spacers **22** from the front and rear edges **23***f* and **23***r* of the body member **20** in a manner similar to that described with reference to the supports **22** in Figure 1. The source **24** of high voltage electrical potential has its negative terminal connected to the body **20** as by means of the aforementioned conductor **25**. The positive terminal is connected as by means of the conductor **26** to the blade **27** of a single-pole, double-throw switch, serving in one position to connect the conductor **26** to a conductor **26***f* which is in turn connected to the forward electrode **21***f* and arranged in its opposite position to connect the conductor **26** to a conductor **26***r* which is in turn connected to the reverse electrode **21***r*.

It will be seen that with the switch **27** in the position shown in Figure 4, the apparatus will operate in the manner described in connection with Figure 1, causing the assembly to move to the left as viewed in Figure 4. By throwing

FIG. 5



Perspective view illustrating diagrammatically a self-propelled device utilizing the principles of this invention.

the switch **27** to the opposite position, the direction of the forces produced are reversed and the device moves to the right as viewed in Figure 4.

In Figure 5, I have illustrated the principles of the invention as embodied in a simple form of mobile vehicle. This device includes a body member **50** which is preferably of the form of a circular disc somewhat thicker in its center than at its edges. The disc **50** constitutes one of the electrodes and is the equivalent of the body member **20** referred to in connection with Figure 1. A leading electrode **51** in the form of a wire or similar small diameter conductor is supported from the body **50** by a plurality of insulating supports **52** in uniform spaced parallel relation to a leading edge portion **53** of the body **50**. A skirt or similar fairing **54** may be carried by the body **50** to round out the entire structure so as to provide a device which is substantially circular in plan. A source of high voltage electrical potential **55** is provided with its negative terminal connected as indicated at **56** to the body **50** and its positive terminal connected as indicated at **57** to the leading electrode **51**.

The device operates in the same manner as the apparatus shown in Figure 1 to produce a force tending to move the entire assembly through the surrounding medium to the left as viewed in Figure 5 of the drawing.

Referring now to Figure 6, there is depicted an illustrative embodiment of this invention in which a pair of mobile vehicles, such as depicted in Figure 5, are shown suspended from the terminals of arm **40**, which arm is supported at its midpoint by a vertical column **41**. High voltage source **55** is shown connected through wires **56** and **57** which extend to the ends of arm **40** by way of suitable rotatable contacts **44** and **45** and brushes **46** and **47** adjacent point **43** in the center of arm **40**. Mobile vehicle **50** is shown suspended from one end of the lever arm **40** by means of conductors **56** and **57**. A similar vehicle **58** is shown suspended from the other end of the rotatable arm of conductors **56** and **57**. It is, of course, understood that these bodies may be suspended by any convenient structure such as wires or rods which wires or rods may support conductors **56** and **57** in any suitable manner.

In this illustrative embodiment the vehicles were caused to rotate at a speed of 17 feet per second with 50 kv. applied to conductors **56** and **57** from source **55**. It is, of course, understood that these figures are merely by way of illustrative example and, as might be expected, the speed of the vehicles increases exponentially with the applied voltage.

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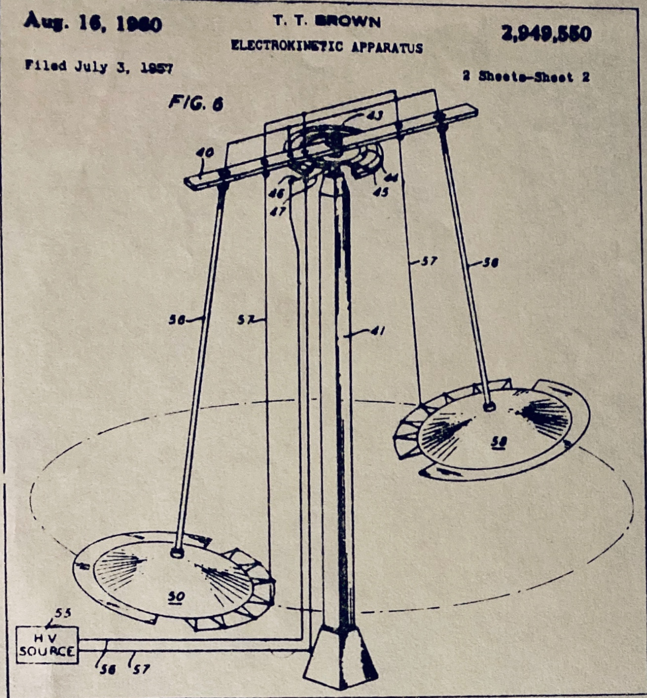
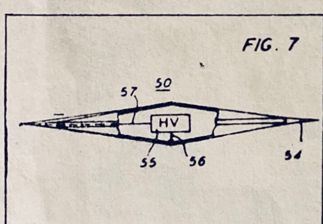


Prospective view of one illustrative embodiment of this invention showing a pair of electrokinetic propulsion devices suspended from a rotatable arm which arm is supported at its midpoint.

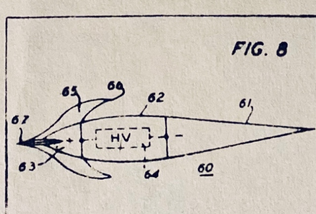


Side elevational view of a mobile vehicle with parts broken away to show the interior construction.

When the apparatus is to be used for propelling a mobile vehicle, it is, of course, necessary that the source 55 of high voltage be contained within and carried by the vehicle. This may be accomplished by using the apparatus in the manner shown in Figure 7, wherein the high voltage source 55 is contained within the hollow central portion of the body 50, the conductor 56 being connected to the body and the conductor 57 being suitably insulated from the body 50 and extended externally thereof and into connection with the leading conductor 51.

The apparatus of my invention may [illegible] propel vehicles of shapes [illegible] described [illegible] connection [illegible] For example, in [illegible] illustrated [illegible]

torpedo-like shape. As is shown in Figure 8, I use a body member which is indicated generally by the reference character 60 and which is formed of three parts, to wit, an afterbody 61 formed of electrically conductive material, a hollow central body portion 62 formed of insulating material, and a nose portion 63 formed of electrically conductive material. A source 64 of high voltage electrical potential is contained within the hollow central body portion 62 and has its terminals connected, respectively, to the nose portion 63 and afterbody portion 61, the positive terminal being preferably



Side elevational view illustrating diagrammatically the arrangement of parts used in an alternative form of mobile vehicle.

the one which is connected to the nose portion [illegible] Thus, the afterbody [illegible] [illegible]

The nose portion 63 may be equipped with a plurality of suitably shaped fins 65. These fins may be extended aft of the junction between the central body 62 and the nose portion 63, as shown at 66, to provide ionizing elements which are spaced more closely to the afterbody 61 and which functions in a manner analogous to the smaller diameter electrode 21. Also, the fins may be shaped to conform to the aerodynamic requirements and may, if desired, be movable in whole or in part for the purpose of permitting the machine to be maneuvered.

I have shown the nose portion 63 as being provided with a needle-like point 67. By using such a nose form, which at present appears to be the best suited for flying speeds approaching or exceeding the speed of sound, I am able to produce an ionization of the atmosphere in the immediate region of this foremost portion of the mobile vehicle. I believe that this ionization facilitates piercing the sonic barrier and minimizes the abruptness with which the transition takes place in passing from subsonic velocities to supersonic velocities.

From the foregoing it will be observed that I have provided an electrokinetic method and apparatus for the production of forces suitable for causing relative motion between a structure and the surrounding medium. It will be observed that the methods and apparatus described herein are particularly adaptable for use as a propulsive means for self-propelled vehicles. I wish to emphasize that the high voltage power source referred to herein may be of relatively simple construction and relatively low capacity. For example, potentials of the order of 30 to 70 thousand volts may be adequate for use with this apparatus, the particular voltage employed dependent, of course, upon the size of the vehicle or apparatus. It will be appreciated that the elimination of moving parts in the apparatus will represent a tremendous saving in first cost and maintenance cost of the apparatus. Also, the direct production of the motive forces from the electrical force represents a high efficiency so that greater propulsive forces and speeds may be obtained with apparatus occupying small space and of light weight.

While I have shown and described various embodiments of my invention, it is appreciated that the principles thereof may be extended to many and varied types of machines and apparatus. The invention therefore is not to be limited to the details illustrated and described herein.