The RMI ROCKET

SINCE 1941—THE FIRST NAME IN ROCKET POWER

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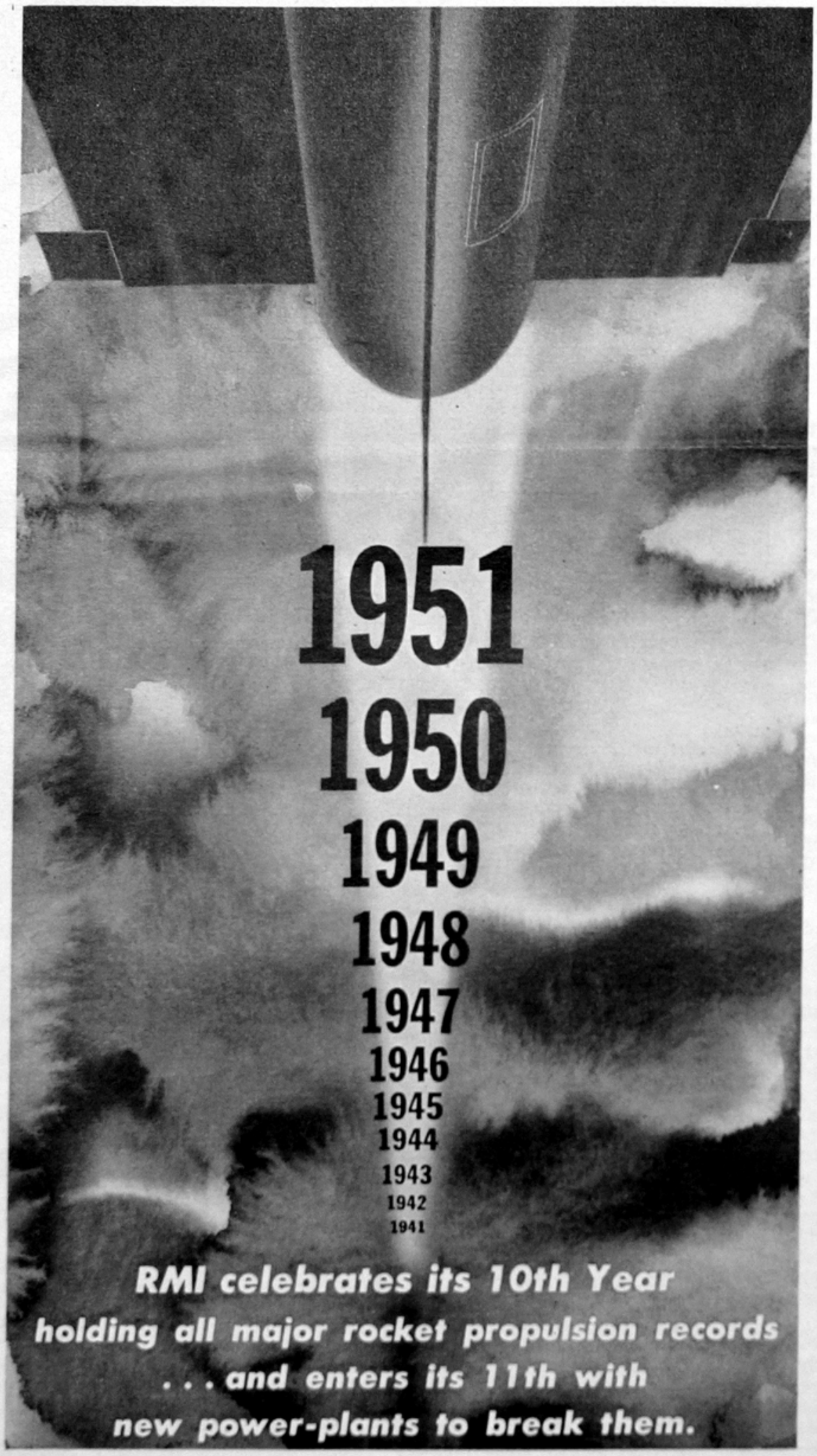
Reaction Motors Celebrates 10th Anniversary

By R. W. YOUNG

In its relatively short span of years RMI has pioneered not only the development of the liquid propellant rocket powerplant, but also has made an outstanding contribution to man's continuing conquest of the air.

Ten years ago supersonic flight in a piloted aircraft was unattainable. No one knew the possibly disastrous effects of passing through the sonic wall on both airplane structure and the pilot himself. R.M.I. played an active part in the solution of this problem in 1947 through the development of the rocket powerplant which provided the thrust necessary to fly the Bell X-1 at supersonic speeds. During this year of 1951, another notable flight achievement was that of the R.M.I. rocket-powered Douglas D-558 airplane which established a new supersonic world's speed and high altitude record.



Spectacular as these accomplishments may be, R.M.I. must not rest on its laurels. We are only at the threshold of the rocket era. There is still much to be done by each one of us to maintain our position and to participate actively in the fields that are open just ahead of us. The application of rocket power to catapult launchers for aircraft; to helicopter propulsion; and to the problem of improving the take-off and landing characteristics of conventional high-speed aircraft opens up an opportunity of far greater potentiality in both military and commercial air transportation than that of supersonic flight alone.

The Navy, the Air Force, and the Army deserve the wholehearted gratitude of R.M.I. for their continuing aid and encouragement. Their confidence in the Company has been its firmest support in the past and merits our efforts to produce even greater accomplishments in the future.

May our own specific impulse increase so that the next ten years will still find R.M.I. a leader in all fields of rocket propulsion!

STAR-SPANGLED RECORD CHALKED UP IN RMI'S TEN YEARS

RMI's history is studded with records and "firsts" — accomplishments climaxed by the shattering of three major world's aviation records in the company's tenth year.

The year 1951 saw the airplane speed record, the airplane altitude record, and the single-stage rocket altitude record fall to aircraft and missiles powered by rocket engines designed and developed by RMI — a performance unique in aviation history.

On July 3, 1951, the Navy announced that on June 11, at Edwards Air Force Base in California's Mojave Desert, the Douglas D-558-2 "Skyrocket" exceeded all airplane speed and altitude records. On August 15, the "Skyrocket" again broke all existing altitude records.

The tremendous power for both of these performances was provided by RMI's famous 6000 pound, four-chamber engine. Although previous flights by the "Skyrocket" had been powered both by the RMI rocket installation and a turbojet unit, for the record-breaking flight the turbojet was removed and the rockets alone provided the total power requirements.

While the heights and speeds attained by the "Skyocket" in its record flights remained secret, the Newark Evening News of August 31 reported "The Associated Press quoted the Los Angeles Times aviation editor as estimating the height reached as 77,674 feet and the speed as more than 1,300 miles per hour".

The powerplant for the "Skyrocket" was developed from another record-breaking RMI engine which, in 1947, powered the "Air Force's Bell X-1 to a new speed mark on history's first flight beyond the sonic barrier. The most significant improvement over the Bell X-1 6,000 pound engine incorporated into the "Skyrocket" powerplant was an RMI developed bi-propellant turbopump which eliminated the need for a large volume of pressurizing gas and permitted the use of light, thin-walled propellant tankage.

On August 7, shortly before the second of the "Skyrocket's" record flights, a third RMI record for 1951 was established when a Martin "Viking", powered by RMI's single chamber 20,000 pound thrust engine, soared to a height of 135 miles after reaching a maximum speed of 4,100 miles per hour. In this flight, it exceeded by 21 miles the previous record for single stage rockets of 114 miles established by a rebuilt German V-2 in 1946.

The unrivaled accomplishment of powering the establishment of three major aviation records in 1951 is a source of pride to RMI, and testifies to its leadership in the rocket industry. In 1951 as in 1941, RMI is "the first name in rocket power".

Hobby Discussion Led to RMI Birth

A hobby discussion by four men in a Jackson Heights, L. I., apartment bears little similarity to an industrial organization claiming some 650 employees, sales in excess of four million dollars, well over a million dollars worth of assets, and several plants.

Yet the connection is direct: out of the hobby discussion grew the conception of an infant business which, ten years later had grown to the RMI of 1951.

The Jackson Heights apartment was the home of Mr. Lovell Lawrence, Jr.; here, in 1940 and early 1941 he met with John Shesta, James H. Wyld, and Franklin Pierce to discuss their common interest in rocketry. From the mid-thirties the four hobbyists had carried on home-workshop experiments in an attempt to produce a practical rocket motor, and by 1938 Mr. James H. Wyld had designed the first regeneratively-cooled, liquid-fueled rocket engine. By 1940 the design had been fabricated into a working model of 100 pounds thrust and fueled by liquid oxygen and alcohol. Sunday afternoons were devoted to testing it in remote New Jersey countryside. The test site was rarely if ever the same, as the earsplitting roar of the engine resulted in a noticeable infrequency of return invitations by landowners.

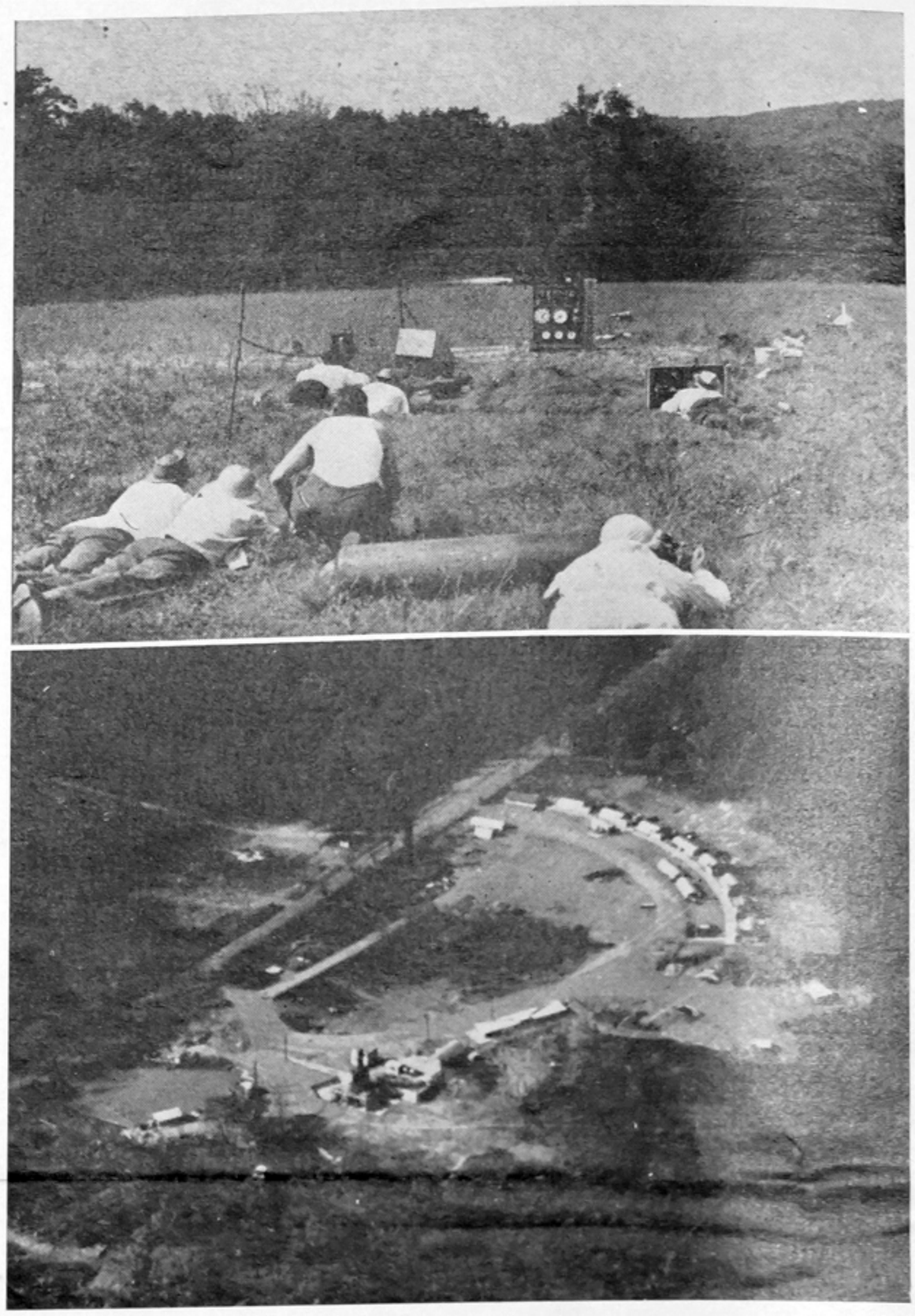
By late 1941 the four rocketteers had become convinced that the device had industrial possibilities, and about the same time the Navy developed a distinct interest in rocket propulsion as a prime mover. In November, 1941 two Bureau of Aeronautics representatives witnessed a test of the engine at Midvale, New Jersey. The roar of the thrust must have impressed the representatives as much as it disturbed the rural tranquility, and a contract was quickly awarded for the development and fabrication of different types of rocket powerplants.

On December 16, 1941, the four rocket enthusiasts incorporated RMI. The tangible assets of the new enterprise were not such as to inspire confidence on the part of investors; they included a lathe, several pieces of machine shop and electronic equipment, a rocket engine and a box of stationery. The utter absence of any cash prevented the occupancy of any really suitable premises and operations were conducted briefly in the basement of Mr. John Shesta's home in North Arlington, New Jersey. Shortly after incorporation, the officer-stockholders borrowed sufficient funds from friends and relatives to finance the lease of a garage in Pompton Lakes and to purchase materials needed to begin operations. With the acquisition of working capital by an advance of contract funds, the new corporation was a going concern.

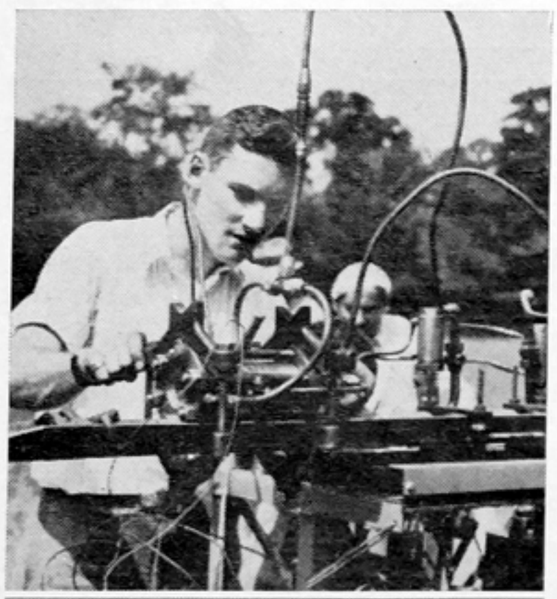
The garage was small — measuring twenty by forty feet — slightly smaller than the quonset huts used for test stand operations in the Test Area today. A part of the building was partitioned off to serve as a combination administrative office and drafting room, while the remainder of the building served as a machine shop and laboratory. In view of the company's limited requirements, the plant was efficient. When one of the four officer-employees received the nucleus of an idea, he reduced it to a design in the office-drafting room, then donned a set of overalls and machined and assembled the unit. When it was completed, he tested it by pointing the proper end out of the back door and firing it into the New Jersey countryside.

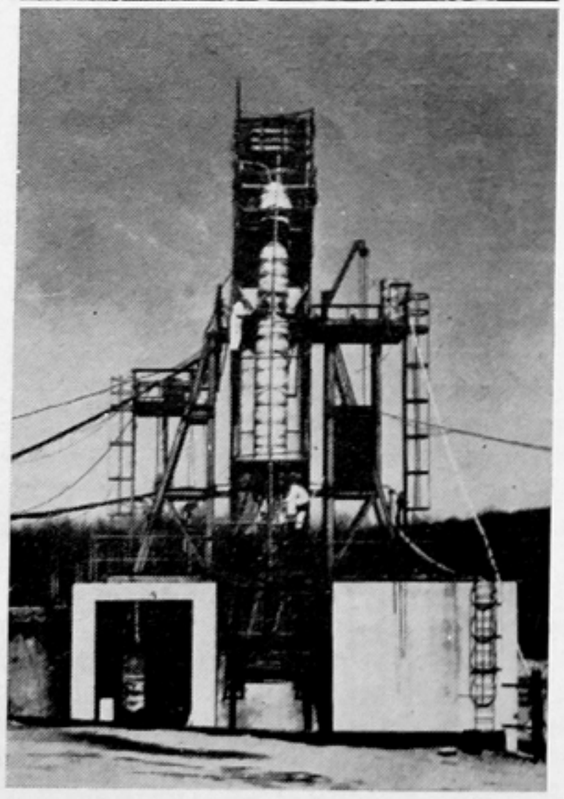
In spite of its limited size and cramped quarters, the company's first year accomplishments were impressive. Working night and day and authorizing themselves only minimum salaries, the four officers designed, produced, and delivered, in nine months, ten different types of engines, ranging in thrust from 100 to 1000 pounds. They completed 1942 with $11,224.46 in new capital equipment and a profit of $632, but with no working capital to finance further operations. By the end of 1942 the payroll had been enlarged by several names, including Bob Lawrence, Lou Arata, Joe Porter, and Les Collins.

The first contract was successfully completed in early 1943. Before this event, however, it had become apparent that the company was outgrowing its garage premises, and in February of 1943, it leased 11,600 square feet of floor space in Pompton Plains. More contracts were accepted and the company continued to grow.



Upper: Sunday afternoon testing operations in 1940 (American Rocket Society). Lower: Test area today.





Upper: Bob Youngquist working on an early project. Lower: Present test stand facilites for Viking.

During 1943, 1944, and 1945, significant new product developments were undertaken. Wartime demands for increased aircraft size, range and load placed emphasis on auxiliary powerplants of the rocket type, and RMI developed a 3000 pound thrust, liquid oxygen-gasoline take-off unit, successfully used on a PBM3C flying boat in January of 1944. This was the first successful large thrust, liquid fueled, assist-take-off unit ever developed.

The use of acid and aniline as fuels offered distinct advantages. They ignite spontaneously, eliminating the need for a separate igniter, and unlike liquid oxygen, they could be stored without evaporation loss. In this period, RMI developed two engines utilizing these fuels, a 400 pound thrust unit for the Navy "Gorgon" guided rocket bomb, and a 620 pound thrust unit—utilizing the "Gorgon" cylinder plus a 220 pound chamber—for the Fairchild "Lark" missile.

During these years the company also carried out work on pulse-jet engines of the German "V-1" type, fabricating a duplicate of this first "buzz bomb" powerplant and several similar units.

Alcohol-liquid oxygen units underwent great development in the years at Pompton Plains. In 1944 the NACA, the Air Forces and the Navy, under heavy pressure to solve aerodynamic problems in very high speed flight, determined to construct experimental supersonic aircraft. Rocket propulsion appeared to be the only available means of obtaining the tremendous required thrust, and RMI designed and produced what is probably the most famous series of rocket engines so far developed — the four-chamber, 6000 pound thrust, alcohol-liquid oxygen engine. The engine was first used in a Bell X-1 in December, 1946, and later made aviation history by propelling the same aircraft through the fearsome sonic barrier.

Immediately after World War II all of the armed services devoted much attention to guided missiles and RMI developed its famous 20,000 pound thrust single chamber unit for use in the Navy "Viking" missile. The company also developed an 8000 pound, four-chamber unit for the Consolidated-Vultee MX-774 missile.

Military applications did not completely monopolize the efforts of the RMI staff. Among

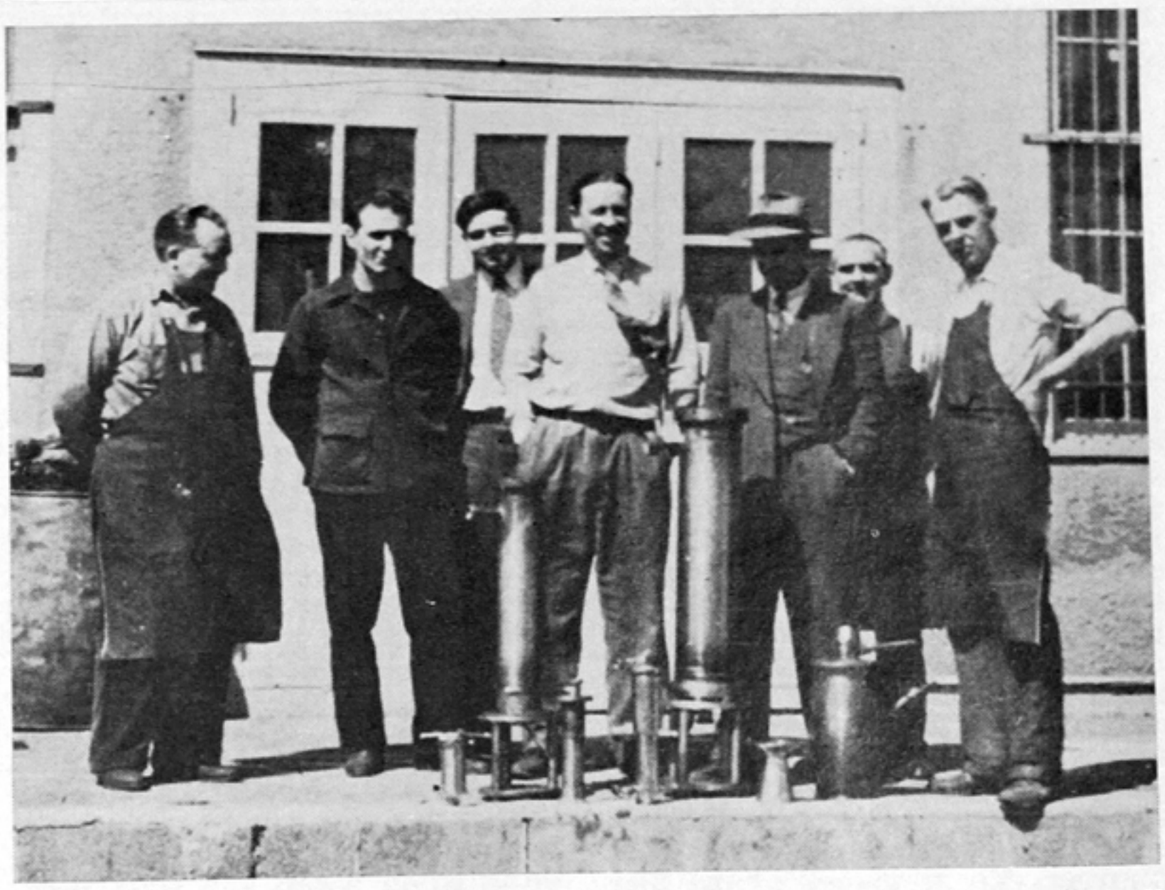
other relatively unconventional applications, thrust chambers were mounted, with varying degrees of success, on rowboats and on a specially constructed iceboat. The latter application was particularly dramatic, the thrust unit accelerating the craft and its intrepid pilot to a breathtaking 70 to 100 miles per hour on the dangerously cramped surface of Lake Hopatcong.

These developments were reflected financially. By the end of 1945 the company had realized a net worth of $30,168.05 and had purchased $44,246.09 in capital equipment. The insatiable need for new equipment prevented any accumulation of working capital, and current requirements for the 1942-45 period were met by demand bank loans and advance payments on contracts.

In spite of careful security provisions, only the stone-deaf residents of Pompton Plains could have been unaware that RMI was "up to something" in the course of developing and testing its new products. The plant was located in close proximity to a state highway and to residential areas, and the test area consisted of an extension to the parking lot adjacent to the plant itself. On occasion the remnants of unsuccessful tests showered the plant building, and in one instance a stuck oxygen valve nearly resulted in disaster. Even in less spectacular test operations, the mere ear-splitting roars of the earlier Sunday-afternoon days had given way to hair-raising blasts. RMI became increasingly non-grata to the residents of Pompton Plains and its unpopularity culminated in a damage suit. The suit was settled some years later, but it had become apparent that the rocket industry would have to develop in more remote sections.

The solution to the problem was completed in mid-1946 by a move to the more spacious and secluded premises on the property of the U. S. Naval Ammunition Depot at Lake Denmark—substantially the same premises as occupied by the Company in that area today. The test area, in particular, was especially well suited to company requirements, being acoustically shielded by wooded hills, secluded, and yet within easy access of major population centers.

The period beginning with the move to Lake Denmark ushered in an attack of acute growing pains. The move was, in the main, dictated by the desire of both the Navy and the company management that the company accept more and larger contracts. These would require more space, more employees, more



Personnel, products, and plant of Pompton Plains days (Lovell Lawrence took the picture).

equipment—and more working capital. Space, employees and equipment were available, but working capital was not. The extent of the company's business expansion — sales had boomed from $49,000 in 1942 to a respectable $900,000 in 1946 — had stretched the puny working capital resources to their limit, and purchases of equipment needed for the execution of new major contracts reduced them well below the level of safety.

From December of 1941 to the end of 1945, the number of employees had increased steadily. However, the total payroll was small, numbering only 55 on December 31, 1945. Beginning in 1946 employment accelerated rapidly, and by mid-1946 had reached 120, climbing to 434 by June, 1947. During this period of rapid employment, every payroll was a major financial crisis, and after they had been met, there was little money left for vendor payments.

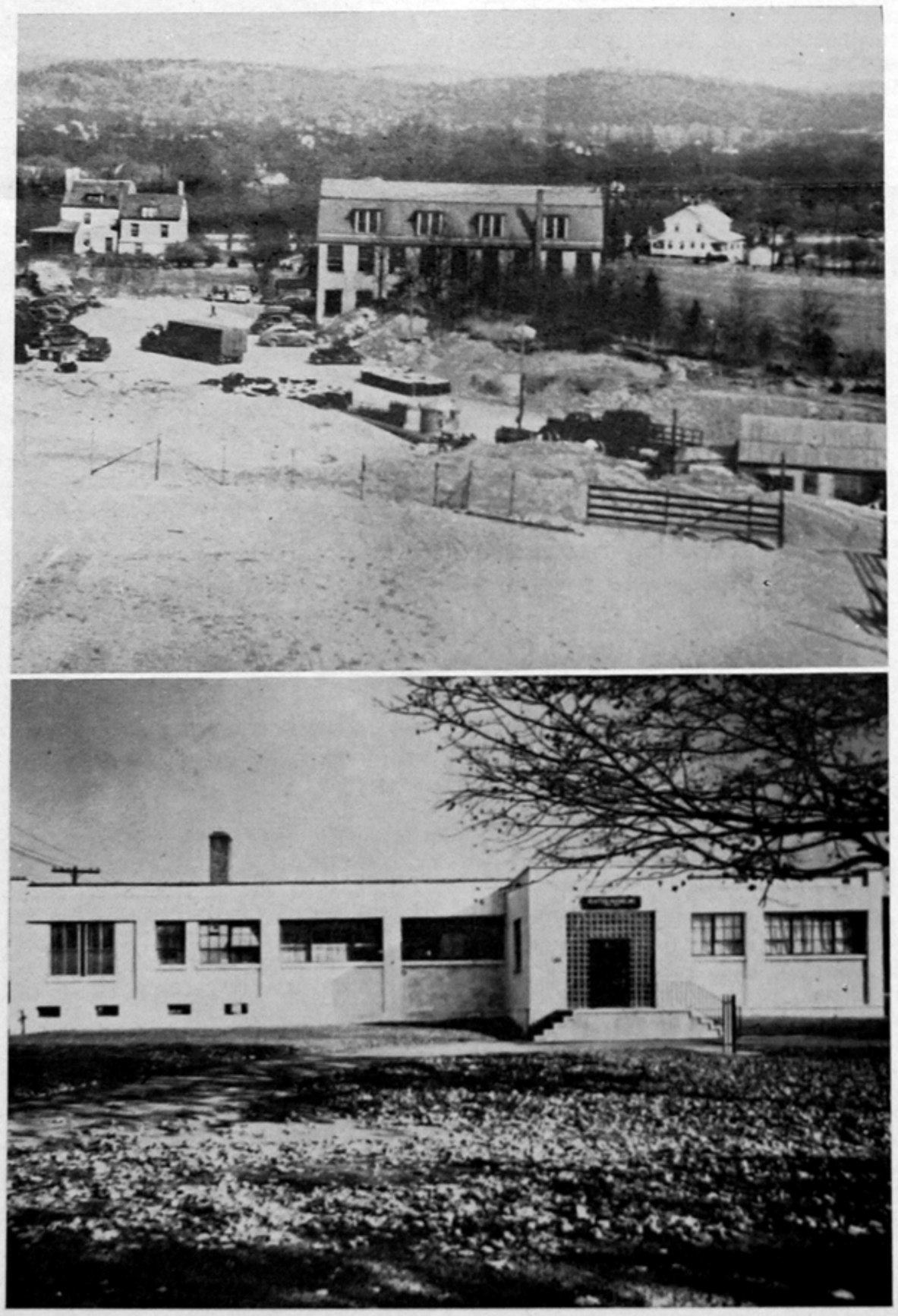
At the same time that payrolls, and purchases of equipment and materials were reaching new, and for those days, dizzy proportions, the Company had undertaken certain contracts on which payments could not be advanced until deliveries were made. Thus, while financial demands increased, capital sources failed to keep pace. Operating losses aggravated the situation. In 1946 the company lost a staggering $117,508 while increasing its total assets from $333,000 to $924,000. The result was that at the year's end it had a net worth of minus $92,787 and a discouraging working capital deficit of $180,367. As FORTUNE magazine (November, 1950) reported, "RMI's books were so frightening that a long series of potential backers took one look and ran."

Fortunately, the Company's technical position was in sharp contrast to the dismal financial condition, and it was probably its excellent technical record that saved it from bankruptcy. Its 6000 pound four-chamber engine had recently propelled the Bell X-1 close to the speed of sound, and development work was progressing rapidly on a turbine-pump revision of the 6000 pound unit, the 20,000 pound "Viking" unit and many other items urgently demanded by the Navy which was growing increasingly concerned over the Company's precarious and worsening financial situation.

By mid-1947 no improvement had been realized. In September 1947, the Company had little money in the bank, none in immediate prospect of realization, and owed creditors approximately $600,000. At that time, Mr. Laurance Rockefeller, after months of investigation and negotiation with the Company Officers, high-ranking Navy personnel, and banking executives, made a debenture loan to the Company and became actively engaged in helping to solve some of the more pressing managerial and administrative problems.

The turning point in the Company's crisis had been reached. New operating and financial plans and policies were adopted, and financial pressure receded. Additional key employees were added to our staff to bolster our executive and administrative strength. In 1947 a profit of $33,000 was earned and the deficit reduced. A profit of $99,000 in 1948 wiped out the deficit and provided net working capital for the first time since 1945. Increased profits in 1949 and 1950 established a healthy Net Worth of almost $700,000 and a Net Working Capital of over $500,000 by the end of 1950.

Despite its financial difficulties, the Company had continued to grow in Personnel, facilities and technical accomplishments. Employment had increased during the financial crisis, rising from 434 in June 1947 to a peak of 473 in 1947 and a level of 465 by the end of 1948. During 1948 a complete job evaluation study was conducted, resulting in the establishment of a complete wage scale system and the elimination of certain wage inequities. A policy of semi-annual salary review was adopted for almost all employees. Improved sickness indemnity and Hospitalization and Surgery insurance were provided and specific policies were adopt-



Upper: Pompton Plains plant; test area is in center, immediately in front of plant. Lower: RMI administration building, 1951.

ed and published concerning sick leave, vacations and overtime.

Technical developments continued at an accelerated rate. The year 1948 saw the Air Force's announcement that the 6000-C4 engine had knifed the Bell X-1 through the sonic wall. Another RMI "First" was scored in the same year when the Consolidated Vultee MX-774 missile made the first successful take-off with an RMI-designed gyro-controlled multi-swivel-cylinder engine. Basic fuel research and advanced rocket design continued and the production of engine spare parts and servicing equipment became important items in the company's backlog.

The year 1949 was marked by a new sales record of $4,245,000 and during the year some 110 new employees joined the Company, bringing the total staff to 576 at the year's end. The increase in business volume and number of employees again began to tax the limits of available space, and emphasized the unsuitability of the Lake Denmark premises for many manufacturing operations. Because of a lack of suitable space to house the necessary specialized equipment, excessive work had had to be subcontracted with resultant delays and expense. Fortunately, the lease negotiations begun in 1948 were completed, and beginning in November 1949, the General Offices and Manufacturing Division were moved to their present locations. The space thus freed at Lake Denmark was rehabilitated for use by the Engineering Division.

Company products continued to make aviation history. The Douglas "Skyrocket", powered by both a turbojet engine and a turbo-pump revision of the 6000 pound thrust engine made its first rocket flights and demonstrated outstanding performance at all altitudes. The first flights of the Martin "Viking" missile, powered by an RMI 20,000 pound thrust engine were made in 1949.

During 1950, sales fell off somewhat, to about $3,500,000 but operations remained profitable. During the early part of 1950, Mr. Raymond W. Young, formerly with Curtiss Wright Corporation, came to RMI as Vice President in charge of Engineering. During the same year, Mr. James H. Wyld, who had been one of the original founders, left on special leave of absence to the Atomic Energy Commission.

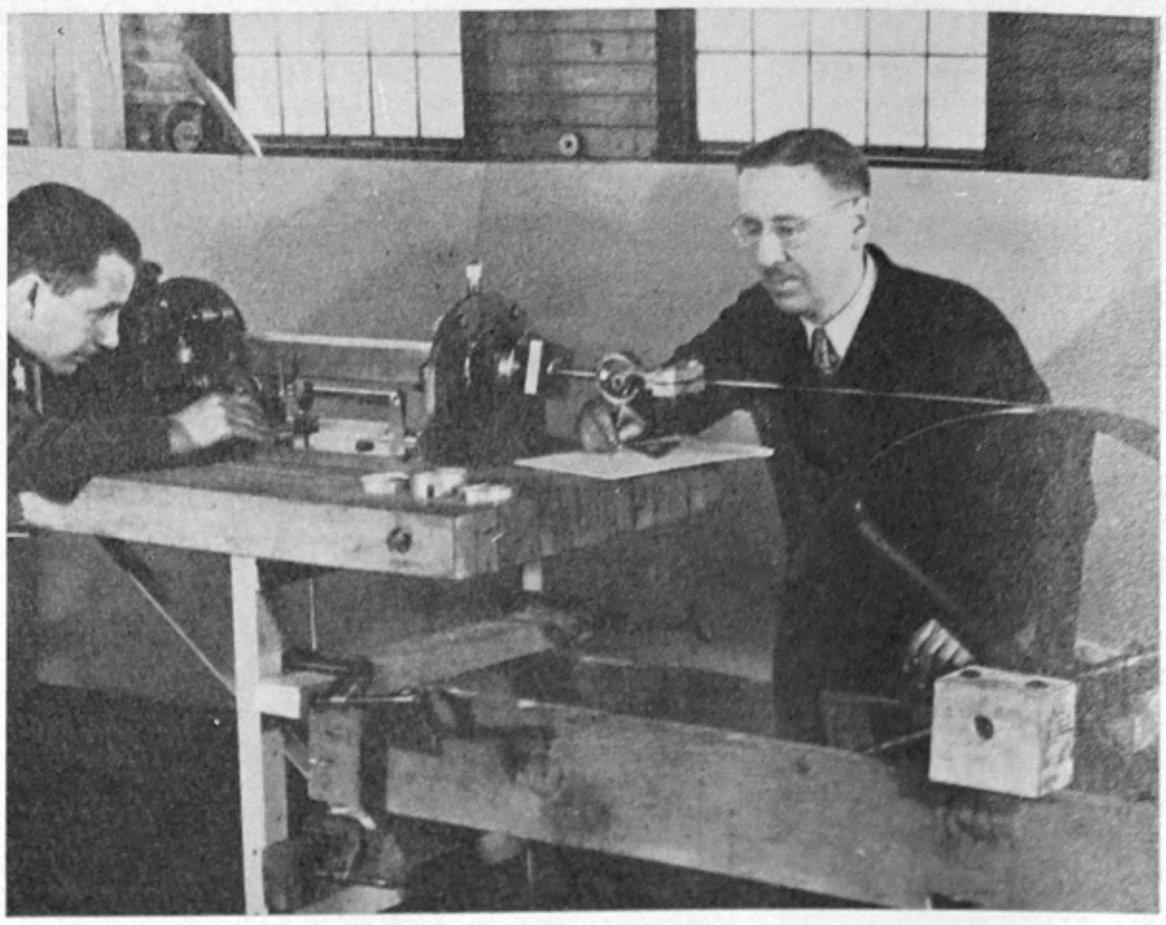
Technically, much of the Company's work in 1950 and 1951 is classified for security reasons. Trials of the "Viking" missiles were continued in 1950 and one, fired from the U.S.S. NORTON SOUND, attained an altitude of over 106 miles. In 1951 RMI products established their new world records, adding to its already impressive list of "firsts". The Douglas "Skyrocket", powered by the RMI 6000 pound turbo-pump engine carried its pilot to an altitude of over 70,000 feet, higher than any human being had ever climbed, and in its descent, shattered speed records by roaring to a velocity estimated at over 1200 miles per hour. On August 7, another altitude record was established when the RMI powered "Viking" missile pierced all altitude ceilings soaring to a dizzy 135 miles.

During 1951 a mounting volume of business resulted in a steady upswing in employment, to the present level of 642—the highest in the Company's ten year history. In March, to accelerate progress on the mounting backlog, the whole Company was placed on a 45-hour work week.

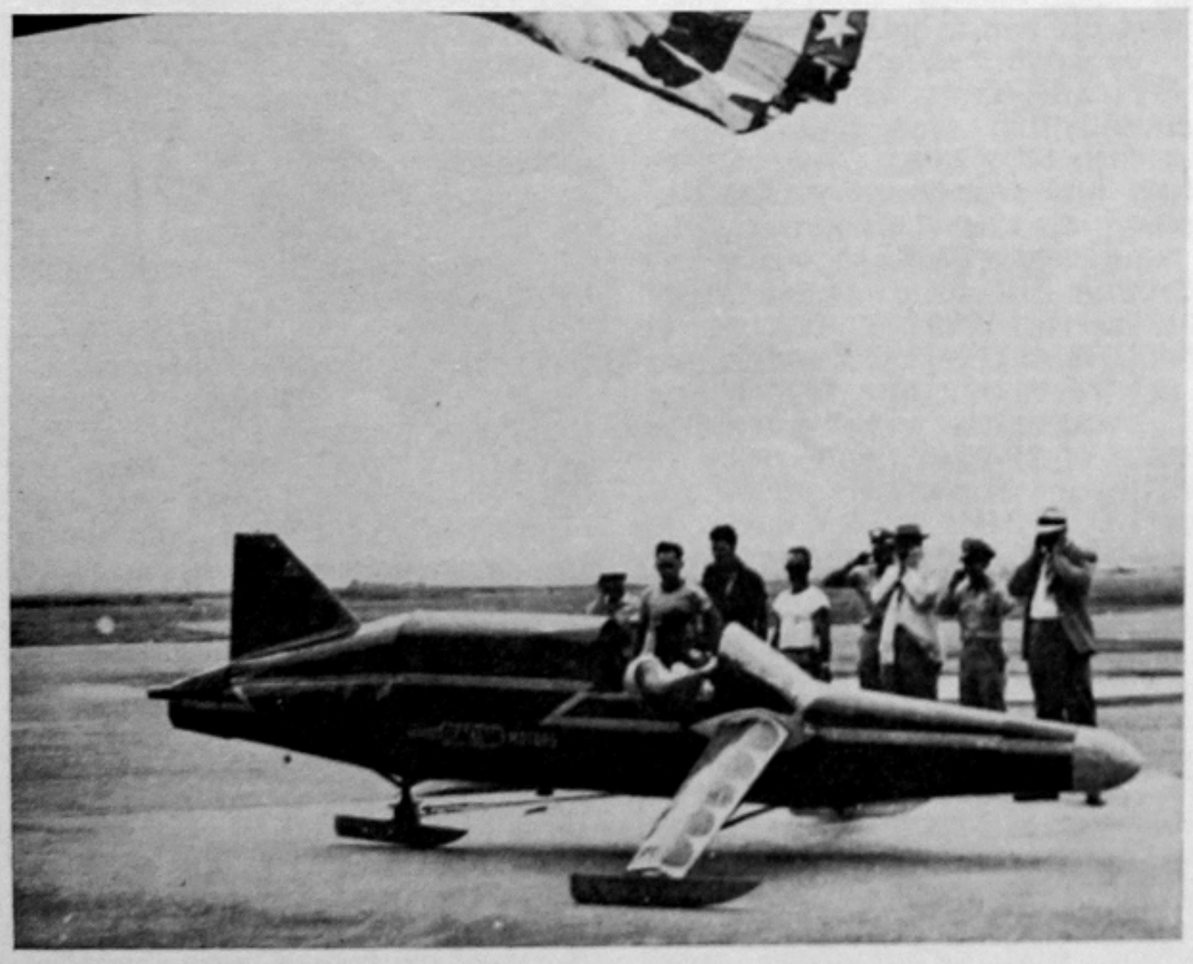
The year 1951 saw the election of Mr. Raymond Young to the Presidency, to succeed Mr. Lovell Lawrence who had accepted the Acting Chairmanship of the Board of Directors. Later in the year, the Company accepted with regret, the resignation of Mr. Lovell Lawrence, who had served the company as president from its Pompton Lakes days to 1951, as Acting Chairman of the board.

At the end of 1951 the Company stands at the strongest position in its ten year history. It is soundly financed and possessed of an impressive depth of personnel resources — executive, administrative and technical; its product developments are spectacular and it has accumulated a considerable backlog.

Reviewing the progress of RMI from its beginning to its present position, we are reminded that RMI only ten short years ago, was a nebulous vision in the minds of its founders. They risked security, credit and property on their faith that the vision could be brought to reality. As the outgrowth of their courage and their enterprise, the realization of their vision has begun—but only begun; the future presents all of us with the opportunity and the responsibility to bring it to completion.



Messrs. Pierce and Shesta at work on a project in Pompton Lakes



Rocket iceboat on Lake Hopatcong.

RMI in Major Role in Rocket Society

For many of you this is the first issue of the ROCKET, and perhaps the first detailed information about the American Rocket Society In that light a brief historical note is in order.

The Society started in 1931 under the nebulous name of the American Interplanetary Society with only a handful of so-called dreamers. Shortly thereafter some other men who recognized the practical aspects of rockets, joined the society. Among them were John Shesta and Jack Pierce who built some of the first liquid rockets in this country. Soon Jimmy Wyld and Lovell Lawrence were to follow and make further contributions. It is quite significant that these pioneers should have also pioneered Reaction Motors, one of the country's leading rocket companies.

RMI men have contributed greatly towards the furtherance of the Society, not only in the past but even today. The same men were early presidents of the Society, Bob Youngquist has been editor of the Journal, Paul Winternitz is Vice-President of the N. Y. Section, and Frank Coss is a board member in his second term and Secretary of the N. Y. Section. Total RMI membership is over forty.

Interest in the society is rapidly growing with many new members from RMI, other rocket and jet manufacturers, and from many allied industries. It is not generally known that membership is not restricted to only technical people, but includes anyone in related industries who are whole-heartedly interested in the field of jet propulsion. Many non-technical people here at RMI are members.

The programs at the meetings seldom run along a purely technical vein, mainly because of security regulations. Films on missile and airplane flights and on interesting ground operations are often shown. The meetings are held in the evening on the third Friday of each month at the Engineering Societies Building at 29 West 39th Street, New York. Guests are always welcome. The social aspect is covered nicely at the coffee and doughnut session after the meetings at which time many interesting ideas are exchanged with men from other companies. At the January 18th meeting Dr. Marcel Golay, Chief Scientist of the Army Signal Corps Engineering Laboratory will give a talk on "Riding Radar to the Moon".

All those interested in joining should see Frank Coss who has the details and the application blanks.

O'Brien's Article Describes RMI Budget Control System

Mr. William O'Brien recently presented a manuscript to the National Association of Cost Accountants entitled "The Development of a Budgetary Control System for a Research and Development Operation". This is a case study of RMI's budget control system and will be published in the February issue of the NACA bulletin.

The Manuscript received one of the highest point ratings ever given by NACA; and Mr. O'Brien is in line for the Lybrand Trophy, awarded annually for the best manuscript submitted to the association.

Why not go out on a limb? Isn't that where the fruit is?

"Wanted—Man to manage Accounting Department in charge of 20 girls. Must like figures."

Reminiscences of a Decade

The purpose of this issue is to pay homage to RMI's ten years of progress. In this connection, acknowledgements are due to the six men who are entering their tenth year with the Company. Each of them was asked to reminisce on the "good old days". The following are the events they thought might be of interest to us.

"The Chesapeake Fiasco"

I have already written two articles which appeared in the June and July 1950 issues of THE ROCKET, dealing with one of this company's first important projects, namely the development of the 3000 pound thrust oxygen-gasoline rocket engine for a PBM Flying Boat.

There was not enough space, however, to give any more than a very terse and brief outline of the development phase of the engine in those articles. So, naturally, when our Editor asked me to write something for the

John Shesta

anniversary number about the "good old days", I eagerly seized upon the golden opportunity to tell you more about this interesting project.

As I mentioned in those other articles, (quod vide) our contract required an official of the Company to be on board for every test flight, just to make sure nothing would fall apart. Believe me, the prospect was not a pleasant one. I had seen too many of those motors blow up on the test stand because of hard starts or other idiosyncrasies and ailments that rocket engines are subject to. These hard starts are somewhat disconcerting even when viewed from behind a massive concrete bulkhead, but what a hard start would do to a plane, I shuddered to think.

Still, there it was, the fateful moment had arrived. The plane was on the ramp, the engine all checked out and ready to go on that cold morning in January of 1944. Whether we liked it or not, this was no time for quibbling, we had to do or die.

Lovell Lawrence and I took alternate days to go up. It is pleasant to look back upon this phase of the work. One thinks of it now as a glamorous adventure, but in those days it was not quite so amusing. You see, knowing we had to fly made a difference. We dismantled the assembly every night and put it back together again in readiness for the next morning. So far as we could, we left nothing to chance.

I remember the icy winds blowing off Chesapeake Bay, numbing our hands as we removed sixteen stubborn bolts, which had been carefully tightened the night before. Of course, standing on wobbling soap boxes so that we could reach the tail of the plane didn't make the operation any easier. In all sorts of weather we fumbled with wrenches and bolts in order to remove the rocket motor. When we finally got it off, we took it into the hanger to make a complete inspection. After satisfying ourselves that the rocket would not explode in mid-air the next day, we began the gruelling job of replacing the motor while bracing ourselves against the wintry gales.

Nevertheless, I still had an empty cold feeling in my stomach when I climbed aboard for a test flight. Captain Gore, the pilot of the ship, gave me my final instructions. They were not too encouraging. "Remove your life jacket and sweater", he said, "because you will never get through this porthole with all that gear on you. If anything goes wrong you dive out of the porthole, but remember — keep your head down, otherwise the propellers will chop it up." The idea of a cold water bath did not appeal to me at all. However, as things turned out, I never had occasion to put my diving ability to the test.

I shall never forget the wonderful sense of relief I always had when the plane finally came in for a landing, especially on Fridays, when I knew the next flight would not be until Tuesday and I had a three-day reprieve. That would be an occasion for a real celebration at the local pub, where we would foregather and rehash our experiences and impressions far into the night.

We had been pretty lucky all the way through the program and the test results were so good that the Navy arranged a grand demonstration as a fitting finale to so successful a project. Admirals and other dignitaries turned out in force.

The day dawned clear and beautiful — the plane was in readiness on the platform for the static run, and all the personnel were ready to perform at their top notch level. Finally the zero hour arrived and the engine was turned on. But alas, as often happens in such cases, something had to go wrong at the last moment. Instead of the usual clean cut jet, great billowing flames of raw gasoline came out of the engine. The oxygen was not feeding! Struggle as we might, we could not get the thing to work. Finally, we had to give up. The demonstration was a complete fiasco.

I suppose we were getting just a little too cocky and nature conspired to take us down a peg. In our daily inspection of the engine we had never checked the emergency oxygen valve. It was located in the bowels of the ship and was too difficult to get at. Salt water corrosion caused it to fill up with sticky goo, and it finally got stuck up good and solid.

Embarrassing though it was, it did not affect the contract because we had already completed the required tests. But, it did teach us a lesson — not to take anything for granted — regardless of how minor the part might be.

—By John Shesta

The Prehistoric Era of the Regenerative Motor

My rocket career began, in a manner of speaking, sometime in the latter part of 1931, when I bought a copy of David Lasser's "Conquest of Space", one of the earliest American books on rocketry which treated the subject with reasonable technical accuracy. The margins of my college engineering texts for several years afterwards acquired a border of crude sketches of rocket motors, along with designs for airplane motors, pictures of the professors, schemes for 1000 inch telescopes, and all the other doodling of an engineering student bored by dull lectures. It was not till the early spring of 1935, however, that my active days in rocketry really began. A few months earlier I had read an article in the now defunct "New Outlook" by a certain "Ugo Andres" which described some of the work of the American Rocket Society and gave thumbnail sketches of some of its members. This led me to look up the New York office of the American Rocket Society and to meet many of its members, including Ugo Andres (who was none other than G. E. Pendray). Within a matter of a few weeks I was deeply engrossed in the Society's early experimental tests, which consisted at that time in some simple motor tests with a crude portable test stand.

At the same time, I was a senior at Princeton University and together with another student, W. E. Rahm, obtained the use of an office in the basement of the Princeton Astronomical Observatory as a base of operations for some proposed rocket work. (However, we were required not to shoot off rockets inside the building!) Our plans for building a model liquid propellant rocket never advanced beyond the paper stage, however, which was probably just as well; safety measures were just as crude as everything else in those early days, and we probably would have gotten into plenty of trouble.

I cannot now recall where I picked up the idea of cooling a rocket regeneratively; it was not original with me, of course, and one major source of inspiration was the early work of Eugen Saenger at the Vienna Technical College in 1933-1934, which I learned about through a fellow member of the Rocket Society, Peter Van Dresser. A series of old sketches in my files show that I was evolving the idea all through 1936; a sketch in "Astronautics" (now the ARS Journal) of that year even shows that use of both fuel and oxygen as regenerative coolants. Alfred Africano suggested a similar scheme about the same time.

The following year, 1937, I finally began the construction of an experimental model motor. At the time, I lived with two young electrical engineers in a large apartment in Greenwich Village. We were all violent gadgeteers, and had a small workshop fixed up in an old pantry at the back of the apartment, about six feet square. One of my room mates, Robert Adams, had a nine inch South Bend lathe,

James Wyld

which we had attached to long 2 by 4's extending from floor to ceiling for lack of a proper work bench. It was on this machine that my first model regenerative motor, of 100 pounds thrust, was built, mostly in the spring of 1938. The motor was finished by fits and starts, and spent part of the time as an exhibit in the Hayden Planetarium.

At about this same time, a new test stand was under construction by John Shesta — a small portable affair, but greatly improved over the original one of 1935. This stand was finally completed late in the summer of 1938, at the home shop of H. F. Pierce in the Bronx. An impetus to its completion was the "recession" of 1938, thanks to which both John Shesta and myself were out of work and able to devote all our time to rocket projects; however, we had to live on some strange fare meanwhile. I economized by subsisting largely on chop suey and spaghetti, while John experimented with rye bread spread with lard. Generally the bouts of test stand construction required a pail of beer, while a successful test run called for some applejack (for the spectators, not the motor).

The stand was first used in

the fall of 1938 to test a splash plate type of motor with film cooling, designed by H. F. Pierce. My regenerative motor was finally tested in December 1938, along with another one designed by R. C. Truax, at that time still a student at the Naval Academy. The Truax motor failed to operate properly, but my own motor luckily made a successful run of about 10 or 20 seconds without burnout.

This promising start, however, did not lead to much at the time. Both John Shesta and I had run through all our money and had to go back to work — in my case, to a job in the mid west and later to one at Langley Field, Virginia, where I worked on high speed airfoil research during 1939-40. As I had no machine shop facilities, my work was confined to theoretical calculations and design work.

Finally, in the summer of 1940, I returned to New York, working with W. R. Rahm, Jr., in a small electrical business he had meanwhile founded for the manufacturer of hospital electro-medical equipment. I resumed work with Shesta, Pierce and others. During the winter of 1940-41 the old 1938 test stand was refurbished and repaired, and so was my motor.

The summer of 1941 saw an energetic new start on the A.R.S. motor test program, which was now conducted at a site near Wanaque, New Jersey, which Lovell Lawrence, Jr., had unearthed. (A very difficult problem in the early days of rocketry was to find some secluded spot where the tests were not too likely to be ended by the arrival of the local police). Among a number of other motors, my own regenerative design was retested, with very satisfactory results, the running time being as long as 40 seconds.

The darkening war clouds of 1941 led Lovell Lawrence to think that our motor work would be of some interest to the U. S. Government, and sometime early in the fall of that year Lawrence, Pierce, Shesta and myself met to discuss plans for a rocket motor company, which I proposed should be called Reaction Motors, Inc., by analogy with General Motors. The analogy was not very close, as we had scarcely two nickels to rub together, and our plant consisted mostly of half of the upper floor of John Shesta's brother-in-law's garage in North Arlington, New Jersey, which was about as large as a rather spacious outhouse. The organizing conference lasted till late at night, and on driving home I was bedazzled with the most brilliant display of the Aurora Borealis seen in the United States in many years. It can now be finally revealed that this display was undoubtedly in honor of the founding of Reaction Motors, Inc.

Within a few weeks, Lawrence had succeeded in wangling a visit from a U. S. Navy Representative to witness a test run of the regenerative motor — again in a hidden spot in the woods near Wanaque. It was a good run, and he departed quite enthusiastic. Within a few more weeks came Pearl Harbor Day, and in a few more days RMI's first Navy contract. Very soon we were installed in our own shop and working like beavers on our first experimental motors for the Navy. (No large bronze plaque is as yet installed on this edifice, on the main street of Pompton Lakes, N. J. There is, however, a provisional sign on it, which reads: "Pat's Tailor Shop".)

—By James H. Wyld

No. 280 Main Street

If you should stroll along the main street of Pompton Lakes you will find, on the westerly side next to the Public Service Gas Company's Office, a cleaning and pressing store — number 280. In October of 1942 this same store was my first contact with RMI. Passing through the front door you came to the front office and engineering department, and then on to the stock room—machine shop — welding shop, etc.; the whole plant covering about 900 square feet.

I cannot say I was impressed

Les Collins

by the equipment in the shop, in fact I wondered how they managed to turn out the type of work they had with the means on hand.

At that time a 60 pound thrust motor was the project on hand and a 1000 pound unit was being developed, as well as equipment and tankage for the test stand which was located about six miles away, at Franklin Lakes.

I well remember two of my first assignments at RMI — one was making an injector for the 1000 pound unit out of a piece of about four inch stainless on an Atlas Lathe. (This same lathe is now in the Manufacturing Division for layout of helix on the small units.) What a job trying to drill a 1¼ inch hole through; it just would not pull. The other job was welding up the head end of a 1000 pound unit. Although I had plenty of experience before on electric welders, I had never run across such a specimen as we had to use, it had a very business-like appearance on the outside, but inside — wow — how that gadget could throw weld splatter around everywhere except the joint. Finally we managed to get it made and all the leaks stopped.

Now off to Franklin Lakes to test. There were none of the elaborate set ups we have today such as recording instruments, etc. We had regular pressure gauges and manometers which were photographed by movie cameras during runs. (Occasionally Mr. Wyld, our Photographer, would forget to push the button!)

There was one test run I remember; some gold braid visitors were due to witness the test, and at zero hour it was discovered that Air Reduction had filled our ox tanks with liquid nitrogen. You should have seen Mr. Lawrence head down the road a couple of miles to a telephone, he sure got action. The liquid oxygen arrived in short order and the test went off satisfactorily.

After the tests, all the equipment had to be manhandled back into the test house or loaded into the truck for the return to the shop. We had only one set of tools then, so could not leave any behind as they might be needed in the shop.

In January 1943 we moved into our new plant at Pompton Plains, a three-story frame building. The siding was such that the owners had stucco coated the whole outside. This building had started life as a silverware factory in the late 1800's; after the death of its owner, it had remained empty for years, and then it was reopened as a night club (The Silver Circle). When RMI took possession, parts of the bar and kitchen were still in place.

During the move a couple of us were working on a hot rush job in the old shop, on the only bench left in the place. All around us machines and stock were being moved out, finally the bench had to go as it was getting to the last load, so into the truck and off it went to Pompton Plains.

The move went off very smoothly and all hands were in there pitching. There were the President, Vice President, Treasurer, Secretary, and Foreman, and all the other employees (three), wiring up machines, moving equipment into place, drilling holes in concrete, setting up the engineering department and stock room. By Monday, January 17, 1943, the new plant was all ready to go.

Things went along smoothly for a while until one day the heating boiler decided to backfire. Down came the smoke stack and its contents found their way through a ventilating grill into the drafting room—enough said.

That's all for this time. When we celebrate our twentieth anniversary I hope to be able to give a brief resume of our move from Pompton Plains to Lake Denmark.

Excursion into Rocketry

—By Leslie Collins

Long before I became the first employee of Reaction Motors, in June of 1942, (excluding the four founders of the Company) and before the inception of the corporation in December, 1941, I recall my first excursion into the realm of rocketry.

John Shesta drove up to our house in Pompton Lakes one sunny Sunday morning in August and was greeted enthusiastically by Mr. Lovell Lawrence who asked, "John, did you bring the liquid oxygen?" Mr. Shesta replied, "yes, but some of it boiled away while driving." Frank Pierce then appeared on the scene and proceeded to remove a bulky container of liquid oxygen from the front seat of Mr. Shesta's Ford coupe. A slight hissing noise was heard as the container was dragged along the ground evoking a remark from Mr. Shesta, "Frank, please be careful, we haven't much left for the test." Upon inquiry I learned that Mr. Shesta had driven somewhat fast over a bumpy road during his trip which caused certain quantities of liquid oxygen to escape.

It seems that Mr. Shesta wanted to acquaint a passenger (a local policeman who asked for a ride) with the properties of liquid oxygen. The orientation was very effective because as

Robert Lawrence

the "boil off" increased Mr. Shesta began explaining briefly the explosive nature of liquid oxygen. The policeman decided that he had traveled as far as he wanted to go (although he was two townships away from his destination) and hastily got out of the car when it stopped for a traffic light. He offered no explanation for his sudden departure.

Nevertheless, there was enough liquid oxygen left for one of the many week-end runs with the original 100 pound thrust engine which was designed, developed, and fabricated by Messrs. Lawrence, Shesta, Wyld, and Pierce in their spare time. These tests were conducted with a portable test rig which was loaded in a trailer and transported to various local areas (whenever local officials unwittingly gave prior approval). Because of the noise, a particular area could be counted on for one test only. It was expected that disturbances would result from testing operations, but certain incidents which happened after the company established its headquarters in Pompton Lakes, Franklin Lakes, and Pompton Plains were not exactly anticipated.

When tests were scheduled at

Franklin Lakes, where the Company had constructed a permanent test stand, the shop was closed and everyone, including the office force (consisting of myself), went to witness the runs. The first test run there, and the events leading up to it, are certainly worthy of mention because they caused an unusual amount of disturbance.

After the Company was formed and received its first contract from the Bureau of Aeronautics, it was necessary that a test stand be constructed immediately. It was difficult to locate a suitable site within the immediate vicinity. Mr. Lovell Lawrence approached the owner of the Franklin Lakes Airport who agreed to sub-let a small area located within the boundaries of the airport property. Time was of the essence in constructing the stand so the formalities of a written lease and the securing of township approval to run tests was dispensed with. The stand was completed in a very short time and preparations were made for the first test. I believe the engine tested was the newly developed 300 pound rocket. At any rate, the test was run under conditions that produced the loudest and most inspiring sounds ever heard in that area. Calls were received by the State Police reporting the crash of B-17 airplanes in the vicinity, and the occupants of nearby houses reported earth tremors. It took a considerable amount of time to convince everyone that an engine which you could hold in one hand was responsible for the noise. The town council held a special meeting and ordered the Company to desist from further testing. However, after all the facts concerning the work being performed by RMI were disclosed, the Company was allowed to continue their operations.

It is interesting to note that this first contract was awarded as a result of a successful demonstration of the 100 pound engine for Bureau of Aeronautics Representatives prior to the creation of the Company. This contract was on a fixed-price basis and called for successive design, development and testing (to specifications established in advance) of a 100 pound and 1000 pound rocket engine within a period of six months. This contract was successfully completed but it required the fabrication of a new 1000 pound engine within a period of 48 hours to do what seemed to be impossible after the unsuccessful test and blow up of the original engine. I don't think that any of us will ever forget that incident.

Although relatively few of us at the present time can look back over ten years of Reaction Motors history and say, "we were there when . . . ", it won't be long before many others, and I hope many, many, others, will be able to look back and say the same thing about the next ten years.

—By Robert Lawrence

A MODIFICATION OF POLICY: A complete reversal which nobody admits.

How Many Remember?

In an interview with one of the Associate Editors of the ROCKET, Lou Arata recalled some of the things he will remember for a long, long time. We wonder how many other employees will remember . . .

WHEN the President, Vice President, Secretary, Treasurer, Drafting Department and Accounting Department all shared the same office. (It was a smaller room than the present Experimental Shop office.)

WHEN the company had only one telephone to its name (now there's a phone on nearly every desk. Some with buttons, yet.)

WHEN one RMI executive sent an interoffice memo to another member of the staff. (This, Lou thought, was kinda silly, seeing as how they both shared the same desk.)

WHEN all the Engineering Work Order Requests were issued verbally. (The first time Lou suggested that these orders

Lou Arata

be put in writing the Engineering Group thought he had been sitting out in the sun too long.)

WHEN Les Collins, who was Shop Foreman, had to also serve as Chief Guard whenever the "visiting firemen" showed up. (It would do your heart good to see Les don his uniform with pistol and badge, meet the visitors at the door and then highball it back and change to his overalls to take up his duties as Shop Foreman, Oh Brother, talk about a Jekyll and Hyde act!)

WHEN John Shesta was a Designer, Toolmaker, Machinist, Welder, Pressman, Pipe Fitter and Truck Driver (all rolled up in one).

WHEN "Captain" Joe Mollek first became one of us. (He almost didn't get started with us because Lou couldn't get the old broken down door open to let him in.)

WHEN we would test a rocket cylinder in the morning and spend the rest of the afternoon trying to extinguish the fire we started in the surrounding woods. (Everyone from the President down joined the bucket brigade.)

WHEN we tested igniters about fifty feet from the main street of Pompton Lakes. (As you can well imagine this would cause quite a disturbance among passerbys, so half the personnel ran out and joined the crowd and tried to distract their attention, by starting a fight if necessary, while the other half tried to hide the equipment.)

WHEN a whole test stand, including test operators, could all be put in the back of a truck, (a small truck at that).

WHEN a test was conducted on an extremely cold day John Shesta would send out for a coupla quarts of "distilled molasses". (The man picked for this job was usually a guy who could be trusted not to keep too warm on the way back.)

WHEN in the event of a "crash program", we were asked to work at nights, we busted out a few cans of beans, from a supply kept available for just such emergencies, cooked our own supper and went on working. (Couldn't take time to run into town for a regular meal.)

WHEN after each successful run everyone would get together and celebrate.

In spite of, or perhaps because of, the above, the Company has certainly taken great strides in the first ten years of its existence. Perhaps ten years from now Lou will be able to reminisce about how RMI built the engines for man's first rocket trip to the moon.

—By Lou Arata

The Gruesome Task

When asked to relate a tale or two about RMI when it was in its infancy, I always recall the gruesome task, which was generally my honor, of obtaining the necessary raw stock for use in the shop. It usually went something like this:

"An oily slip of paper would be thrust at me by a wild-eyed

Joe Porter

machinist, whose very look spelled emergency! I would grab it from his trembling hand and glance at the hastily scrawled figures. As though I knew exactly what he wanted, I'd take off on the double out the front door of our store, (I mean shop) and with a mighty heave I'd succeed in opening the metal door in the sidewalk. After feeling around for the light switch, which, when found, never failed to give you a hearty if not jolting welcome, I would pick my way down a crumbling flight of cement steps and although a little rattled but still in one piece proceed to spring as far from the last step toward the center of the celler as possible, the water at that point being not quite as deep. After sloshing over to the other side of the room, which contained the raw stock, I would proceed to feel around under the surface until the right size was located, the tolerance ran in most cases plus or minus whatever looked to be the right color. Upon having the prize in hand, I would wade back across the celler, spring to the last step and race up them forgetting (?) to turn off the light switch. After lowering the iron door as quietly as possible, this being equivalent to about a 100 pound bomb going off, would trot into the shop and hand the steel to the machinist, who without a second's delay or an audible thank you, would place same in his machine and proceed to build RMI.

—By Joe Porter

His Dilemma

by Lovell Lawrence

Our thanks to Lovell Lawrence, one of the founders of RMI, for contributing to this 10th anniversary issue.

It was a beautiful summer day when I had finally put enough gadgets together so that I could close my desk, say so-long and go up to the Adirondacks for a vacation. While lazily lying around in the Cocktail Lounge or performing some other equally exerting sport, my mind wandered back to all the wonderful people who were carrying on for me in my absence. As time went on and my vacation was drawing to a close, I started to ponder the first day back at work and to map out a program (of course, not without at least five calls from the office). With such good intentions, what happens? I drive up to the gate and find that as usual I had left my badge on top of the bureau. "Chiefy Graham" reads Section 14 of the Navy Security Manual to me including excerpts of RMI's Security Regulations and promptly dispatched me to the outside parking lot. After directing me to the Security Office he wrote some illegible scrawl on a white piece of paper and said, "Okay, you can go to your office now." He is one of those wonderful people referred to during my vacation days.

My pass didn't do much good except to agitate my already fuming disposition. After saying a smiling good morning and a right turn toward my office, the atoms split. Barricades of old boards were nailed across the door and Jim Reese in all his splendor stood at order arms with an honest to goodness musket (1860 variety) refusing my entrance. I must say that I was in a quandry but I took courage and instructed Mr. Reese to remove his person only to find him with orders directing him to guard the entry. Frantic calls to Chief Graham produced no results except a suggestion to contact Mr. Keller, or perhaps to take it up with the Navy. I finally got in my office and if you have no imagination ask Dave Keller to tell you what I said to him.

Where Liquid Rockets May Lead Us

"The roads you travel so briskly lead out of dim antiquity, and you study the past chiefly because of its bearing on the living present and its promise to the future."—Lieutenant General James G. Harbord, K.C.M.G., D.S.M., LL.D., U. S. Army (Ret.) (1866-1947)

An anniversary is an appropriate time to look back at the past and forward to the future in order to see the present in a broader perspective. On the tenth anniversary of our founding as the pioneer company in liquid rocket engines, let us see where the liquid rocket started and where it may lead us.

THE PAST

The liquid rocket powerplant has been in existence for only some fifty years. For the first four decades of that existence its potentialities went unrecognized except by a handful of dreamers. These enthusiasts saw that the rocket principle offered the only way of achieving soon one of man's oldest dreams—flight through space to the moon and to the planets. Individually and in groups in several countries they set to work studying and experimenting, despite universal ridicule of "rocket schemes". We can be proud that four of these "visionaries" were the founders of our company.

These experimenters all over the world, spending probably less total money for rocket development in the ten years from 1930 to 1940 than is currently being spent per hour, ran successful rocket engines, flew successful rockets and laid down the fundamentals of rocket technology.

THE PRESENT

It was on these fundamentals that the startling rocket developments of World War II were based. The pre-war work brought about recognition of the military potentialities of the rocket unit as a "package of power". With this recognition, sums unbelievable in the 30's were poured by various countries in the 40's into the development of rocket assist units for aircraft, rocket interceptors, winged rocket missiles, and that awesome "revenge weapon" of the Germans, the V-2.

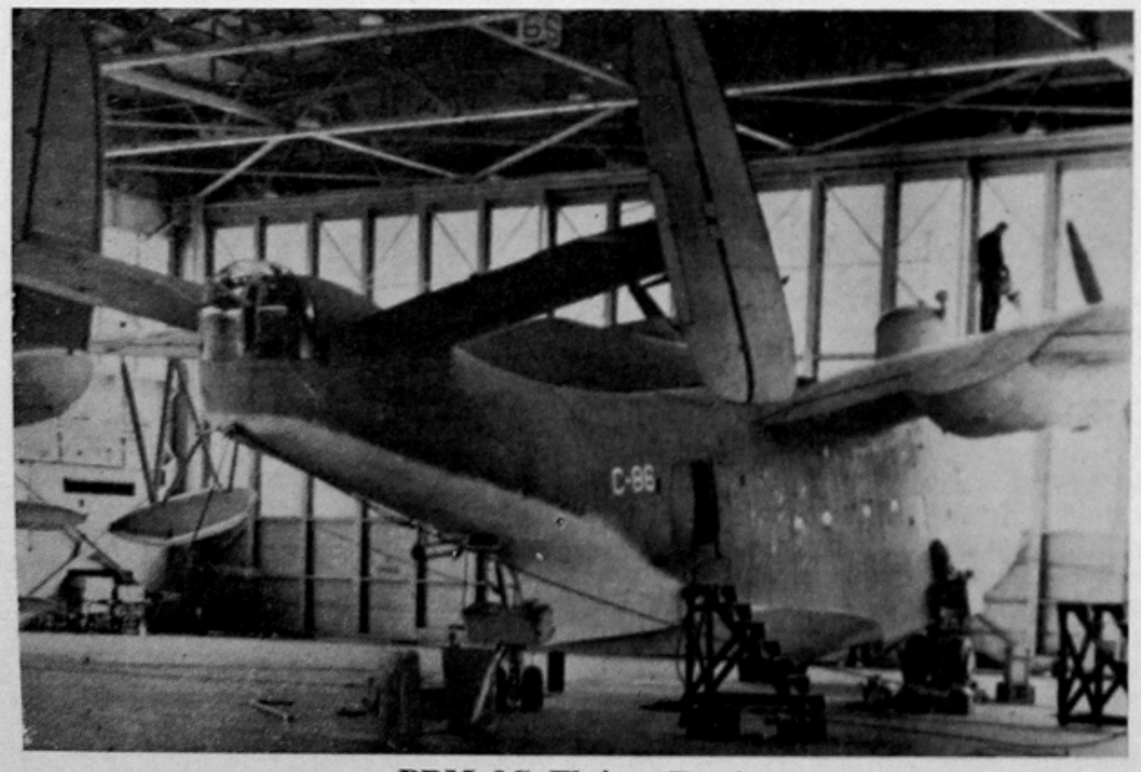
Following the war, effort on military applications of the rocket principle were not only continued but stepped up. We and others are evolving rocket powerplants of higher performance, lighter weight and in many sizes for numerous military needs. Our company's more than ten-fold increase in size since the end of the war typifies this accelerated effort. Obviously, military uses will predominate in the near future, and our efforts will continue to be concentrated on this field. At the same time, our past and current work has brought the rocket art to the point where its peacetime benefits could be examined and in some cases used.

One benefit, not usually recognized although already being used, is the better knowledge of such subjects as heat transfer, materials, combustion and flow of fluids which rocket powerplant research has given to industry. Because the rocket engine thrives on extreme conditions — extremely low and extremely high temperatures, extreme speeds, extreme pressures, and unusual propellants—rocket people have had to learn how to handle these conditions. What they have learned is useful not only to themselves in improving rocket engines, but to others in making better hot water heaters, steam boilers, aircraft coolers, gas turbines and innumerable other modern-day devices as well.

Among other and more intriguing possible peacetime uses of the rocket unit are rocket jets for rock-drilling, rockets jets on airplane wheels for pre-spinning before landing, liquid assist-take-off units for transport and passenger aircraft, and rocket powered or rocket-started helicopters.

An important peacetime use, one in which our 20,000 lb. thrust turbo-rocket engine for the Navy's Viking rocket is already playing a major part, is the carrying of scientific instruments to heights of 30 to 300 miles above the earth's surface. The Viking flights are providing information on weather conditions, cosmic rays, and on the sun's spectrum never before obtainable. It is reasonable to expect that before long, the weatherman will learn how to make accurate long-range weather predictions from this type of information. The tens of millions of dollars which can be saved annually by agriculture and industry when such predictions can be made, will more than justify the routine use of "weather rockets" of the Viking type.

Through the fearsome sonic barrier.



PBM 3C Flying Boat

THE FUTURE

To the dyed-in-the-wool rocket enthusiast, "the future" is synonymous with intercontinental travel, manned and unmanned earth-circling satellite vehicles and moon-rockets, and space-flight craft. This future seems to come closer with each year that passes. In the 1920's we saw Buck Rogers in the 25th century. Today on our television screen (which itself was once a gleam in an enthusiast's eye) we see Jim Corbett, Space Cadet in perhaps the 21st century. Rocketry has progressed in the past ten years to the point where an unmanned orbiting rocket or moon rocket carrying a small payload could be designed, built and fired by 1960. The cost is not unreasonable and the technical know-how is in existence. We at RMI could probably develop the engines in less than six years.

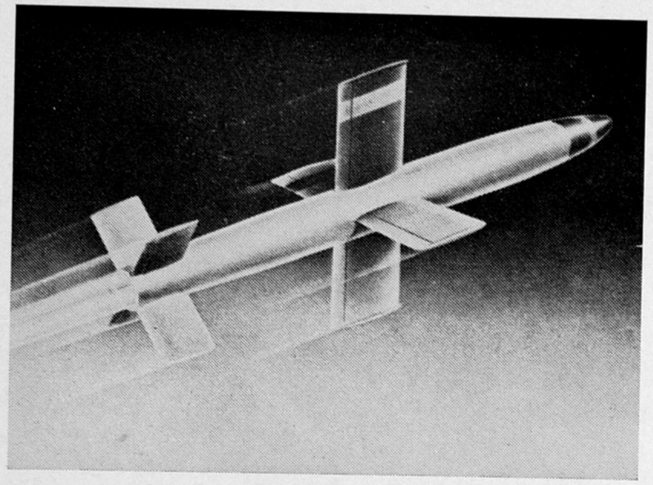
The key to these intercontinental and space vehicles is the use of the "step-rocket" principle. The "Bumper Wac",—consisting of WAC Corporal rocket fired from the nose of a V-2 rocket and reaching an altitude of 250 miles last year, is an example of a two-stage step rocket. A three-stage rocket of good performance could reach the 17,800 mile per hour speed necessary to go into an "orbiting" trajectory around the earth, giving us another "moon". This moon would go over our heads about once an hour, indefinitely. It would need no power to stay in its path since it is literally "falling around the earth".

But the unmanned rocket vehicle is only a trial balloon to the space enthusiast—a way of checking out a few of the problems involved in transporting himself at a speed of two thousand to twenty thousand miles an hour. His real goals are four. One is to go from New York, U.S.A. to New Delhi, India, in a few hours. The second is to set himself up on an earth satellite. The third is to land on the moon and explore it. The fourth, for which he must wait until radically new types of rocket engines are found, is to journey out beyond the moon to other planets.

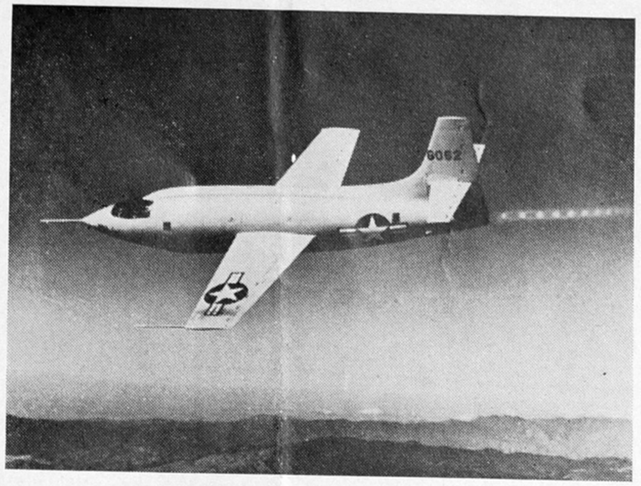
Obviously many problems lie in the path to these goals. Accurate navigation must be provided, techniques for landing smoothly are required. Protection against penetrating rays that are harmful to the human body may be necessary. Food and air supplies must be developed. But it was not too long ago that there was a question as to whether man could live in an airplane traveling faster than sound, or whether radio waves might not be deadly to a radio listener.

Many benefits can be hoped for when these goals are attained. Intercontinental passenger rockets can bring us into more direct contact with others, which is often so important to understanding other countries and other points of view. A scientific space-station above the earth's atmosphere could yield new knowledge of the sun's rays and of their physical, chemical, and biological effects, and new knowledge of the planets and the universe. Both space-stations and moon-stations can provide jumping-off places for travel through the universe.

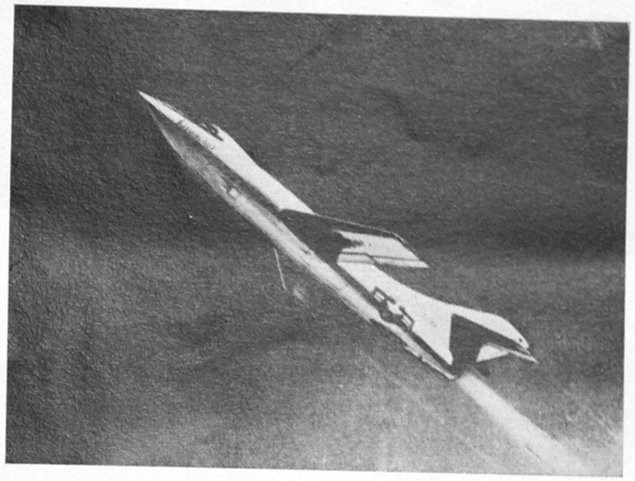
But even if these benefits were only wishful thinking, the real space enthusiast will still strive toward his goal like the rest of us, as he seems to possess a curiosity and a need for physical and spiritual adventure. Luckily, we don't all have to be out-in-the-blue rocketeers to be members of RMI. We can get our adventure, if we like, by knowing that the work we do at our turret lathes, typewriters, and test stands for Project OOO is also the groundwork for the Project Moon or maybe Project Mars!



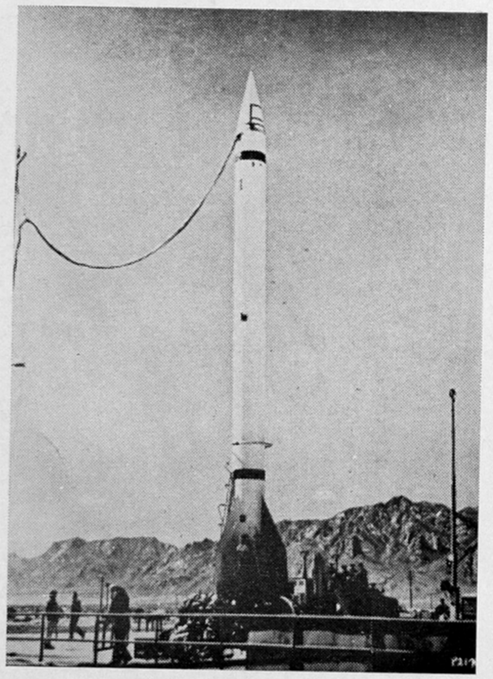
Fairchild "Lark"



Bell X-1



Douglas "Skyrocket"

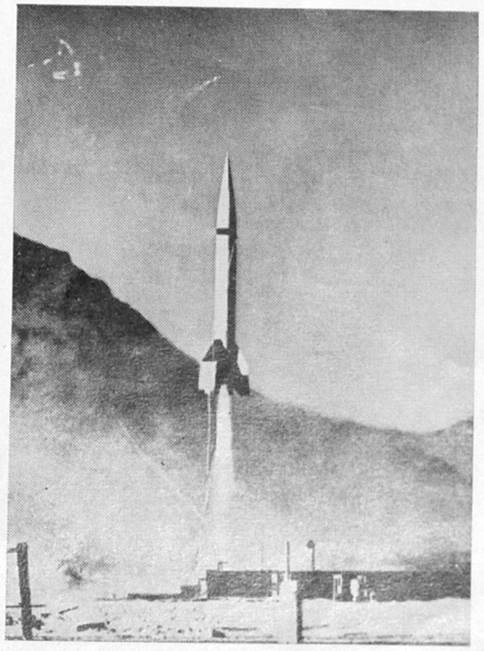


Martin "Viking"

Rocket powered

by

REACTION MOTORS, INC.



Consolidated Vultee MX-774

Research Director Remembers When

By Dr. P. F. Winternitz

For this Tenth Anniversary Issue the old-timers have been asked to make contributions. Now, if it comes to the real old-timers I am certainly not one of them. However, when I came to Reaction Motors in July 1946, which is about when they moved from Pompton Plains to Lake Denmark, there was still much left from the sunny days of childhood. Progress Reports consisted of a couple of sentences. They were concocted with much fantasy by Stan Schmidt from a few words, which he extracted periodically under much grumbling (on our side) about the nuisance of telling him over and over again that "investigations were continued during the report period." The work in the Chemistry Laboratory was considered to be quite obscure and very dangerous. To prove this fact, I one day found on the door to my office a big placard carrying the caption "Caution, Danger! Explosive Area." Looking back I feel that the author may not have referred strictly to dangerous chemical compounds.

Anyway, we used to handle quite a number of new and unknown propellants ourselves, often with some disregard of our personal safety — at least we thought so at the time, although now in retrospect many of our apprehensions appear to have been exaggerated. I remember the time when a company in Pennsylvania was supposed to deliver one pound of a new propellant, which I will call, for security reasons, Violatane (this name should remind you that I do not wish to violate security regulations). We had, of course, measured all the properties of Violatane, such as freezing point, melting point, vapor pressure, and so on. But chemical compounds are peculiar substances —you cannot predict how they will behave by measuring all the physical and chemical properties, just as you cannot foretell how a human being will behave by measuring his size and waist line. So we did not trust Violatane too much, and the other people did in turn not trust us. There was some question about permission to transport Violatane from Pennsylvania (across the state border line) to Lake Denmark;—but the Navy wanted to see tests. In this dilemma it was decided that we would go ahead and pick it up and that the responsibility s h o u l d be shared by the most experienced people in the Research Department (which consisted at that time of four staff members).

One bright Sunday morning, Jimmy Wyld, Dr. Horvitz (the Chief Chemist at that time) and myself set out in the jalopy w h i c h was Reaction Motor's truck, station wagon, and means of transportation for high brass. It had been adapted by taking out the back seats to accommodate a wooden box which contained about 1000 lbs. of dry ice. It was late Fall and there was no heater in the car, and on our way across the Allegheny Mountains we all nearly froze to death. The dry ice, which was very poorly insulated, did not exactly increase the temperature in the car. We arrived about noon at our destination, lifted the cylinder with Violatane with much caution and still more apprehension, into the dry ice box, tied it down carefully with ropes and chains and off we were on our way back, not without missing our way a few times because we wanted to avoid congested roads. Needless to say these back roads were very bumpy and that we halted about every half hour in order to check that our precious Violatane was there. A distinct smell from a leaky valve added to our jitters. But around midnight we arrived safely at Lake Denmark — nobody had caught us and the Violatane was still with us. The cylinder was transferred by means of a crane into a prepared wooden box which also contained lots of dry ice. You can imagine how tired we were — Jimmy was too exhausted to make it back home and slept well into the next afternoon at my place in Dover. Anyway we had our pound of Violatane safely stored—in contrast we think nothing of keeping much larger quantities in the laboratory now. Violatane is even shipped by plane and the ICC seems to trust us—at least in this respect. We recovered very quickly from this trip, but the "station wagon" did not. It soon had to be replaced.

Later on we found out that Violatane was quite easy to handle; it was not exactly as innocent as a violet, but we managed alright and were rather successful with our tests.

I think I will never forget this trip when we hauled the first pound and felt that we were quite dangerous people.

Flash! RMI Outgrows River Rouge

(This article is not endorsed by management, which has enough trouble as it is operating RMI's 1951 establishment.)

On December 18, 1961, more than 70,000 employees will celebrate RMI's twentieth anniversary in a mammoth plant, a mile long and ten city blocks wide.

Fantastic? Not if the slide rule tells the truth and if RMI experiences for the next ten years parallel the phenomenal rate of growth of the past decade. Figure it on your own scratch pad; from December 18, 1941 to this tenth birthday, RMI's working force has increased from a half dozen—including the four founding partners—to its present 650, an increase of over **ten thousand** percent! Apply this rate of growth to the present number of employees; the answer:—70,400 by 1961. This astounding conclusion is confirmed by recalculation on an annual basis. The annual average increase in the working force has been 60%. Continuing this rate into the threshold of the interplanetary era, we find an answer close to the first one: 71,413 employees—enough to split the seams of Yankee Stadium or to fill up a city the size of Portland, Maine.

Applying a corporate yardstick to reveal the significance of this forecast, the RMI of 1961 will rival, in number of employees, such present day industrial titans as Eastman Kodak (69,000) or the Goodyear Tire and Rubber Company (75,000).

This expansion will result from the adoption of RMI powerplants for volume production assemblies as the results of research and engineering work grows to full fruition. Consequently, as RMI shifts its emphasis from research and development to production the manufacturing functions will absorb the largest share of the personnel increase.

To illustrate the magnitude of the expansion, the number of RMI's **production** employees will exceed the total of **all** employees of such nation-wide concerns as Remington Rand or the B. F. Goodrich Company. The Research and Engineering staffs will exceed the **total** payrolls of **both** the Elgin National Watch Company and the Emerson Radio and Phonograph Corporation, while the Sales, Finance and Administration employees will be roughly equal in number to the white collar army employed at the Newark Office of the Prudential Insurance Company of America.

RMI will also have the outsized plant necessary to house this host of employees. Since the days when the ink was fresh on its Certificate of Incorporation, RMI premises have undergone an 8570% expansion in floor space. Projecting this rate into the future, by its twentieth birthday, RMI will have enough space for a production building larger than the famous Ford River Rouge plant, a research and engineering plant larger than the Curtiss-Wright establishment at Caldwell and enough g e n e r a l administrative office space to house a medium sized insurance company.

The production plant will take a major share of facilities space in 1961. The army of production employees will roll Reaction Interstellar rocket engines along assembly lines in a plant larger than the giant Ford River Rouge Plant in Detroit. Following the current architectural trend toward one story buildings, it will occupy an area which, if square, will have sides over half a mile long. By any standards, especially by present RMI standards, the structure will be prodigious. At a normal pace, it will take an hour to walk around the plant and a quarter of an hour to walk from a time clock on one side to a work station on the other.

The Research and Engineering Divisions whose magnificent efforts will have made the whole expansion possible will have undergone a tremendous expansion and the 1961 roster of engineers, scientists and auxiliary personnel will watch their retorts and slip their slide rules in a space larger than the total RMI plant today plus the whole Curtiss-Wright establishment on the Route 6 bottleneck at Caldwell Township.

Meanwhile, the Finance and Administrative employees will compute G & A rates, reject Sick Leave Requests and persuade customers, in an administration building larger than Eastman Kodak's main camera works in Rochester.

The m a m m o t h proportions of RMI, 1961 model, will create severe problems in many areas. Cafeterias and assembly rooms will require more than the total of all present RMI floor space. But cafeterias will have to be decentralized and distributed at s t r a t e g i c points around the plants; without decentralization an employee might spend half his lunch period walking to the cafeteria only to find ten or twelve thousand ahead of him in the serving line.

Such a simple expedient will probably not entirely solve the colossal parking problem. The 70,000 employees will arrive in a minimum of 20,000 automobiles — if automobiles are still current — requiring a parking lot at least 550 yards square. Tail-end Charlie who now drives into the Stickle Avenue lot at 8:01 and rings the time clock at 8:02 will have a strong incentive to change his habits over the next ten years. If he parks in the last space of the 1961 lot at 8:01, he will, unless COM-E-1 is revised in the next decade to provide portal - to - portal pay, lose a half hour's compensation.

The possibilities for elaborating the detail of the 1961 plant are numerous. We may expect in the neighborhood of 15,000 desks, 500 Coca Cola machines, 1200 rest rooms, and bigger and better 1961 model noises from the 1961 model Test Area; but let's not go overboard; it's just a fantasy. However, it is a fantasy of the sliderule, not of pipe dreams. It is no more fantastic a fantasy than the real RMI of 1951 was to the founders in 1941.

Unter den Woolers

It's bin noticen in the engineeren departmenten that many engineersers bin aroundrunnin und upopenin der windowpaners mit huffers und puffers und inletten der chillisch breezers. Der resulten bin der secretaryshers bin incomen to worken mit sweateren uprooten from der wardenrobers. the engineersers bin squealin mit delighters und other departmentem peeplers bin inpeepin de windowpaners mit gogglin eysers. Omit squawken und rashen promisers the secretaryshers bin sayen that if it is much colder becomen they will wearen overcoaters over der s w e a t e r e n to offwarden der chillers und shakers. The engineersers being ofcorsen gentlemeners will no doubten complyen mit de wishers from der weaker sexers und outcutten the upopenin of der windowpaners because they bin realizen how toughen its bin to make mit der shortenhandsers und typerwritin mit overcoaters over der sweateren.

Illen windsers b l o w e n no gooden.

RMI Sports-Conscious from Start

By TOM HARRY

Athletic activities here at RMI have not always presented the full sports calendar we enjoy today. Nor was there the variety of recreational activity now available to those desiring extra curricular conditioners.

Today's sports agenda reflects the expressions and desires of our own personnel throughout the last ten years. In almost every instance, a suggestion or request from a group in the company was directly responsible for some new addition to the year's calendar. And so the list grew to include our present recognized activities.

It was when our Company's founders back in the early days at Pompton Plains first found themselves engaged in completely new industry that our athletic program actually took on a decided, but a yet very unofficial existence. Although engaged in an effort that heralded a vast and unknown industrial potential, these men managed to find diversions from their daily chores. Possibly too, it was this relaxation that made it possible for them to go on to create our products of today.

Early in 1942, it was Les Collins and Walt Myers who, during their lunch hours, "stalked" clay pigeons with the shotgun. On many of these occasions, John Shesta was the third trigger man. And on other occasions at the Franklin Lakes Test Stand, several of the boys, if they thought the local arm of the law wasn't around, just preferred simple target practice with their favorite side-arm. This was at a time when cartridges were not easily obtained and it was not uncommon to see them seeking each ejected shell after firing so that it might be refilled, set with a new primer and used once again.

Lovell Lawrence and Jim Wyld managed to get into these activities occasionally, but Jim, always on the business end of his camera, usually preferred to "shoot" the boys as they took part in their various capers.

Sometimes it was Walt Myers and Lou Arata who would saddle a couple of horses from a nearby stable for a brief canter into these same hills. Some others, probably wiser through bitter experience, preferred to hike up these same trails for their "constitutional".

At other times, it was the Franklin Lakes Test Stand that provided these men with an opportunity to be self-sufficient. It was not at all uncommon to see them huddled around a campfire cooking or heating their lunches on the cold days. A few tried sleighriding and skiing on the slopes as a diversion from their day's work.

It is also whispered about that firefighting was quite a sport in those days, particularly, after a "run" had set fire to some nearby shrubbery, or someone had not properly tended the "grub" fire. This was sport in those days.

Nor was this all. There was the Christmas party in '44 when the office was virtually "remodeled" so everyone could dance; and then the picnic in '45. For the latter, Lou Arata was able to obtain about seventy black market roasters and five precious pounds of butter. To this day, the problem of the three pounds that "melted away" is still unsolved.

Since moving to the Lake Denmark-Rockaway area, our sports calendar has broadened to include a wide variety of popular activities. In all probability, it was Jim Nutt who organized our first recognized sports activity. In December of '46, RMI put its first basketball team on a court in the Dover Industrial Basketball League. This proved to be a successful season and was followed in '47 with a team coached by Tom Waterman, who learned the art at the University of California. Tom coached the boys for two seasons relinquishing the reins to Byron Adams who directed the team in the 49-50 season. Homer Berger offered his services last year, and with Bob Mulligan, Bob Frick, Byron Adams, Don Grish, Bob Ames, Elmer Jerry, Floyd Kimble, Frank Czipo, and Red Gillen (the latter four now in Service) the team managed to finish with the leaders. This year, Bob Ames is directing the boys and it is hoped that the 1951-52 "five" will be worthy of its predecessors.

Some of our older players, finding the pressure of the hardwood boards too much for their wind and their legs, have decided to let the younger boys take over. And so this year, Bob will certainly be glad to hear from anyone who might like to try basketball at RMI.

It was in the spring of '47 that our first softball team, captained by the now "retired" Lou Mizzoni and managed by "Pep" Dondero, entered the Dover Industrial Softball League and won the championship with a 19-5 record. Included on that team were Walt Ehrenberg, Jim Farrell, Hank Jatczak, Tom Manolakos, George Haynes, Doc Kramer, Don Hanley. Fred Cresatella (now in Service), Pat O'Neil, Ed Garbarino, Bill Knuckey, and Al Miller. Except for some minor changes in its lineup, the team has remained intact throughout the past five seasons. Always a contender for the top berth, the team, under George Haynes' direction as manager since 1948, has given a good account of itself. The team won the championship in '47 and '49, finishing second in the last two seasons.

On this year's team, in addition to the first lineup, were Bill Harrison, pitcher, Don Grish, Leon Smith, Frank McAleer, Don Hanley, Don Molloy, Bob Jolly, and Floyd Kimble who left for service on the 27th of November.

Perhaps it will be recalled how, in the '48 campaign, our team had organization difficulties. It was not until the first seven games had been lost that players were recalled from the RMI "farm system". Thus fortified, our boys took the next seventeen games in stride, thereby gaining fourth position in the final standing. Had such a move been made earlier in the season, we surely could have clinched second spot and possibly, even the championship. This last season again saw many good games and it was the close ones we handed away that really cost us the title. But through the years, our league record is deservedly considered the best and we're still the team that must be beaten by any serious contender for the championship.

In the fall of '47, bowling was added to the fast growing calendar. Lou Mizzoni managed to form an eight team league and although only seven completed the season, it was a very encouraging start and certainly a promising indication for the future.

The following year saw a complete reorganization. Sixteen teams rolled on two different nights at the Lake Hiawatha Bowling Alleys, forming the nucleus of today's schedule. (As in the first year, Lou was the high average man. However, the following year, on these same alleys, Ed Weir took high honors.)

Finding the Hiawatha Alleys inadequate for our needs, we were fortunate to obtain the sixteen alleys at O'Dowd's. This was the realization of a long desired accomplishment. It meant all sixteen teams—close to a hundred men— could now bowl together as a single group. Here, Lou Mizzoni came back, and although barely able to qualify, managed to regain the coveted high average score. This year it will take a score in the 170's to gain the title; even the 180's is not a remote possibility. Ed Weir seems to be well back in stride as are Hein, Manolakos, Farrand, Hoetger, O'Neil, Grow, and Haynes. Never before have we seen so many bowling averages in the 160's.

Our young ladies, not to be outdone, organized their own bowling league in '48 with Lillian Jancik and Jean DeMouthe taking high average honors on the Lake Hiawatha Alleys. Their activities for the year were climaxed by a dinner at the Fireside Inn. Betty Ball and Shirley Rarick will testify to its success. This first year saw approximately twenty ladies finish the season, followed by a record of thirty-five the following year. Here again, Lillian Jancik took top honors, edging out Kay Kimble and Betty Ball.

With Marge Becker as league President last year, the girls rolled on the Rainbow Alleys. Betty Ball, Hazel Lange, and Myrtle Stickle took the honors, in that order. The season was brought to a close with a dinner at the Dover Farms Inn attended by the "brass" of RMI as guests of the girls. Perhaps that indicates where the location of power lies.

On the subject of banquets, it has been suggested that a joint affair be planned bringing both leagues together at the season's end.

This year with Shirley Rarick at the helm, there are about thirty-five girls participating and the averages indicate that most of them are starting to **hit the pocket.**

In July of last year, we added another activity—golf. It was Bob Frick, Sam Cowin, Jake Troll and Ray Zuccheri, all ardent golfers, who thought it time we planned a tournament, and it became a reality in July at the Spring Brook Country Club. Twenty-seven participated and Sam Cowin headed the low scores with a 77. The success of the affair served to add golf to the regular sports calendar.

Tournaments were held last May and again in September, each occasion drawing a larger number of our personnel. In May, at the Valley View Country Club, it was our Executive Vice President, Mr. C. W. Newhall, who took first honors, followed by Sam Cowin with a four stroke deficiency. In September, at the Cedar Hill Golf Club in Hanover Myron Wood took the honors with Sam, one stroke behind. The addition of golf to the athletic program has increased employee participation by attracting many devotees of individual sports who otherwise take little part in company activities.

While the athletic program has greatly increased in scope, more sports will no doubt be added as time goes on. For instance, there is considerable interest in tennis and in archery, which seems to attract considerable interest at noon hours under Tom Dalman's guidance. From all reports, Audrey Gordon, Ann Jay, Marion Bawkin, Chuck Dimmick, Doug Matthews and Ray Hopping all enjoy the sport quite regularly. Too bad Tom and Ray weren't more lucky with the broad-heads when they went after deer last month.

Horseshoes, is a favorite sport at RMI. Scattered about our grounds are nine or ten pits that are used by some fifty or more employees each noontime. If pistol or rifle practice attracts your interest, Russ Hellmuth, long a rifle enthusiast, is sure to entend a welcome as will Frank Iwanowsky whose interest is in side-arms when not running his hounds. It was Captain Asserson and John Shesta in '48 who first got several of us together on the indoor range at the Marine Barracks. Shortly after, an RMI team competed with several local police teams and made an excellent showing.

The fishermen—both salt and fresh water varieties — believe that theirs is the way of the outdoors, as do the skiiers, who not only welcome snow, but unlike most rational people, make every effort to be out in it, whenever possible.

Many of us, on the other hand, might enjoy a good hike through the hills or perhaps prefer to spend some physical effort in the garden around the home, as a diversion from the day's regular curriculum. But whatever your choice, you can feel certain it will go a long way toward keeping you fit for the more serious duties that will confront all of us in the future.

TO EXPEDITE: To confound confusion with commotion.

Inside Problems of RMI's Growth

By C. W. NEWHALL

Back on December 16th, 1941, just nine days after the Japs hit Pearl Harbor, "Bun" Lawrence, John Shesta, Jimmy Wyld, and Frank Pierce left a meeting in a New York office building with a brand new certificate of incorporation in their hands and, somewhat hesitatingly, established the first rocket company in the United States. They had worked together in the early days of the American Rocket Society with Jimmy's early one hundred pound engine. With this small piece of hardware in their hands, and the blessings of the U. S. Navy, these pioneers decided to leave their jobs and start the company which now keeps six hundred and forty of us busy. Their first home was an old barn-like structure in Pompton Plains, N. J., where an embryonic machine shop built the company's first engines for sale to the Navy. An expansion at Pompton, together with much testing noise, brought the local population down on the heads of these early pioneers with a sizeable legal suit for disturbing the peace and allegedly cracking much of the plaster in the town.

With the deluge of "V" missiles on London toward the end of the war, the little company really started to come into its own and it soon became evident that larger quarters were a must, and the company, with the help of the Navy, found the old Marine barracks early in 1946, which we now occupy at Lake Denmark. Our present test area started to rise during the latter part of the year and we moved into the new quarters firmly convinced that these quarters were big enough for a long time to come. Then came the people! From the end of the war in Europe up to the financial trouble in 1947, we expanded almost ten-fold. This rapid expansion, together with the starting of many new contracts, brought on our financial trouble, with Mr. Rockefeller and the Navy coming to the rescue.

It wasn't long before these quarters began to look too small and in 1949 we added Rockaway to our rapidly expanding company. Today, in 1951, we find ourselves with no less than twenty-nine separate projects and again we are thinking of a new home. Today we find our company powering the aircraft and missiles which hold most of the world's speed and altitude records in the country. This is indeed a fine record of which we can all be justly proud.

What the future will bring, of course, we do not know. We do know that this industry of ours is in the forefront of aviation development and as aviation progresses it must move toward us, rather than away from us. What this may mean to the future of the company and to all of us depends to a very large extent on our own initiative and ability to keep ahead in this rapidly expanding field. With the continued understanding of the Navy and Air Force, which has helped us so well in the past, we should indeed be able to carry R.M.I.'s standard to an even higher position on the pyramid of achievement.

As the company moves into the future, we must take every advantage that is possible of our past experience to build better engines for the Services. Perhaps, we will find our much desired production in some of the guided missiles of the future, or we may find the interceptors and bombers, which are coming in the next ten years, will need our engines to move their heavy frames off the ground, or again, we may find that our experience with little engines will stand us in good stead as we watch the rapidly growing field of helicopter development. Perhaps, too, high temperatures and pressures that are a part of our everyday operations may lead us to new and interesting fields of chemistry or the processing of new and, as yet, unheard of materials. We must not overlook these fields either. Perhaps some principle, which we are now developing and see only as an application to the wars of the future, may lead us to an outstanding commercial development that will stand us in good stead should the present unfortunate emergency diminish into a peace-time economy.

Today R.M.I. finds itself engaged almost wholly in development, but our wide variety of projects, together with our ten years of experience in a rapidly growing field, should offer much encouragement to the production contrasts that we know will help so much to stabilize the company and provide the foundation for our further growth.

POME

Ten years is much too hoary an age
To be treated with levity, ribaldry or other forms of persiflage
Especially when, according to a statistic
It is characteristic
Of most new business ventures
To flop before the ink is dry on their bond indentures.
Today, a decade old and up in the industry's top rank
With money in the bank
Let's recall that even when it had no credit
Our company never missed a payroll (did it?)
But made the world's best rockets
And the wherewithal to put these birthday paychecks in our pockets.
So leave us heave a sigh of satisfaction
And bend a toasting elbow for Reaction

—Anonymous

RESEARCH WORK: Hunting for the guy who moved the files.

Upper row, left to right: bowling at Lake Hiawatha in 1949; bowling banquet, 1951; bowling awards, 1951. Middle row: our first championship team, 1947; Lovell Lawrence presenting championship award to Pep Dondero; 1949-50 basketball squad. Lower row: girls' bowling banquet, 1951; softball squad, 1951; chow line at RMI picnic, 1950.

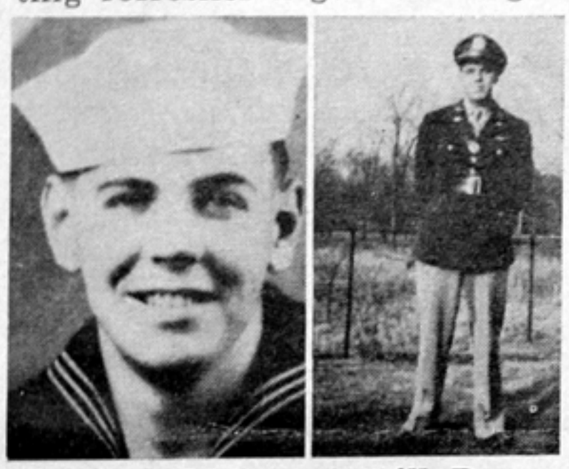
RMI in Uniform

These are just a few of our men in uniform. We know them well from their days with us here at RMI, and now, while away in the Services, they will surely welcome word from us here at

Sam Martin, Bob Jenkins

home. Some we hear from quite regularly. Many on duty, perhaps in Alaska, Germany, Korea, Japan, Austrialia or Turkey, or on the high seas are kept well occupied throughout the day. It is these men we do not hear from as frequently as we would like.

In some recent letters we have learned Chuck Fletcher is getting refresher flight training at



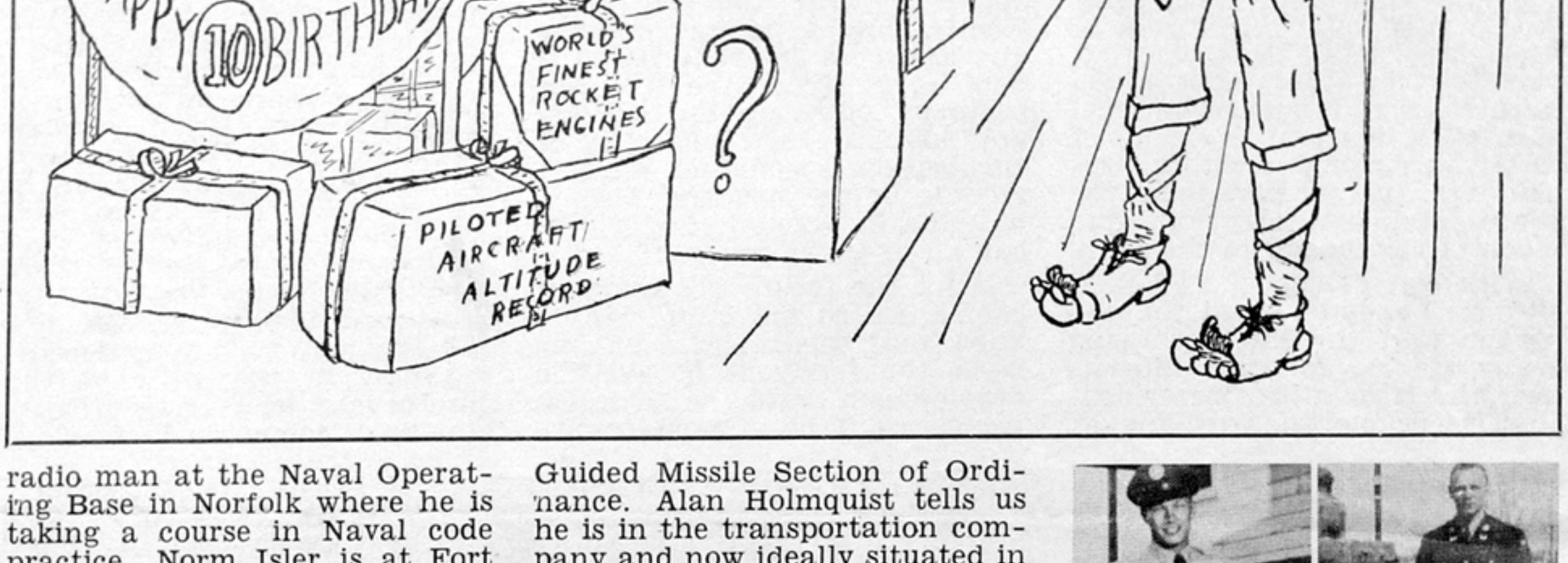
Melvin Redmond, Bill Bone

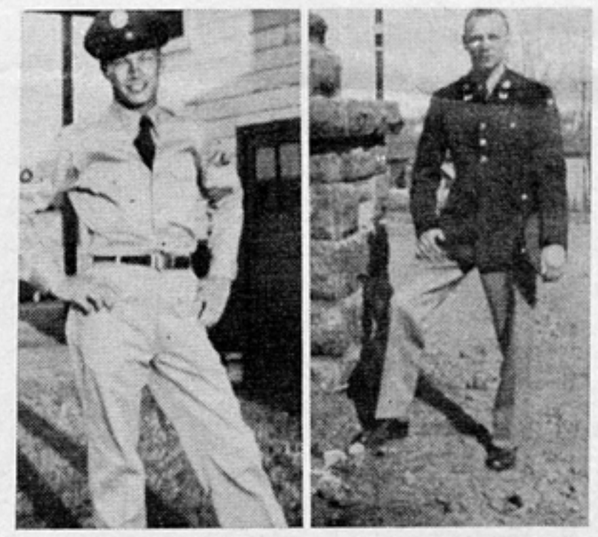
the Naval Air Station in Atlanta. Mel Redmond is fast becoming a radio man at the Naval Operating Base in Norfolk where he is taking a course in Naval code practice. Norm Isler is at Fort Belvoir with a corps of Engineers but expects to transfer to the Guided Missile Section of Ordinance. Alan Holmquist tells us he is in the transportation company and now ideally situated in LaRochelle, France. Gordon Tasker about this time, is completing his course at the Airplane Engine Mechanics School at Shepard Air Force Base in Texas. Warren Mills is located close by at Mitchell Air Field as an Instrument Flight Instructor. Mel Zeisser is getting himself in excellent condition at Fort Leonard Wood in Missouri as he leads some trainees in Infantry Basic Training. Gerald Grogan is attached to the Fleet Air Service Squadron in Jacksonville, Florida doing complete engine build-up with the Navy. Dick

Fletcher, Holmquist, Collins

Collins is with the Army Chemical Center in Maryland. Bill Bone is in Korea with a Fire Fighters unit and our last bit is on Dick Gehrke dated the 17th of November aboard the U.S.S. Franklin D. Roosevelt, somewhere in the Mediterranean Sea. Dick is a SKG2 or as we would know it, a storekeeper on one of our newest aircraft carriers.

This will give you some idea of their activities. They now total twenty-five and it is a list we do not want to see increase. A line or two from we here at the plant would surely provide some holiday cheer. Personnel will gladly supply you with their latest addresses.





Gordon Tasker, Norman Isler

This issue of the "Rocket" is another RMI "First". In commemorating this Tenth Anniversary of Reaction Motors, we have endeavored to paint a historical picture of the first decade of our existence. Today, we are celebrating that occasion.

As you have probably already noticed, we are dressed up for the event. The cafeterias have been specially decorated for the occasion as well as the Service School which will be the scene of a luncheon. Here, the Executives of the Company will honor our "ten year" employees in a manner befitting the day.

You will notice too, that the "Rocket" has been "revised" just a bit. We have tried to make this anniversary issue as interesting as possible so that you and your family will read and enjoy its contents. In these twelve pages you will find much of the Company's activities and accomplishments during these ten years. We have included a photographic record of RMI's major products, its personnel and recreational activities to supplement the articles that have been written. We believe they are of interest, particularly, perhaps, the memoirs of our "ten year men" as they reminisce those early days in Pompton Plains. This all, we feel is part of that ten year period, a very intregal part of our growing up and without it there would be no color.

This copy of the "Rocket" has been given to you in a personally addressed envelope. Included with the issue also, you will notice is an insert which we believe interesting. It pictures our most popular record breaking achievements and surely is something to preserve; perhaps to frame if you wish.

We sincerely hope you will enjoy this issue and that you will cooperate wholeheartedly in the program that has been planned to celebrate this ten year anniversary.

The Rocket

A MONTHLY PAPER
BY AND FOR THE EMPLOYEES
OF REACTION MOTORS

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