

OHIO BRASS MANAGEMENT REPORT

A look through the corn shows truth in "History Tells Which Line Excels"

BY ROGER A. BLACK
CHAIRMAN OF THE BOARD
THE OHIO BRASS COMPANY



The slogan is clearly of Ohio Brass authorship. It appears on an O-B mailing piece, dated 1926, carrying a series of authoritative articles on the EHV lines of that generation which were operating at 230,000 volts. The slogan: "History Tells Which Line Excels."

The piece came to light when one of our power company customers in Texas cleaned out his desk prior to moving to a new office. We would like to think that the owner of the desk, or his predecessor, fondly studied the slogan every day for the past 42 years and generated kind thoughts of Ohio Brass. But even our advertising people would hesitate to voice this claim.

OBVIOUSLY LOOKING from a biased viewpoint, we can, however, see some light of truth in the slogan—even though it's plainly corny compared to today's sophisticated advertising phraseology. The light ac-

tually shines with an even broader beam than it did 40 years ago. The following paragraphs indicate how we choose to relate this truth to the current experience of our electric utility customers in regard to construction of extra-high-voltage transmission lines:

MANY UTILITIES are now contemplating construction of a second generation of EHV lines, at 345 or 500 kv. The majority of the first generation lines



were built with O-B insulators and hardware and are operating successfully . . . just as are many of the early single-conductor lines built with O-B hardware and insulators.

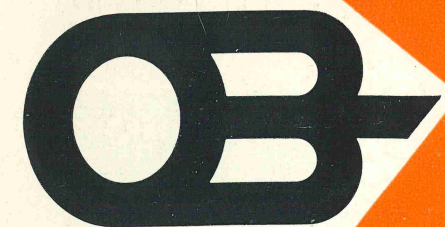
AS YOU CONTEMPLATE those second generation lines, we hope you'll give us the opportunity to work with you again. No doubt you will hear that the first line could have been better. We'll agree with that and will gladly work with you to make sure it is better . . . helped by the experience gained in the first round and by the addition of one of the finest research tools available anywhere—the new Frank B. Black Research Center. We have already supplied materials for 345-kv lines which have operated successfully for almost 20 years. They demonstrate the truth of that 40-year-old slogan: "History Tells Which Line Excels."

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Canadian Ohio Brass Company Limited • Ontario, Canada



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Hi-Tension News

JANUARY 1969

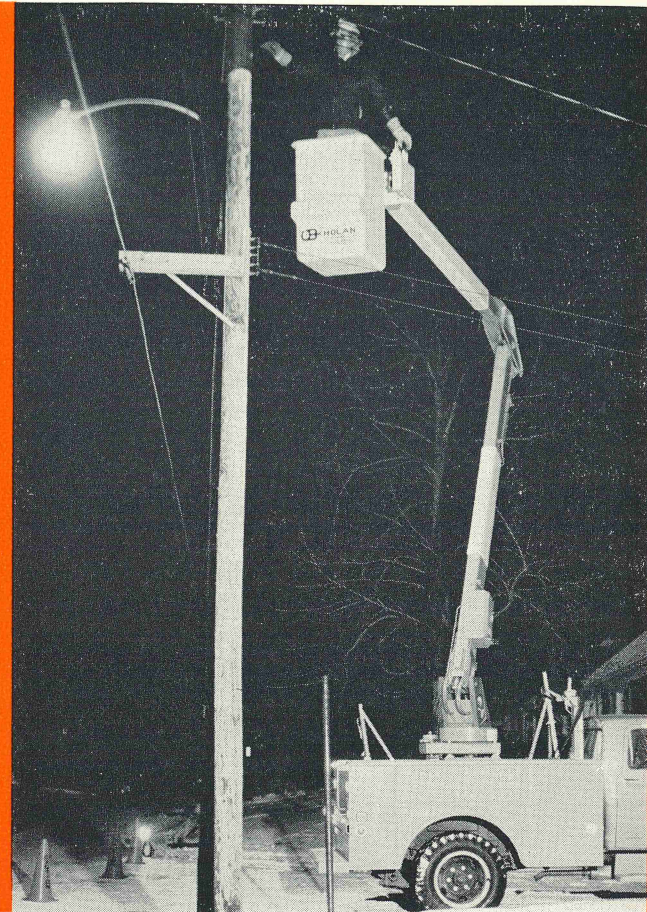
Send to Ed Wheeler
Baltimore
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THE MAN HANDLERS ...FROM HOLAN

Three different Broncos
in seven models
put men and tools
"on top the job"
on your distribution
system

BRONCO 87 — Offered in heights of 27 and 31 feet to bucket bottom, here's Holan's lowest priced aerial device. It's an ideal unit for streetlight, general service, and trouble-shooting work — night or day. Sets up fast because it needs no outriggers.



What type aerial device do I need for my men to work on my distribution system? That's a frequent question posed to a Holan district manager and his best answers take the form of questions — What's the height of the majority of your system? Will much work be performed from the property side of the pole? Is the right-of-way convenient for access? Will the unit work mostly within city limits and downtown traffic?

Answering a question with a question, or in this case several questions, generally isn't "cricket." However, it's the only way your Holan district manager can determine which Holan Bronco represents the best investment for your particular conditions. He offers you a choice of three distinct types of aerial elbows in seven different models — the Bronco 87 in 27- and 31-foot bucket heights, the Bronco 83 in 27-, 32-, and 36-foot bucket heights, and the Bronco 89 in 36- and

40-foot bucket heights. Each is designed to meet specific requirements and provide the right combination of reach and versatility for your working conditions.

If you need a low cost, high-quality aerial device for light-duty troubleshooting and maintenance, your Holan man might recommend the Bronco 87. Offered in 27- and 31-foot bucket heights, the Bronco 87 is a compact unit that mounts easily on an 8,000-, 10,000-, or 15,000-pound GVW chassis and scoots around in city traffic to handle general maintenance work such as streetlight replacement, re-fusing, and service calls. It fits right into your 24-hour troubleshooting department.

Actuation of the Bronco 87's upper and lower arms consists of 95 degrees from the horizontal for the steel lower arm and 125 degrees for the fiberglass upper arm relative to the lower. Continuous 360-degree rotation adds an important plus to the versatility of this

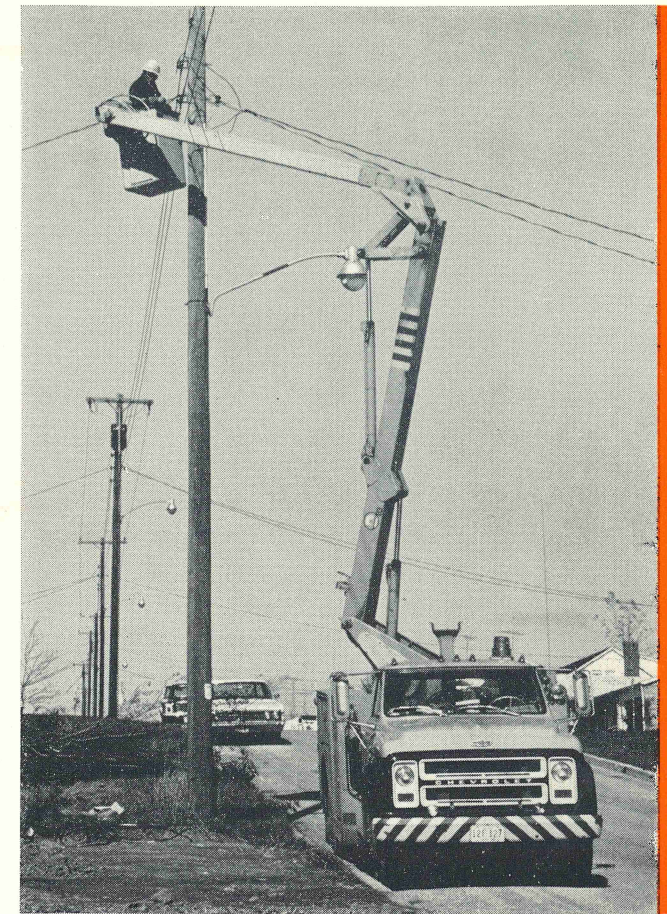
rugged light-duty unit. Uniform stress boom design assures even distribution of the rated 300-pound man-and-tool load through the built-in torsion-bar stabilizer system. There are no outrigger jacks to set, your men are up to the work position within seconds after arriving on the site. Pedestal mounting of the Bronco 87 center over the rear axle permits maximum storage room in the truck bed. And, end mounting of the fiberglass bucket provides easy access to narrow work positions and a three-sided work area on the job. Bronco 87 with all-steel upper arm, lower arm, and bucket is available for strictly streetlight and tree trimming work if you prefer.

To make sure your new Bronco 87 fits your requirements, your Holan district manager may suggest several options to add extra capability to your bucket truck. A fiberglass insert for the lower arm protects ground personnel and "sidewalk superintendents" from accidental contact of the lower arm with energized underbuild. A remote engine start/stop selector at the bucket level lets your crews conserve fuel when working in one position for long periods of time. Hydraulic or pneumatic tool outlets at the bucket level permit use of power saws, drills, and other tools to simplify work procedures.

If your crews need to reach the property side of your system often, or need a little extra reach, your Holan district manager may suggest the Bronco 83. He gives you a choice of 27-, 32-, and 36-foot models — each of which has a history of excellent service in the more than 300 Bronco 83 units presently in service. The smooth performance, compact design, and field-proved durability make it an ideal unit for insulator change-out, transformer re-fusing, general maintenance, service calls, streetlight work, and numerous other jobs on a distribution system that are easily within the reach.

Built-in Holan quality in the Bronco 83 starts with the flight pattern — 90-degree steel lower arm and 200-degree fiberglass upper arm actuation. It's a simple matter to maneuver the upper arm 180 degrees and move beneath underbuild with the smooth continuous 360-degree rotation system and reach the property side of a line. A built-in stabilizer system eliminates the need for outrigger jacks to keep setup time to the bare minimum. Uniform-stress arm design is standard. And, the Bronco 83 mounts on a 10,000- to 15,000-pound GVW chassis to provide a low-silhouette aerial unit that gets around easily in both back alleys and rush hour traffic. The roomy fiberglass bucket provides a sturdy, stable, work platform for your crewmen, while

BRONCO 83 — Holan offers three models of the Bronco 83 — 27, 32, and 36 feet to bucket bottom. The 200-degree upper arm and 90-degree lower arm flight pattern and continuous 360-degree rotation furnish plenty of on-the-job maneuverability without outrigger jacks.

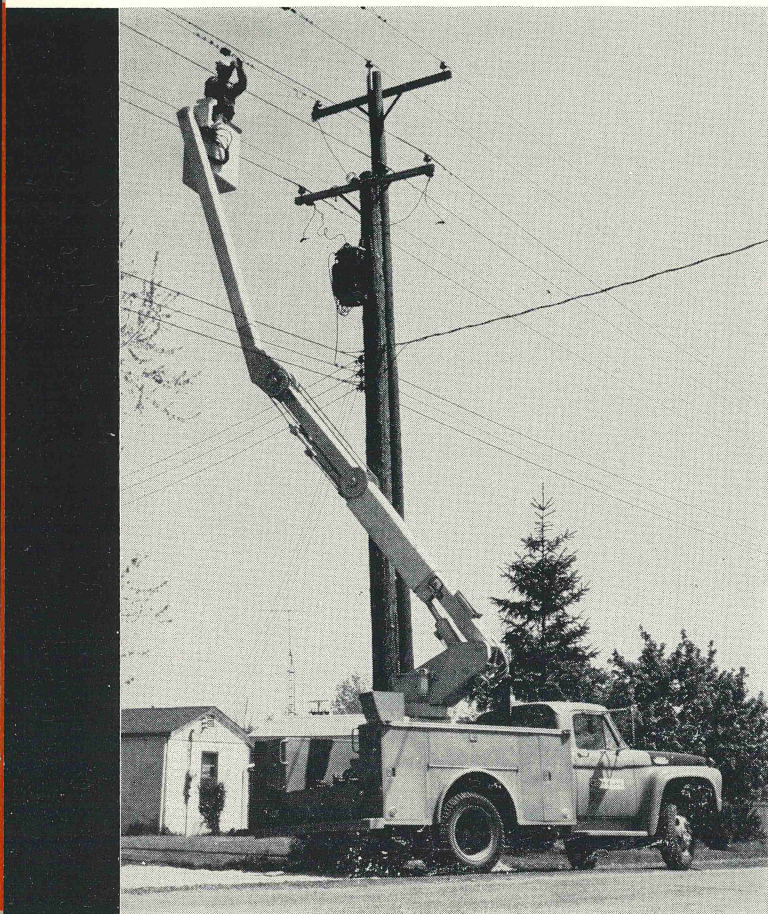


the built-in parallelogram leveling system keeps the high-walled bucket vertical to the ground.

To round out the capability of your Bronco 83, your Holan district manager offers a wide range of options. Select an 8,000-pound first-wrap rated winch for the lower arm to give your crews lift capability. An emergency power pack adds extra safety for a one-man troubleshooting crew. Or, select a remote engine start/stop, hydraulic or pneumatic tool outlets, brake locks, or several of the other work-oriented options offered with the Bronco 83.

Need more capability and more reach? Your Holan district manager also offers the Bronco 89. It's a constant-radius actuation unit for man-and-tool load handling up to 300 pounds and mounts on a 15,000-pound GVW chassis. Holan offers the Bronco 89 in 36- and 41-foot bucket heights with fiberglass upper arm

BRONCO 89 — Here's the first constant-radius man-and-tool handling bucket from Holan. It's offered in bucket heights of 36 and 41 feet, and may be equipped with Holan optional fully hydraulic safety overload device.



and bucket to provide plenty of reach for your high-voltage distribution and subtransmission lines. Here, too, Holan offers a rugged, versatile aerial device with an extra-rigid Z-type base frame and torsion bar stabilizers in the 36-foot Bronco 89. The 41-foot model employs wide-stance hydraulic outriggers for rock-solid stability at this greater height.

Maneuverability is an integral part of the Bronco 89. The steel lower arm pivots 90 degrees in the vertical plane while the fiberglass upper arm moves in a 215-degree arc about the lower arm. Continuous 360-degree rotation is standard. Pedestal mounting of the Bronco 89, either center over rear axle or center back of cab provides a full truck bed storage area. And, uniform-stress arm construction means even load distribution to eliminate any possible stress points.

Optional equipment for the Bronco 89 includes the fiberglass lower-arm insert for added electrical protection of ground personnel. You may select the

safety group which includes a remote engine start/stop, or add an emergency power pack, brake locks, safety interlocks, or even an 8,000-pound rated lower-arm winch. And, because the Bronco 89 is a constant-radius unit you may add Holan's fully hydraulic safety overload device. Your Holan district manager will be glad to help you fit out a Bronco 89 to meet your toughest requirements.

As with all Holan mechanized equipment, quality is the watchword in design and during manufacture of the Broncos 87, 83, and 89. Rigid quality control checks are made throughout the manufacturing process. Each Bronco is tested at 1½ times rated load to assure maximum on-the-job stability. All fiberglass arms are tested electrically to 100-kv a.c., while fiberglass buckets are probed at 100-kv d.c. Fiberglass upper arms also include Holan's exclusive monitoring band which permits you to add the optional arm-current monitoring circuit for testing the insulation integrity of your unit.

Holan's control system offers smooth, reliable maneuvering for your aerial device. Dual high pressure hydraulic lines are controlled by precision valves with fail-safe, self-centering spools, connected in series-parallel. Pedestal-mounted override controls for the upper station are standard on the Bronco 87, 83, and 89, too. This control system has proved its durability and dependability in years of service and hundreds of Holan units in field situations.

With your elbow selected, your Holan district manager will then start asking more questions — What type tools and equipment do your men carry? How much material must be carried on the truck? What type body do you need? This latter question leads to the introduction of several different types of bodies offered by Holan. You have your choice of the CA-102, TA-102, Pack Horse 350, Pack Horse 300, and the CSB models with the Bronco 87 and 83. With the Bronco 89, the slightly larger chassis requirement gives you the choice of a Pack Horse 350 or the Pack Horse 300. Flexibility is part of the design in all these Holan bodies. By using standard modules and fitting them with shelves, brackets, bins, hooks, racks, and other hardware, Holan gives you a custom-tailored body to fit your particular requirements.

We've covered a few of the choices you gain when you talk to your Holan district manager about your new aerial elbow for carrying men and tools to your maintenance and construction work. If you would like additional information on the Broncos from Holan, write us direct and we'll send you descriptive literature. Or, give your Holan district manager a call and let him start asking you questions.

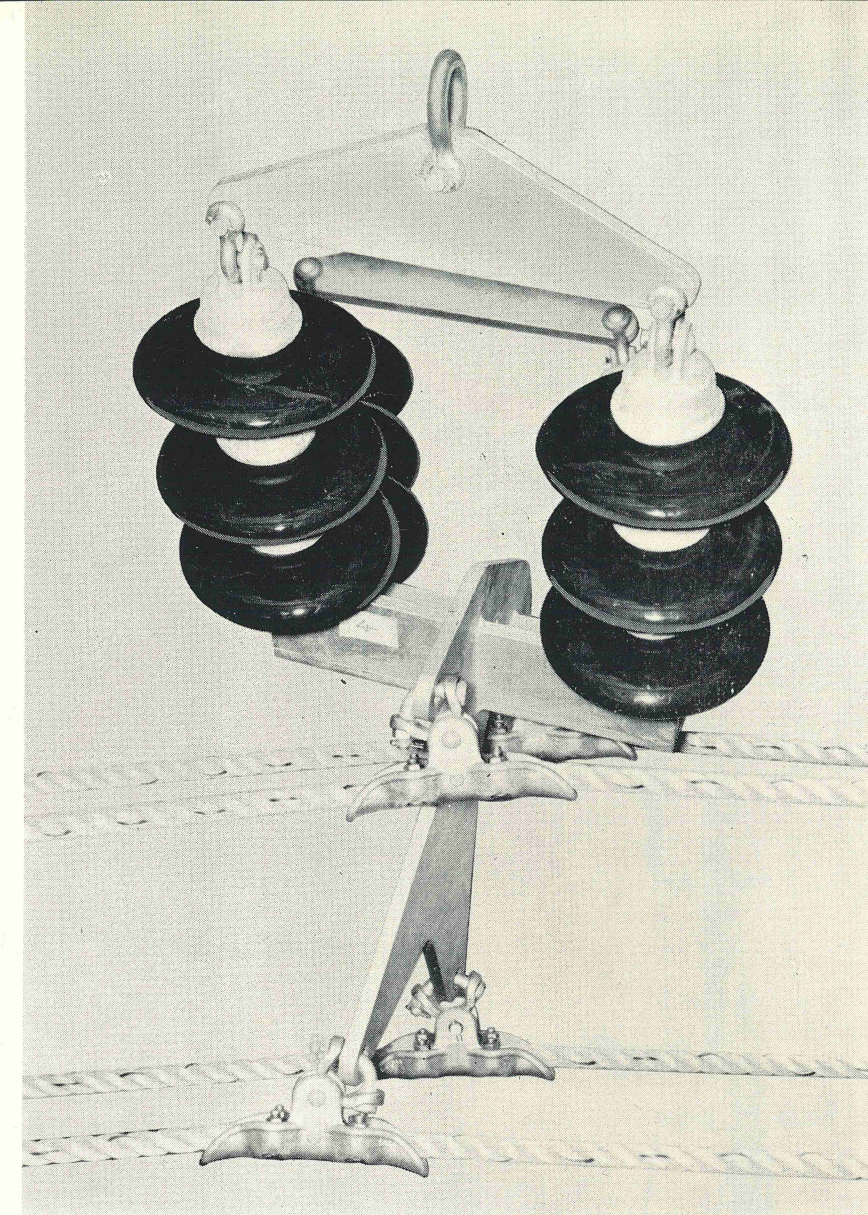
Wide range of free movement essential in bundle- conductor supports

Bundle conductor, almost universally used at 345 kv and above, introduces some new concepts of mechanical behavior. The idea that two, three, or four sub-conductors react in unison to all external forces is a fallacy. It is true that they can swing together in the wind and sag together under changes in temperature, but it is equally true that they react independently, sometimes violently, to certain other conditions. Typical of these is the random unloading of ice accumulations and, still more severe, the mechanical forces of high "G" values and instantaneous occurrence accompanying a heavy fault.

Independent reactions of sub-conductors can impose severe distortion at support points. Considerable free movement must be provided at the connection between the clamp and the yoke plate to accommodate displacement. In addition to amplitude, ease of movement is an equally important factor.

If range of movement is insufficient, or if excessive mechanical "drag" is present in the system of parts, the conductor can be subjected to a sharp flexure at the end of the clamp.

One of the important elements in design technique of all O-B hardware for bundle-conductor application is a wide range of free movement. Curved-bolt "Y" fittings attach clamps to the yoke plate. Attachment holes in these plates have chamfered edges to provide a smooth bearing surface over which the curved bolt can readily move.



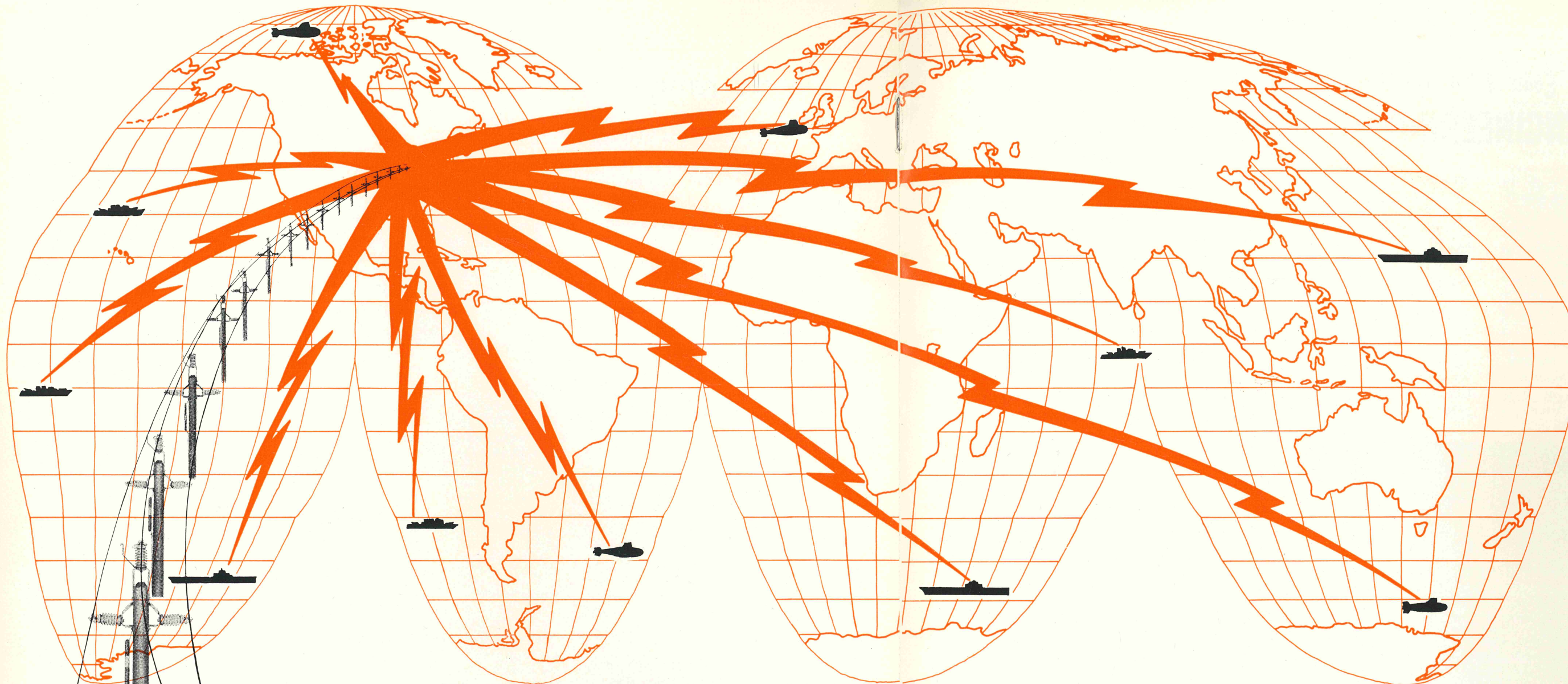
Dramatic demonstration of severe external forces falling on the presently most complex piece of conductor hardware — a double-V-string, quadruple-bundle support. Ropes were substituted for conductor, since their greater flexibility would more readily reveal any deficiency in clamp movement. The yoke was distorted 30 degrees in both the horizontal and vertical plane, simultaneously. Note that no unnatural flexure exists at the end of any clamp. It is also significant that all four insulator strings remained loaded.

Were these holes drilled in the conventional fashion, sharp edges would seriously impede movement.

Falling into an entirely different category of mechanical considerations is recovery from displacement. Since conductors are normally in a condition of balance, a distorted yoke plate might easily remain in a state of rest in this unnatural position. Careful design consideration has been given to location of load centers to assure restoration of proper yoke position under the normal dead weight of the con-

ductor system.

O-B bundle-conductor hardware represents untold hours of design and laboratory research. The fact that the great majority of EHV lines hang on this hardware supplies a constantly growing mass of performance data to guide further refinement. When you apply O-B materials to a new construction project you get the benefit of a high order of technical development — not a product that has been quickly thrown together in the hope of getting a piece of an attractive market.



Thortec system to provide ultra-high-reliability feeder for new USN Communications Center

Scientists have been constantly baffled by the inherent problems of communicating with distant naval vessels which, at any moment, may be above or below the waters of any of the seven seas of the world. This technical inability has been particularly frustrating in an electronic age when even voice and television communication techniques with space ships and other planets are well perfected.

Project Sanguine promises the first real breakthrough in giving the U. S. Navy the comprehensive capability for communicating simultaneously with any ship in its far-flung fleet. Rudimentary details of Project Sanguine appeared in the October 14, 1968, issue of *ELECTRONIC NEWS*, describing a fantastic underground network of signal transmitters located in 150-square-mile grid arrangement in Northern Wisconsin. The coaxial cables forming the grid connections

will be arranged in parallel lines six miles apart, running east to west and north to south. Feeding energy to the grid will be 240 generators, each housed in a separate brick building and controlling two transmitters, one above and one below ground.

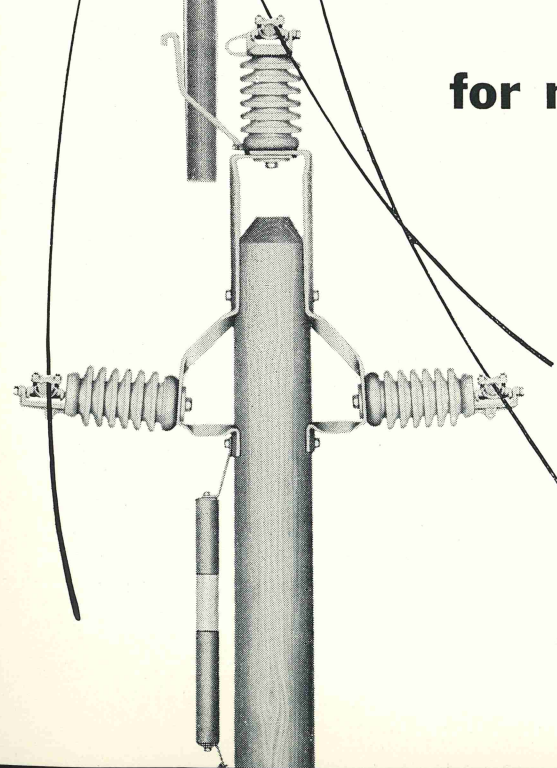
Estimates of Project Sanguine's ultimate cost have been placed as high as \$1.5-billion by the time it begins full-fledged operation. Preliminary tests will require \$27.5-million, although the Navy says only \$8-million has been allocated at present. Major electronics firms involved in the preliminary studies are RCA, Westinghouse, MIT's Lincoln Laboratory, and Bell Telephone Laboratories. Others, such as Alcoa and General Cable Corporation, have experience in the coaxial grid installation.

The hard-rock geological structure of Northern Wisconsin was selected as the site for the new communication facility because of the few faults which are encountered in its granite, quartzite, dolomite, and slate composition and further because the flat lands and their rural nature are expected to hold down construction costs.

A ground of low electrical conductivity is essential to make this type of transmitter possible, according to Navy spokesmen. The system is based on very low frequency pulses, less than 100 Hertz, and its communication feasibility has already been demonstrated. The testing program at present contemplated for the system has the objective of perfecting interference-suppression techniques.

Localized interference is known to affect both power lines and other types of communication systems. Telephones ring, lights flicker, television and radio programs are buzzed and distorted in the vicinity of the transmitters. A four-year test program is planned to determine the most cost-effective way to achieve the required interference-suppression measures.

Lake Superior District Power Company in Ashland, Wisconsin, has contracted to construct a 46-kv sub-transmission feeder line to Project Sanguine. Its engineers have investigated and chosen Ohio Brass' new Thortec self-protecting poletops to provide the ultra-high standards of service reliability commensurate with the function of the communication center.



Research Center's goals encourage industry's participation in CREATIVE ENGINEERING PROJECTS

Today's gigantic expansion of the electric utility industry has ramifications far beyond the most daring concepts of the engineering prophets. The challenge of anticipating the enormous energy requirements of our bursting economy emphasizes the urgency of expanded efforts in creative engineering at all levels of the utility industry.

Modern system designers, supported by industry-wide cooperation, have successfully steered a course toward mobility of huge quantities of electrical energy

through plans and construction of nation-wide EHV transmission systems. System capacities have soared as voltages have increased, first to 345 kv, then to 500 kv and now 765 kv appears to be a UHV pause for regrouping on the way to 1000 kv or beyond.

Crucial problem in most equipment for proposed EHV systems is that of extrapolation. Can a million-volt transmission system be built by simply doubling the size characteristics of components used for 500,000 volts? Is such strict extrapolation

physically, electrically, and economically possible? Is it necessary?

The Frank B. Black Research Center is conceived as a principal partner to industry in the development and evaluation of these major projects in creative engineering. Its full-scale, outdoor testing apparatus, its precise measuring devices, its skilled technical personnel, and its creative professional staff possess the extraordinary degree of specialization in the behavior of high-voltage electricity to make substantial contributions to the cooperative development projects which further progress in the state of the art.

Outstanding accomplishments in EHV transmission line design have resulted from the hundreds of full-scale, simulated transmission tower experiments conducted in O-B's laboratory as shown in the illustration. Range of the research center's capabilities can be exemplified by contrasting the tower experiments with the full-rated impulse and power frequency design tests performed on EHV (500 kv) cable and pothead assemblies to provide needed information on proposed underground transmission practices.

These examples illustrate only a few of the engineering tests which form O-B's incomparable storehouse of performance data and trial techniques. O-B's staff is ready to assist you in defining guidelines for the design variations you believe will improve your system plans. The new research center is dedicated to the knowledgeable integration of specialized experience with the potential advances of ideas spun off through close cooperation of the industry's gifted and creative engineers. O-B's philosophy of research was summarized in remarks made by executive members of the engineering staff during the discussion session which preceded the October 19, 1968 dedication of the research center. The following excerpts indicate the depth and versatility of anticipated development projects.

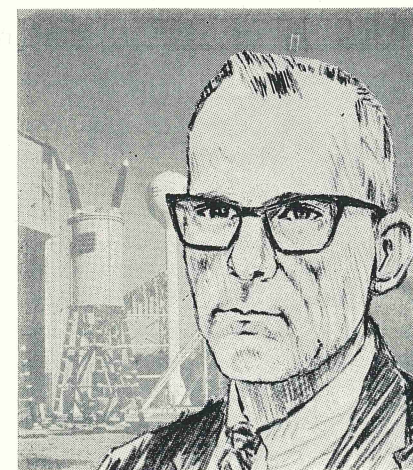


Douglas E. Winters

Doug Winters is O-B's Vice President of Engineering and has the responsibility of coordinating the technical development projects for the company.

Our primary goal is to develop new and improved products . . . not just to keep up with the competition, but to make genuine contributions in the markets we serve — products which will enable our customer to do a better, or less expensive, or altogether new job, compared to that which he has been capable of doing in the past.

We can, in our new facilities, provide the equipment, talent and manpower for specialty areas too costly for individual possession, available to customers and other manufacturers alike, as we together search for better ways. O-B's research center nurtures and promotes the technical activities which advance our industry through discovering and working with new ideas and old problems.



Jack W. Kalb

As Director of Research at the Frank B. Black Research Center, Jack Kalb is a major influence toward the integration of basic developments in related sciences with the specific project objectives.

Research center executives talk about O-B's expanded capabilities

Whether the next higher system voltage will be near the magic figure of one million volts, or higher, we plan to answer the important questions, which are coming in the field of increasingly higher power transmission voltages. Our contributions will be in determining sensible arrangements of conductors and supporting hardware, in evaluating the lengths and configurations of insulation units, in analyzing the anticipated switching surge duty in relation to the performance of protective devices, and finally in the investigation of more accurate laboratory simulation of service operation under contaminated conditions.

Our new facilities will increase immeasurably the depth of our research effort, adding new dimensions to the exploitation of the common disciplines and establishing new technical bonds with ceramic, organic, and metallurgical progress.



Arnold G. Yost

Arnie Yost, Chief Development Engineer of the Frank B. Black Research Center, is principally concerned with the transfer of research findings into products designed for manufacture.

Beauty, reliability, economy, and industry growth are primary factors creating need for new products. From these factors come the major development projects which concern O-B's research center: EHV/UHV transmission, both overhead and underground; URD; HVDC, again both overhead and underground; and product resistance to the con-

tamination of polluted atmospheres.

The new laboratory provides the greater space and improved facilities to carry forward the extensive activity which O-B personnel devotes to these subjects. The remarkable accomplishments of recent years provide an invaluable background of experience for the investigation of optimum provisions for future electrical construction.

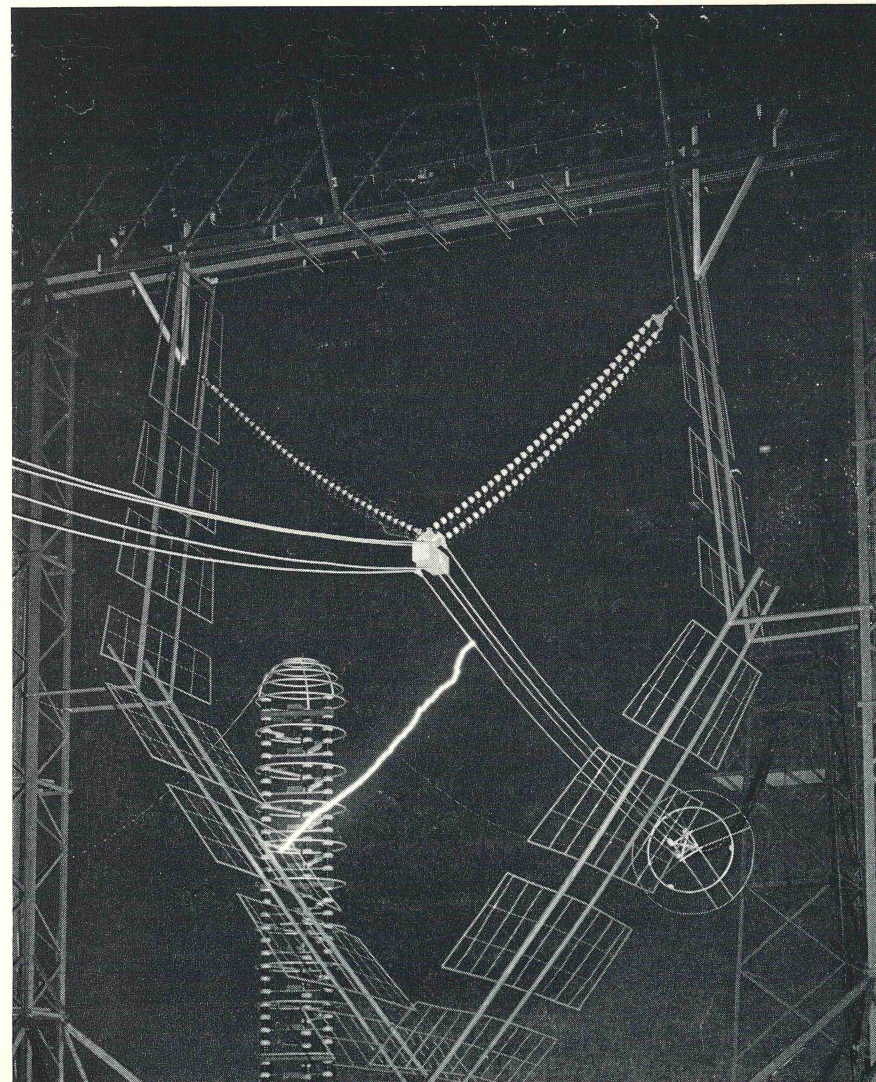
Less specifically predictable, but just as certain, are the totally new product categories that must evolve for tomorrow's electric utility industry. The people and tools that comprise the research center are the certainty that many of these needs will be filled.



John M. Sheadel

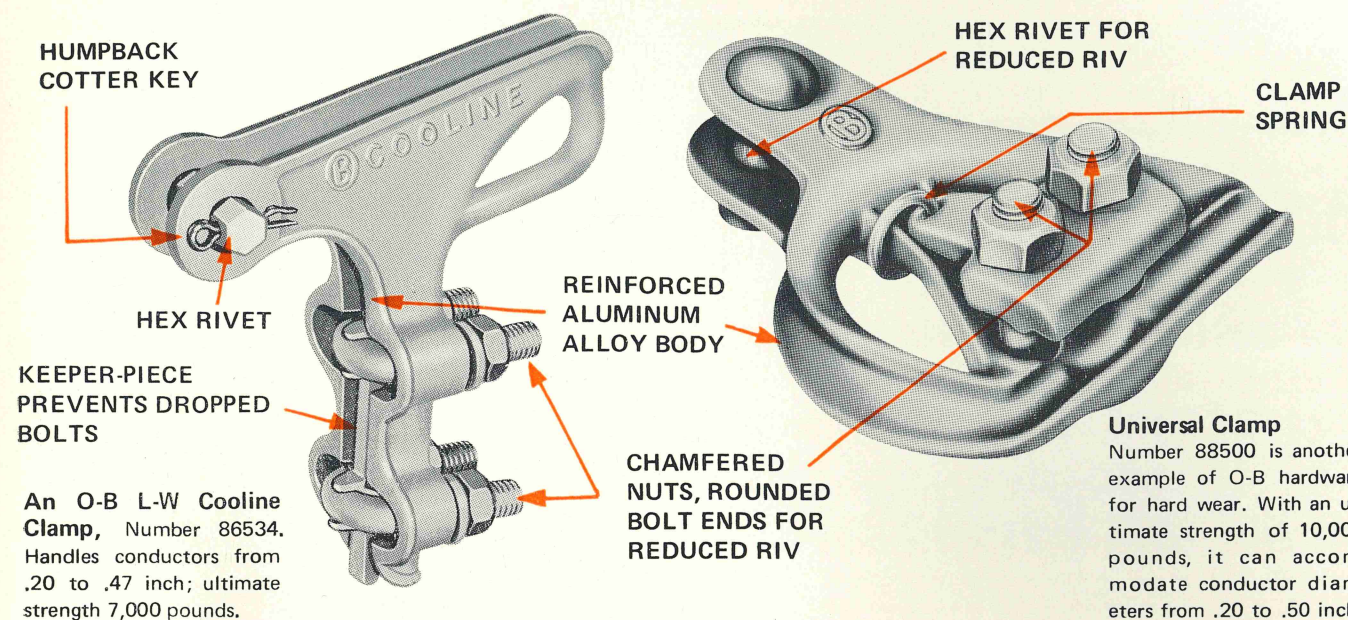
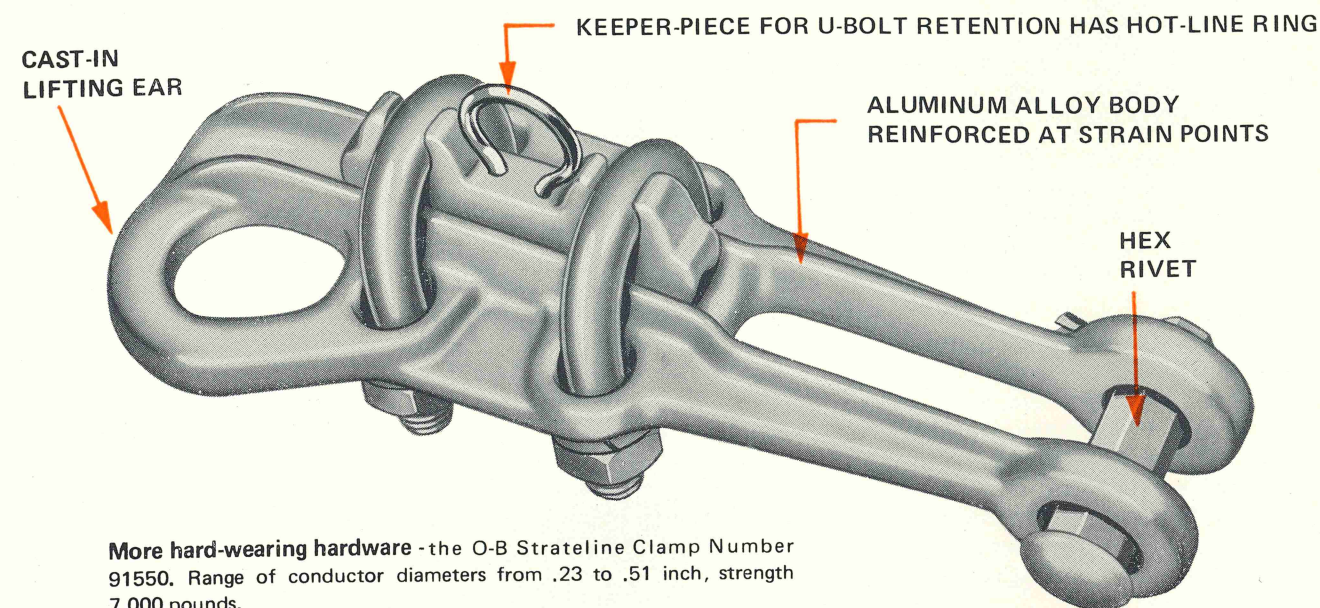
John Sheadel is the Chief Development Engineer for the Mansfield product section of The Ohio Brass Company. His close association with the technical operations of the research center determines development objectives to benefit products and customers in the transit and mining industries.

Our new research center carries on a heritage of product development based on unique capabilities for high-voltage and high-current test procedures. Its broad aspects involve O-B products which in design criteria are among the Company's oldest as well as its newest. The technical information exchange of the test laboratory is a contributing factor toward O-B's leadership in products for the distribution of power in the mining and transportation industries.



Full scale "idea machine" at O-B's research center encourages industry cooperative testing projects by which creative engineering can substantially advance EHV design principles.

HARDWARE FOR HARD WEAR



O-B insulators, hardware "team up" on the poletop

You can't go wrong when you specify compatible parts, in new construction or distribution line upgrading. Many companies who make insulators produce equipment which may be installed using any brand of hardware — so does Ohio Brass, of course. But Ohio Brass is the *only* insulator manufacturer that also makes hardware items — clamps, clevises, and component parts — and it gives you a single source of supply for all your distribution needs. Naturally, the O-B components fit together well, have a pleasing appearance, and help to reduce line maintenance. Additionally, you have available a selection of "standard" components to satisfy virtually every distribution requirement.

For example, the O-B Strateline series has been designed with your installation needs in mind. Extra-long U-bolts are easier to handle on the pole; they are extra-large and exceptionally strong, but are easily

drawn down, with the clamping action of the seat maintaining full holding power. The clamping seat is "waved," which serves as a snubbed grip when tightened, enhancing the normal holding strength of the clamp. Clamping is done with a minimum of strand deformation and less weakening of conductors.

The O-B Strateline clamp is made of high-strength aluminum alloy, especially selected for strain-clamp use. Strength is increased at points of mechanical stress — and you can also specify malleable iron or bronze bodies in the Strateline series.

The stainless steel "humpback" cotter key will not corrode and is easily inserted, holding tightly without spreading. It is easy to remove and replace with hot-line tools. There are no sharp edges on U-bolt ends or nuts to cause radio interference; the nuts thread on easily, too.

The solid, high-strength keeper-piece is permanently attached to

both U-bolts, resulting in fewer parts to handle and less danger of dropping pieces during installation. Conductor diameters from 0.15 to 1.55 inches can be accommodated, with generous safety factors built into every size and capacity. Each clamp is shipped firmly tightened onto a wood insert, avoiding loose parts, loss of pieces, and possible damage to U-bolt threads in shipping.

Another headliner when paired with O-B insulators is the O-B L-W Cooline Deadend Clamp, Number 86534. It's especially designed for application in the short spans and low mechanical tensions common in distribution systems. Like the Strateline, the Cooline clamp is constructed of high-strength aluminum alloy, strengthened at points of stress. Its waved clamping seat also provides a snubbed grip, enhancing its holding strength and preventing excessive conductor deformation.

Number 86534 has the same extra-long, extra-strong U-bolts as the Strateline, with the same aluminum keeperpieces attached, stainless

steel non-corroding humpback cotter key; and low RIV due to rounded U-bolt ends and chamfered nuts.

The O-B Type L-W Clamp series is available in conductor size ranges from 0.20 to 1.30 inches. Strength and size are matched to conductor capacity with wide safety margins. These clamps are shipped clamped to wooden inserts, as are the Strateline clamps.

One item in O-B's extensive hardware list has been extremely popular — this is the Universal Strain Clamp, Number 88500. Reason for this is the special spring on the clamp which holds the clamping jaws open automatically until the nuts are tightened. The same spring holds the clamp body and jaws together during installation, eliminating dropped parts and saving time. Any lineman who has ever installed a strain clamp without this spring arrangement is familiar with the problem. With one hand, he forms and holds the conductor into the clamp seat. With his other hand, he adjusts and positions the holding jaws — and with both hands oc-

cupied, how is he to tighten the clamping nuts? It's very difficult, and almost a two-man job — but the Universal Strain Clamp handles it with ease. You can even open the jaws well past the capacity of the clamp, and you still won't run out of thread and drop a clamping nut.

When the Universal Clamp has been installed, other virtues become apparent. The large circular seat adds a snubbing action to the holding jaws and makes its grip non-slip without damaging the conductor strands. Even if the cable has to be resagged later, the clamped area will not be noticeable and will be completely undamaged.

Other features of O-B clamps — humpback stainless steel cotter key, rounded nuts and U-bolt ends, special aluminum alloy body — are embodied in the Universal Strain Clamp Number 88500. It will accommodate conductor sizes of ACSR, 5 to 2/0; all aluminum, 4 to 3/0. Rated ultimate strength of the Universal Clamp is 10,000 pounds.

The ferrous components of all O-B clamps and hardware fittings

are hot-dip galvanized. These coatings meet the requirements of ASTM A153, "Specifications for Zinc Coating (hot dip) on Iron and Steel Hardware." All U-bolt threads are standard after galvanizing, and nuts are "No-Ox-Id" dipped to protect and lubricate them.

O-B clamps have the pattern number cast into each part; the range of conductor diameters is cast into the clamp body for reference. Many O-B clamps and fittings are packed in standard quantities which permit easy one-man handling.

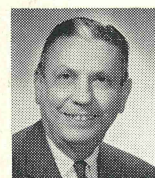
And last — but certainly not least — the lineman needs only *one wrench* to install O-B clamps. That's all that's necessary — all clamping nuts are the same size. It means a lot in convenience and ease of installation.

It's true. When you "team up" O-B hardware with O-B insulators — on the poletop, where it counts — you have an unbeatable combination of versatility, quality and uniformity. Ohio Brass makes them together — and they *work* together. Excellently.

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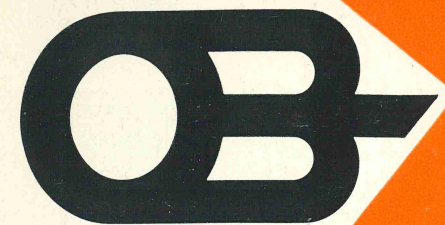
AS YOU CONTEMPLATE those second generation lines, we hope you'll give us the opportunity to work with you again. No doubt you will hear that the first line could have been better. We'll agree with that and will gladly work with you to make sure it is better . . . helped by the experience gained in the first round and by the addition of one of the finest research tools available anywhere—the new Frank B. Black Research Center. We have already supplied materials for 345-kv lines which have operated successfully for almost 20 years. They demonstrate the truth of that 40-year-old slogan: "History Tells Which Line Excels."

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JANUARY 1969

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