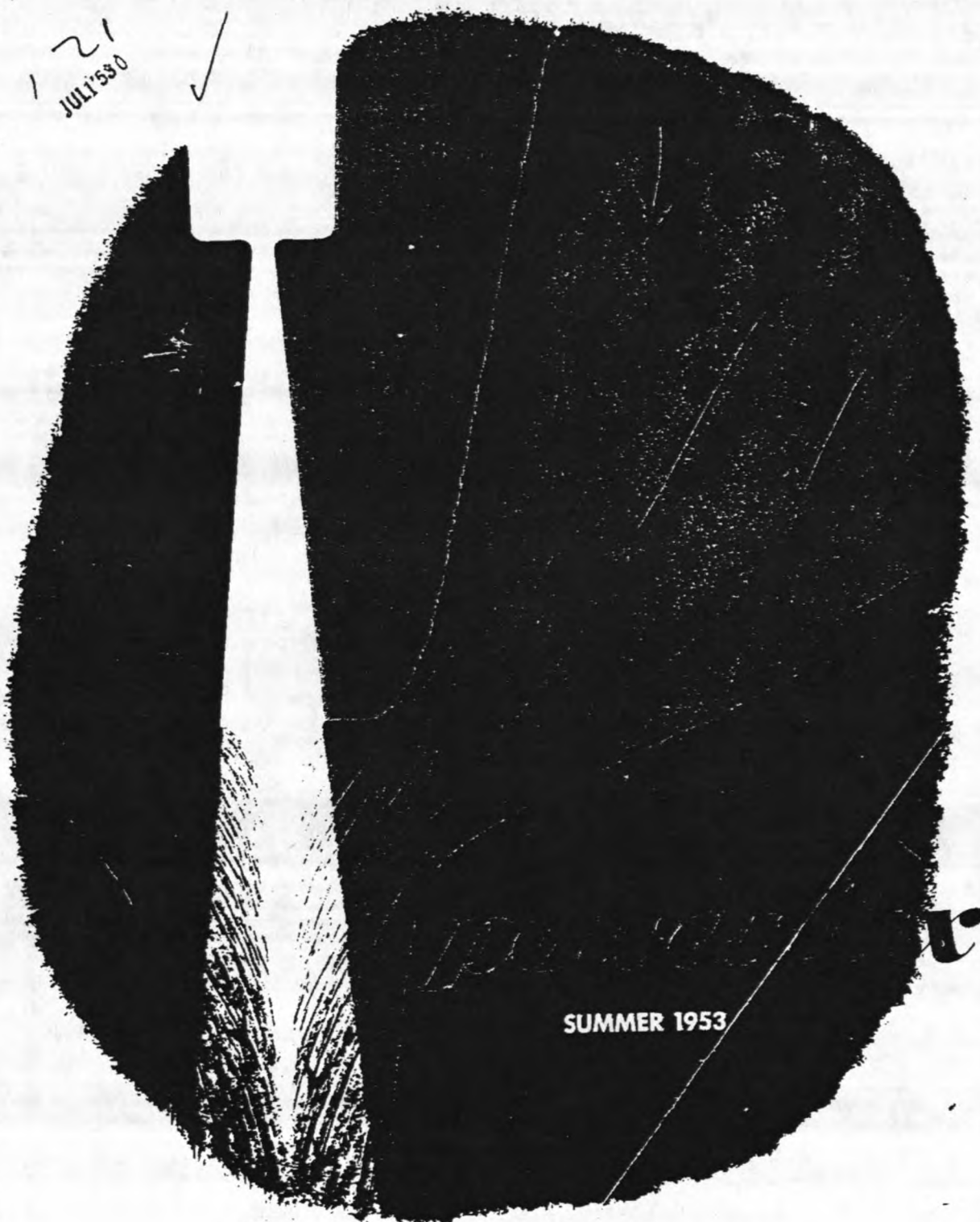


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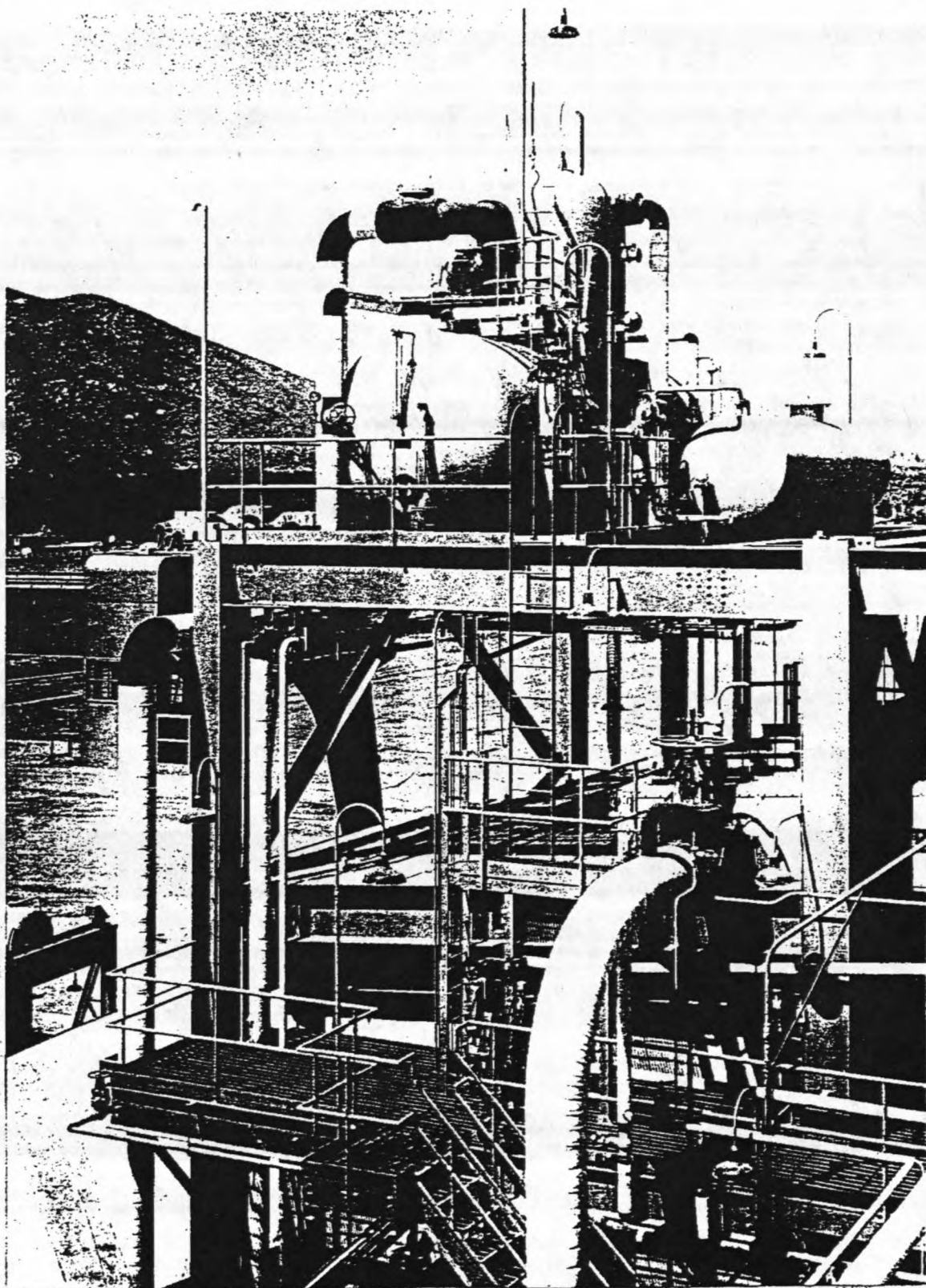


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SUMMER 1953

PUBLISHED BY ELLIOTT COMPANY

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This view at the new "outdoor" Highgrove Station of California Electric Power Company, shows one of the two Ellis deaerating feedwater heaters mounted "high and outside." See article page 25. These vertical spray-type deaerating heaters are rated at 302,000 lb. per hr. The 7-ft. diameter horizontal steel storage tank below the heater has a capacity of 752 cu. ft.

powerfax

SUMMER, 1953

VOL. XXXI NO. 2

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New Publications

Bulletin PB-1400-4, Elliott Coil Insulation. Describes in detail all essential steps in the insulation of 2300-v and 4160-v Class A stator and field coils.

Bulletin PB-1400-5, Elliott Electrical Equipment for the Petroleum Industry. Covers various types of motors and generators, both standard and special designs, especially adapted for petroleum service.

Anne Now Vice President



John W. Anne has been elected a vice president of Elliott Company. He has been with the company since 1925 immediately after graduating from Pennsylvania State College.

He was assigned to the condenser department. He became manager of the condenser department, later manager of the heat transfer and turbine sales departments. In 1948 he was appointed sales manager of the Jeannette Division.

District Offices

New address for Tulsa District office, effective June 1st, is 910 Petroleum Building, Tulsa 3, Oklahoma.

M. L. Hiller is now Washington district manager. He joined the Elliott Company turbine engineering department in 1937. In 1941 he was ordered to regular Army duty with rank of captain. After various honorable wartime assignments, he was promoted from active duty with rank of lieutenant colonel in 1945 and immediately transferred as a field engineer to the Washington district office.

Carlson is now manager of the Minneapolis office. A graduate of the University of Minnesota he joined Elliott Company and was assigned to Minneapolis in 1937. In August he was transferred to the Minneapolis office as a Petty Officer First Class in the Navy for three years.

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S. W. Crisman has been appointed assistant district manager of the Pittsburgh office. He came with Elliott Company in 1935, was assigned as a field engineer in the Pittsburgh district office in 1937. A first lieutenant in the Reserve Signal Corps, he was called to duty early in 1941. He became a captain, was promoted to lieutenant colonel, sent overseas, was in the Normandy invasion, and was wounded several months later in Germany. He rejoined the Pittsburgh office in November 1945. J. H. Strickler continues as manager.

F. M. Haynes has completed his tour of military duty (having been called two years ago as a reserve captain in the Army) and has returned as a field engineer to the St. Louis office. Mr. Haynes came with the Elliott Company in 1948.

H. D. Mateffy is the new Duluth manager. Also a graduate of the University of Minnesota, he came with Elliott Company in 1951 and has been in the Minneapolis office since July, 1952.

Howard A. Bach, an engineering graduate of Carnegie Tech, who joined the Elliott Company in 1951, has been assigned as a field engineer to the Detroit office.

V. A. Peterson, Los Angeles district manager, is chairman of the reception committee for the ASME semi-annual meeting in Los Angeles, where a big crowd is expected, June 29 through July 2.

Harry Pastre

Harry A. Pastre, pioneer and retired vice-president of Elliott Company died May 25, 1953, at the age of 80. Mr. Pastre had told, in the Spring 1951 *Powerfax*, the story of the early days of Elliott Company. He was associated with W. S. Elliott before the company was organized in 1901, and in 1908 became Elliott's first salesman. In 1935 he became a vice-president of the company. As Mr. Elliott's special representative, Mr. Pastre traveled extensively, visiting Europe, South America, Mexico, Canada, and Alaska. Up to the time of his retirement in 1943, he was active in numerous technical, engineering, and fraternal organizations.

Gano Dunn

Gano Dunn was a graduate—and valedictorian—of the country's first college electrical engineering course (Columbia, '89). Immediately he joined the recently formed Crocker-Wheeler Electric Motor Company, soon to become chief engineer.

During his 20 years' service with Crocker-Wheeler, Mr. Dunn sparked a long series of significant electrical developments; the first major electrification in the steel industry, the first electrified printing plant, etc. In 1905, he introduced the first mill type motor-forerunner of the present 600 series.

At the time of his death, April 10, aged 82, Gano Dunn was president of the J. G. White Construction Company.

SOMETHING from NOTHING

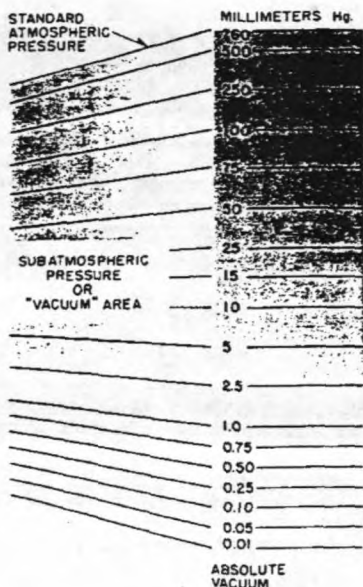


by GEORGE S. STOUT, Process Division, Elliott Company

HAVE you ever seen a magician pull a live rabbit out of an empty hat? If so you probably enjoyed it, but did not believe it. You thought it impossible to get something from nothing. Yet, present-day industry reaches into empty space and brings out an amazing variety of products to make your life easier and more enjoyable. Vacuum is indeed the magic hat of industry.

Vacuum Is a Tool

VACUUM is one of industry's most important tools. Without it, radio and television would be impossible. It turns out the frozen orange juice



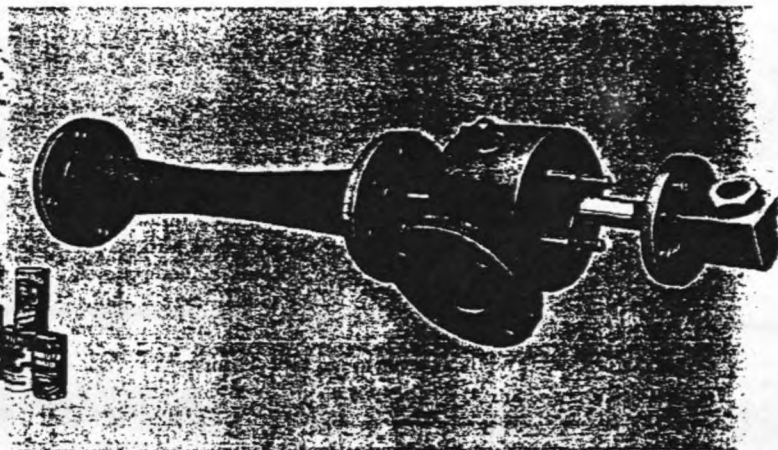
that you find in your grocery store. It gives you penicillin, vitamins, and blood plasma. It has a hand in the manufacture of the records you buy for your phonograph. Vacuum helps to bring fresh, delicately flavored vegetables and fruits from the farm and orchard to your table. It figures in the making of a large number of products ranging from atomic bombs and jet engines to costume jewelry.

With vacuum it is possible to do many things that cannot be done under ordinary air pressure. For example, water will boil even when it is cold, and matter that is frozen solid can be dried. Glass, plastics, cloth, and other materials can be coated with metal. Materials can be impregnated with oil, wax, or plastics. By the use of vacuum, air pockets can be prevented from forming in clay products; gas bubbles can be prevented from forming in molten metal. And under vacuum, complex organic substances can be torn apart and their different molecules collected separately.

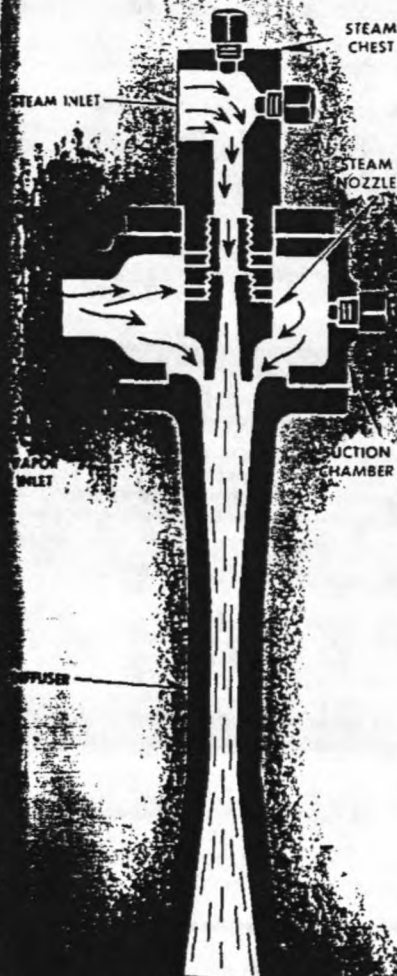
What Is Vacuum?

Although an important industrial tool today, vacuum remains to many people, something of a mystery. Vacuum is created by removing air or other gas from a space. As the gas is withdrawn, the pressure within the space becomes less than that in the surrounding atmosphere. The degree of vacuum attained is a measure of the extent to which the gas has been removed: if it amounts to only a small percentage, a low vacuum results; if most of it is extracted, a high vacuum is obtained. If all the gas could be removed, the space would then be entirely empty and the pressure in it would be zero—a perfect vacuum.

In the past, atmospheric pressure was used as the base for measuring vacuum. However, since atmospheric pressure varies with different localities and elevations and also changes from morning to night, it has proved to be a poor reference line. In recent years a successful attempt has been



Above and to the left are shown the elements which make up a steam jet ejector. A jet of steam, accelerated through the nozzle, comes in contact with, entrains and carries away the vapors from the vessel to be evacuated by the ejector.



made to bring about a change in the reference line. The practice of speaking of subatmospheric pressure as a "vacuum"—a relative value—is giving way to the more foolproof method of calling it "absolute pressure"—an absolute value. Absolute pressure simply means the amount of pressure above a perfect vacuum. Thus, in the new terminology all pressures, whether above or below atmospheric, are based on a non-changing zero pressure at absolute vacuum.

Average atmospheric pressure amounts to approximately 15 psia. This pressure will support a column of water some 400 in. high, or a column of mercury (Hg) approximately 30 in. high. A pressure of 1 in. Hg absolute means that the pressure is sufficient to support a column of Hg 1 in. high. When the absolute pressure becomes less than 1 in., it is more convenient to use the smaller units of the metric scale—millimeters of Hg. One inch is equivalent to approximately 25 mm. When the pressure becomes

lower than one millimeter, it is convenient to use the still smaller unit called the micron. One millimeter is equivalent to 1000 microns.

How Vacuum Is Produced

Within 500 miles of the spot on which you are now sitting, there exists a better vacuum than man has ever been able to create. Only 500 miles away—straight up—the vacuum is estimated to be nearly perfect. It's been suggested that all we have to do is construct an airtight pipeline, straight up, and pipe this perfect vacuum into our plants.

Actually, somewhat more practical means are used to produce vacuum commercially. Various types of mechanical vacuum pumps can accomplish the job, using pistons or impellers to do the work. For most applications, however, the steam jet ejector offers many advantages over such mechanical devices.

With this relatively simple "vacuum pump," a jet of steam, accel-



Did you notice this issue's cover design? It is intended to portray, with some artistic license, the flow of vapors around the nozzle of an ejector.

erated through a nozzle, passes through a chamber which is opened to the vessel to be evacuated. Within the chamber, the steam jet comes in contact with and entrains the vapors from the vessel, carrying them away

to be vented, or condensed and recovered. In this fashion, a high-velocity jet of steam can produce, within the vessel, absolute pressures as low as 50 microns Hg, equivalent to approximately 1/15,000th of normal atmospheric pressure.

In effect, the steam jet ejector is a compressor, compressing vapors from below atmospheric pressure up to atmospheric pressure. Like most compressors, the steam jet ejector is often more efficient and economical when the work it has to do is divided among a number of ejector stages in series. As a rough rule, the practical limit of compression for any individual stage is about 10 to 1. This is to say, a single ejector can efficiently compress from approximately 3 in. Hg abs to atmosphere.

By joining two or more ejector stages in series, the inlet of one stage being connected to the discharge of the preceding stage, extremely low absolute pressures can be obtained. In general, the lower the absolute pressure (or the higher the vacuum) required, the more ejector stages are required. For various reasons, the greatest practical number of suc-

cessive ejector stages is five, producing a pressure equivalent to about .003 in. Hg abs.

Condensers are often interposed between stages of multi-stage ejector units. Their primary purpose is to reduce the load on successive stages by removing condensables from the vapors being evacuated.

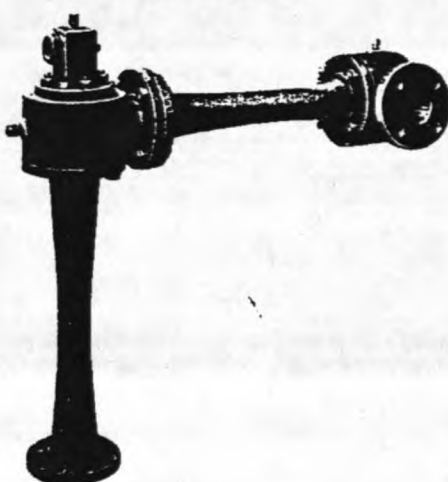
Two types of condensers are employed in this service. If it is permissible to mix the steam and evacuated vapors with the cooling water, the barometric condenser is usually applied. If mixing of vapors and cooling water must be avoided, the more expensive surface condenser is used. This is particularly true where cooling water is not abundant and must be saved from contamination or where stream pollution would otherwise result.

Frequently, in addition to so-called "intercondensers" between ejector stages, an "aftercondenser" is placed at the discharge of the last ejector. This is done to save the heat of the steam, to recover the condensate, or to eliminate the noise and nuisance of an exhaust which is discharged directly to the atmosphere.

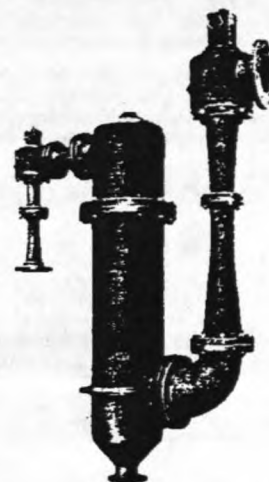
Simplest of the Elliott ejector family—a single-stage ejector. Capable of producing approximately 3 in. of mercury absolute.



Two-stage ejector—two stages connected in series—with discharge of first stage directly connected to vapor inlet of second unit.



Another two-stage ejector. On this unit, a barometric condenser has been inserted between the first and the second stages.



Uses of Vacuum

Scarcely a food, drug, or chemical is produced these days without the help, somewhere along the line, of vacuum created by the steam jet ejector. Ejectors are now applied in hundreds of processes for distillation, deodorization, crystallization, deaeration, and dehydration; for evaporation, vacuum impregnation, and vacuum cooling.

Chemical, food, and pharmaceutical industries find vacuum indispensable in many manufacturing and processing operations. Just as water boils at a lower temperature on a mountain than at sea level, so other liquids boil or vaporize at lower temperatures when the surface pressure on them is reduced. Products which would be damaged at atmospheric boiling temperatures can be vaporized successfully at lower temperatures made possible by vacuum. An example of this is milk, a heat-sensitive liquid that, for best results, must be evaporated at a temperature of 125 F or lower, made possible by pressures of around 4 in. Hg absolute, using single-stage ejectors.

Evaporation plays an important



Two five-stage ejectors in a large pharmaceutical plant. Each unit maintains pressures as low as 50 microns on vacuum chambers which are used to dry antibiotics such as penicillin.

part in the food industry. While food processing could be accomplished commercially by heating the food, this procedure would result in a loss of flavor and destruction of vitamins. By processing under a vacuum, they retain their nutritive value and their taste approaches that of fresh commodities. This method has promoted the growth of the frozen orange juice industry to the point where it is now concentrating juices of other citrus and non-citrus fruits, such as grape-

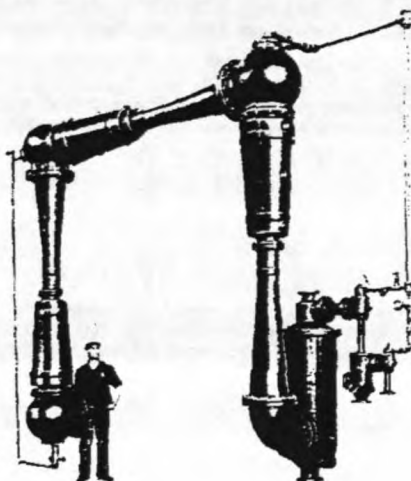
fruit, lemons, grapes, apples, and even fluids like coffee and milk. By another process, fruits, vegetables, meats, fish, and eggs are first preserved by quick freezing and then subjected to evaporation under high vacuum. The finished product is a powder rather than a concentrated liquid. Fresh ground coffee soon becomes stale in the presence of air because oxygen promotes rancidity; however, it will remain fresh for reasonably long periods if packed in containers from which most of the air has been removed.

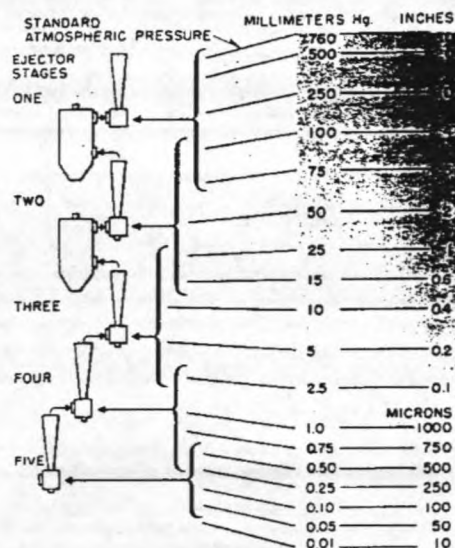
Blood plasma and penicillin owe their present state of commercial development largely to vacuum. The blood plasma must be dried rapidly at low temperature to prevent the growth of bacteria and the deterioration of essential elements. The yellowish plasma that remains after the red corpuscles have been extracted is bottled and frozen, the open top bottles are placed in a vacuum chamber and the pressure is reduced to about 0.5 mm of Hg absolute pressure by four- or five-stage ejectors. Globules of penicillin, taken from the mold cultures which produce it, are dropped into bottles and frozen, and placed in a vacuum chamber and the pressure reduced to as low as 100 microns. Both blood plasma and penicillin are dehydrated while in the frozen condition.

Three-stage ejector with barometric condensers between the first, second, and third stages for the removal of condensable vapors.



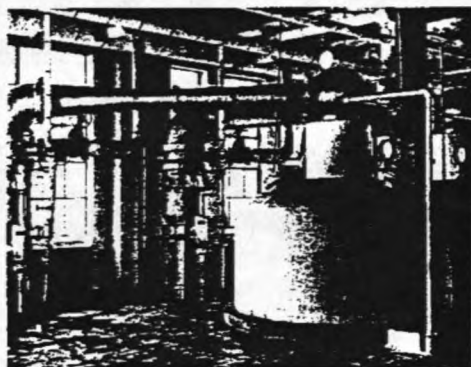
Five-stage ejector. The three enormous initial stages, known as "boosters," make possible extremely low absolute pressures.



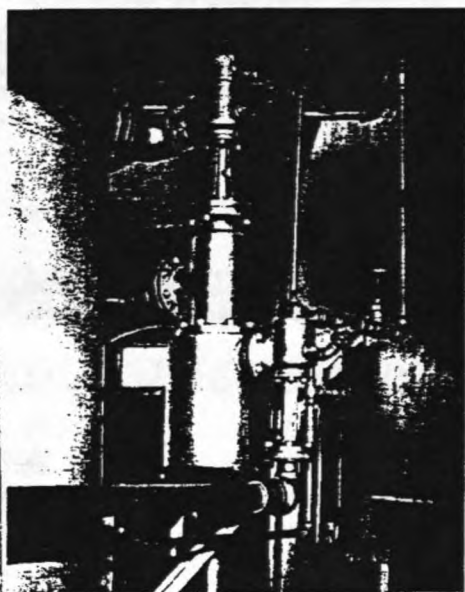


APPLICATIONS

- Thermocompressors
- Gas boosters, ventilating units
- Conveying of dry products
- Vacuum cookers
- Vacuum filters, cloth dryers
- Evaporators for salt, sugar, milk
- Chemical crystallization units
- Refinery and chemical distillation
- Wood preserving processes
- Deaeration of clay
- Detergents and soap products
- Pharmaceutical products
- High altitude test chambers
- Steam stripping and deodorizing units for animal and vegetable oils
- Vacuum packing equipment for coffee and other foods and chemical products
- Evaporative freezing units for various food products
- Vitamins and frozen fruit juices
- Freeze drying equipment for blood plasma, penicillin, streptomycin, and other special drugs
- Evacuating and sealing equipment for refrigeration units, light bulbs, radio tubes, electronic equipment
- Molecular distillation of complex chemical compounds



Installation of two three-stage ejector units, serving two large vegetable oil deodorizers.



This two-stage ejector installation serves a milk evaporator.

Molecular distillation is another industrial process that vacuum has made practical. By this method, vitamins are extracted from vegetable and animal oils. The petroleum industry also makes extensive use of the process in separating oils, greases, waxes, and the like into molecules which can be tested one by one for viscosity or stickiness at various temperatures, for chemical instability, etc. In this manner the petroleum products can literally be tailor-made for specific applications.

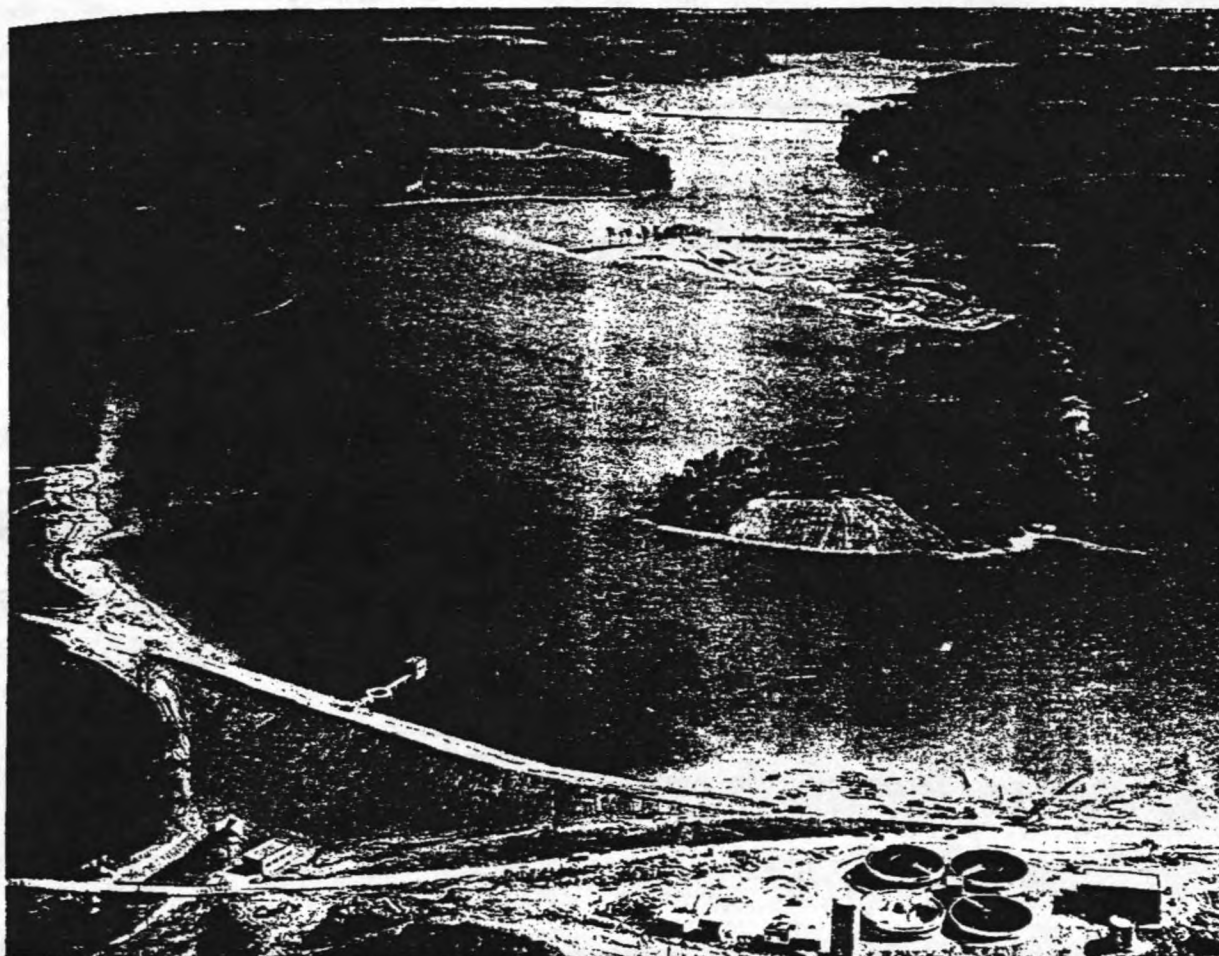
Metallurgy is another field in which the use of vacuum is on the increase. Metal casting is a good example. Molten metals usually contain appreciable quantities of dissolved gases. When the hot metal is poured and begins to solidify, the gases are forced out, forming blowholes in the casting. However, if the surface pressure which holds the gas in the molten metal is reduced, the gases escape before the metal hardens. The result is a high-density casting free of blowholes, with more than normal toughness and ductility, and of improved thermal and electrical conductivity. These properties are of extreme importance in the building of such things as jet engines for aircraft. In

like manner, the clay to be used for forming bricks, tile, and other ceramic products, is placed under vacuum and the air is removed so that the product does not contain air pockets within the structure and blisters on the exterior surfaces.

The use of vacuum during the manufacture of electrical cables and capacitors can increase both their life and their effectiveness. If products of this kind are subjected to a pressure of around 0.1 mm of Hg, even the smallest bubbles of air can be withdrawn from between the layers of material and the spaces filled with an insulating compound. This operation is generally accomplished by internal heating to drive out all traces of moisture. And vacuum makes it possible to simulate the conditions high above the earth. This procedure is used by aerodynamic engineers in the development of aircraft and rockets.

Glass, plastics, paper, metal, cloth, and other materials are being coated with thin layers of aluminum, copper, gold, stainless steel, nickel, silver, zinc, etc., by means of vacuum. The objects are arranged in an air-tight chamber in such a way that the surfaces to be treated all face a common point where the metallic substance is vaporized by passing an electric current through it. Because of the absence of air, the molecules produced travel in straight lines and are deposited on the exposed surfaces in an extremely uniform film that can be rigidly controlled both as to quality and thickness.

Actually, the list of present-day applications of vacuum in industry is an almost endless one. Yet few of them would be possible or practical without the humble steam jet air ejector. Elliott Company was one of the first to recognize the possibilities of this ingenious vacuum pump and has since designed and engineered thousands of ejector installations. We are proud of our part in the development of an indispensable industrial tool—vacuum.



Aerial view of Beaver Run Dam and Lake, the largest water works supply reservoir in the state of Pennsylvania. At the left at base of dam can be seen the low-service pumping station and at right are the filtration and purification units, and high-service pumping station.

BEAVER RUN RESERVOIR AND FILTRATION PLANT

NOT many miles from the Elliott Company Jeannette plant is the recently completed Beaver Run Reservoir and Filtration Plant built by the Municipal Authority of Westmoreland County. This new reservoir has meant that most of the communities in the county are now served by a single water system instead of by smaller individual water companies which were often unable to meet the growing needs of the residential and industrial users.

Located in approximately the geographic center of the county, the reservoir impounds 9.2 billion gallons of water and covers an area of 1130 acres. It stretches some 5½ miles behind its 90-ft rolled-earth embankment dam and has a shoreline of about 25 miles. Immediately back of the dam is the "morning glory"

type overflow which discharges surplus water through a conduit-tunnel under the dam. The spillway designed with its large freeboard provides storage which will take care of a heavy rainfall over the entire 43-sq mi tributary area.

Situated on a hill overlooking the dam is the filtration plant and high-service pumping station. This attractive stone building is the center of operations. On the left as you enter is a light spacious office, and to the right is a complete chemical laboratory where tests are made on the water approximately every hour. Behind these is the main pump room with the high-service pumps and main control panel. Also in the building are the chlorinators, chlorine storage room, heater room, and a room housing auxiliary mechanical equipment which includes three air compressors for aeration, two vertical wash-water pumps, and an auxiliary lighting generator and high-pressure water service pump driven by gas engine for emergency use. The second floor is used largely for the storage of the alum, soda ash, lime and carbon black used in purifying the water. In the basement is the clear well with a capacity of 560,000 gallons of water.

About 2000 ft from the filter plant, located at the base of the dam is the low-service pumping station. In it are four $5\frac{1}{4}$ -mgd centrifugal water pumps, operating against a 120-ft head, driven by Elliott 150-hp, squirrel-cage induction motors. Operating in pairs they pump the raw water from the reservoir up to the filter plant. These low-service pumps are remotely controlled from the main control panel.

The filtration process includes aeration; treating the water with alum, lime, soda ash, carbon, chlorine, and other chemicals as may be required; and the usual mixing, settling, filtering, and pre- and post-chlorination. The chemicals are introduced into the raw water pipe line before or just after the aeration tank. When aera-

tion is used, air is introduced into the tank through porous lateral pipes from the three compressors driven by Elliott 20-hp, squirrel-cage induction motors located in the control building. After aeration the water goes to the valve house located in the center of four purification units and passes through one of these. The plant is so laid out, as to ultimately provide for eight units. The filter medium con-

lines. These pumps have a total capacity of somewhat over 20 mgd against a 255-ft head and are driven by Elliott 300-hp, squirrel-cage induction motors. There are provisions for a fifth high-service pump to take care of any future demands.

More than 140 miles of large-sized transmission and distribution mains have already been installed in Westmoreland County. New water supply



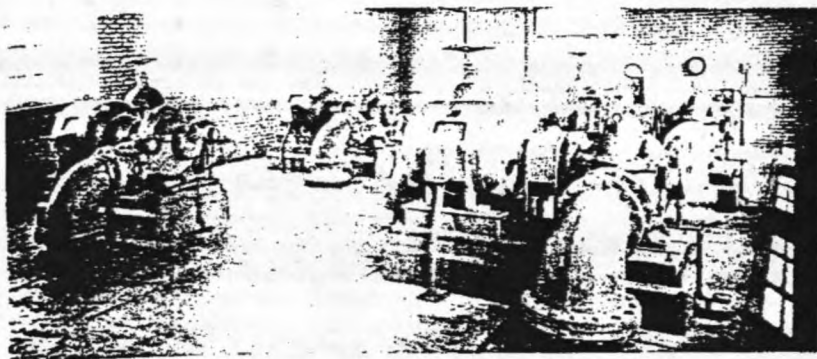
All of the plant's filtering and pumping operations are controlled from the main control panel which is located in this attractive stone building overlooking the dam.

sists of 30 in. of sand. The entire filter operation is remotely controlled pneumatically from a central control board. When the loss of head in the filter reaches the predetermined limit, an alarm bell and light notify the operator who then initiates an automatic washing cycle operation by pressing a button on the control board.

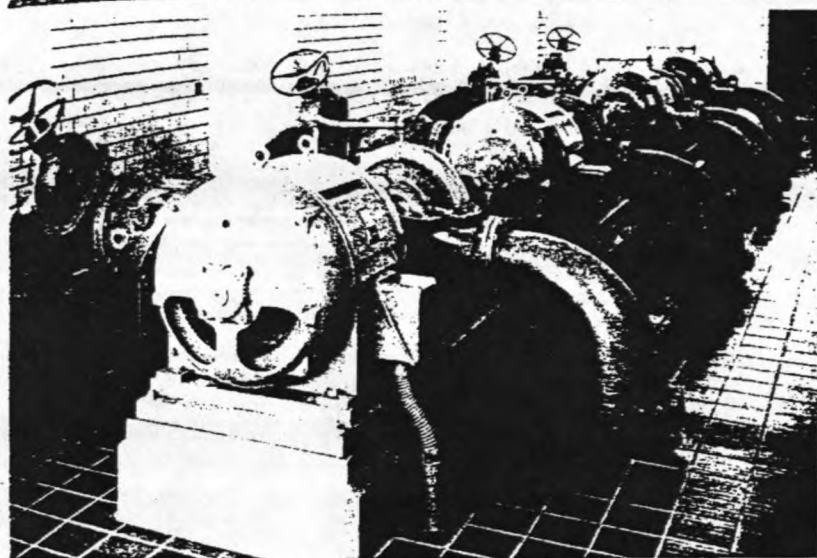
The completely treated water is stored in the clear well. From here the four high-service pumps pump the water to a valve head and loop connection to the main transmission

lines from the filter house include a 36-in. pipe line extending about 71,000 ft to the Greensburg-Jeannette distribution system in Jeannette. This line extends an additional 13,000 ft as a 24-in. concrete pipe to the Adamsburg Reservoir. Service to the Vandergrift-Leechburg system is through about 30,000 ft of 20-in. concrete pipe.

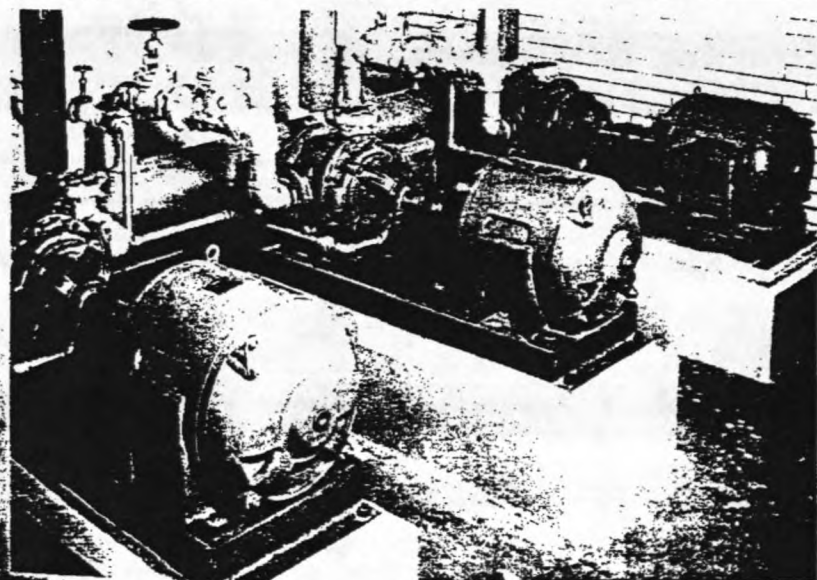
Several new industrial plants are moving into this area and one of the important factors in their choosing to locate in Westmoreland County is an adequate water supply.



In the low-service station, there are four motor-driven pumps: motors 150 hp, 1770 rpm; pumps 3650 gpm, 120-ft head.



The pump room in the high-service pumping station is good-looking. Floors are of red tile, walls of buff tile, and the motor-driven pumps are painted green. Elliott 300-hp motors drive 3475-gpm pumps at 1770 rpm.



Three Elliott Crocker-Wheeler, 20-hp, 1170-rpm motors drive Nash-Hytor compressors which furnish air for aerating water.

REVISED NEMA STANDARDS TO BE INCORPORATED IN ELLIOTT CROCKER-WHEELER MOTORS

THE National Electrical Manufacturers Association recently adopted a new set of standards. These standards affect polyphase squirrel-cage motors in ratings up to and including 30 hp at 1800 rpm. As a result of the new standards, more power will be packaged in less space—a trend of the industry over a period of years.

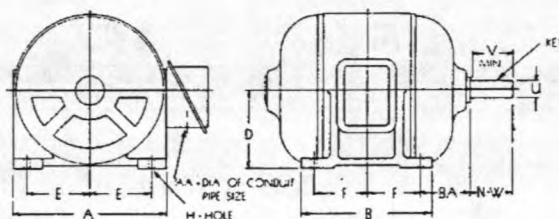
The present schedule calls for frame sizes 182 and 184 to be available January 1, 1954, with the additional required frame changes to follow at approximately five-month intervals per frame size. The program, according to present plans, should be completed by late 1955.

To assist manufacturers who incorporate NEMA motors in their products, we are tabulating critical mounting dimensions on these new frame sizes as well as a tabulation of frame assignments for the various horsepowers and speeds.

RATING COMPARISON

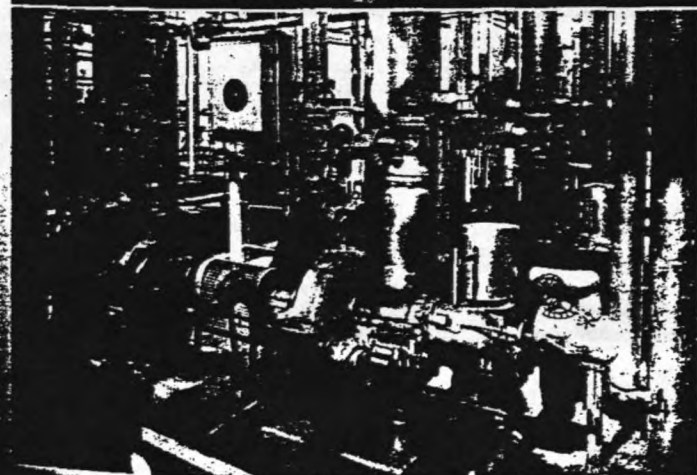
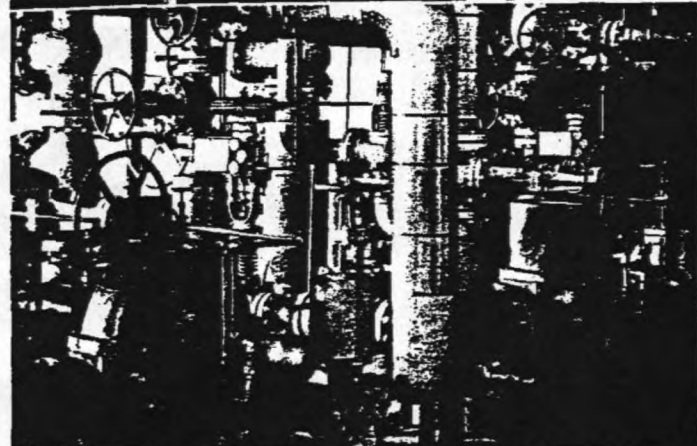
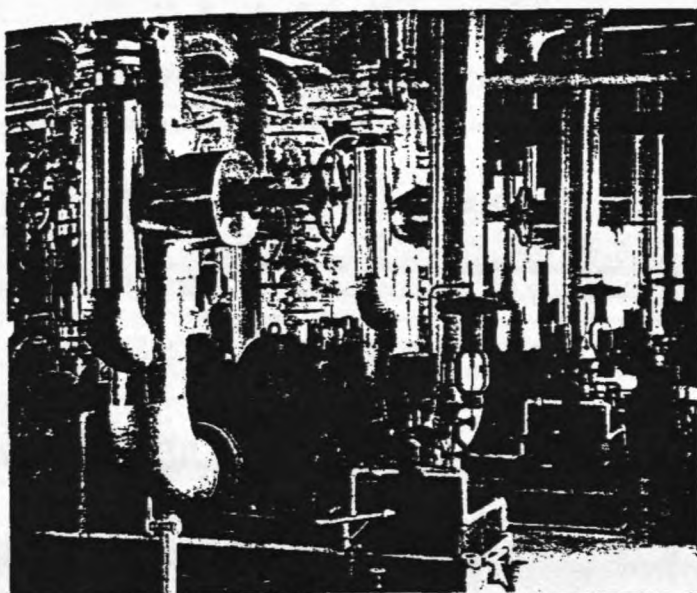
Black indicates present frames; red indicates new standards

H.P.	2-pole	4-pole	6-pole	8-pole		H.P.	2-pole	4-pole	6-pole	8-pole	
1/2	—	—	—	204 182	OPEN AND FAN- COOLED	10	284 254U	324 256U	326 284U	364 286U	OPEN AND FAN- COOLED
3/4	—	—	203 182	224 184		15	324 256U	326 284U	364 324U	365 326U	
1	—	203 182	204 184	225 213		20	326 284U	364 286U	365 326U	—	
1 1/2	203 182	204 184	224 184	254 213		25	364S 286U	364 324U	—	—	OPEN ONLY
2	204 184	224 184	225 213	254 215		30	364S 324U	365 326U	—	—	
3	224 184	225 213	254 215	284 254U		40	365S 326S	—	—	—	
5	225 213	254 215	284 254U	324 256		20	326 286U	—	—	—	FAN- COOLED ONLY
7 1/2	254 215	284 254U	324 256	326 284U		25	364 326S	365 326U	—	—	



DIMENSIONS (IN INCHES) FOR SINGLE-PHASE AND POLYPHASE SQUIRREL-CAGE INDUCTION
FOOT-MOUNTED MOTORS

Frame Number	Key			A Max.	B Max.	D	E	F	BA	H	N-W	U	V Min.	AA Min. Size of Conduit
	Width	Thick-ness	Length											
182	3/16	3/16	1 3/8	9	6 1/2	4 1/2	3 3/4	2 1/4	2 3/4	13/32	2 1/4	7/8	2	3/4
184	3/16	3/16	1 3/8	9	7 1/2	4 1/2	3 3/4	2 3/4	2 3/4	13/32	2 1/4	7/8	2	3/4
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215	1/4	1/4	2	10 1/2	9	5 1/4	4 1/4	3 1/2	3 1/2	13/32	3	1 1/8	2 3/4	3/4
254U	5/16	5/16	2 3/4	12 1/2	10 3/4	6 1/4	5	4 1/8	4 1/4	17/32	3 3/4	1 3/8	3 1/2	1
256U	5/16	5/16	2 3/4	12 1/2	12 1/2	6 1/4	5	5	4 1/4	17/32	3 3/4	1 3/8	3 1/2	1
284U	3/8	3/8	3 3/4	14	12 1/2	7	5 1/2	4 3/4	4 3/4	17/32	4 7/8	1 5/8	4 5/8	1 1/4
286U	3/8	3/8	3 3/4	14	14	7	5 1/2	5 1/2	4 3/4	17/32	4 7/8	1 5/8	4 5/8	1 1/4
324U	1/2	1/2	4 1/4	16	14	8	6 1/4	5 1/4	5 1/4	21/32	5 5/8	1 7/8	5 3/8	1 1/2
324S	3/8	3/8	1 7/8	16	14	8	6 1/4	5 1/4	5 1/4	21/32	3 1/4	1 5/8	3	1 1/2
326U	1/2	1/2	4 1/4	16	15 1/2	8	6 1/4	6	5 1/4	21/32	5 5/8	1 7/8	5 3/8	1 1/2
326S	3/8	3/8	1 7/8	16	15 1/2	8	6 1/4	6	5 1/4	21/32	3 1/4	1 5/8	3	1 1/2



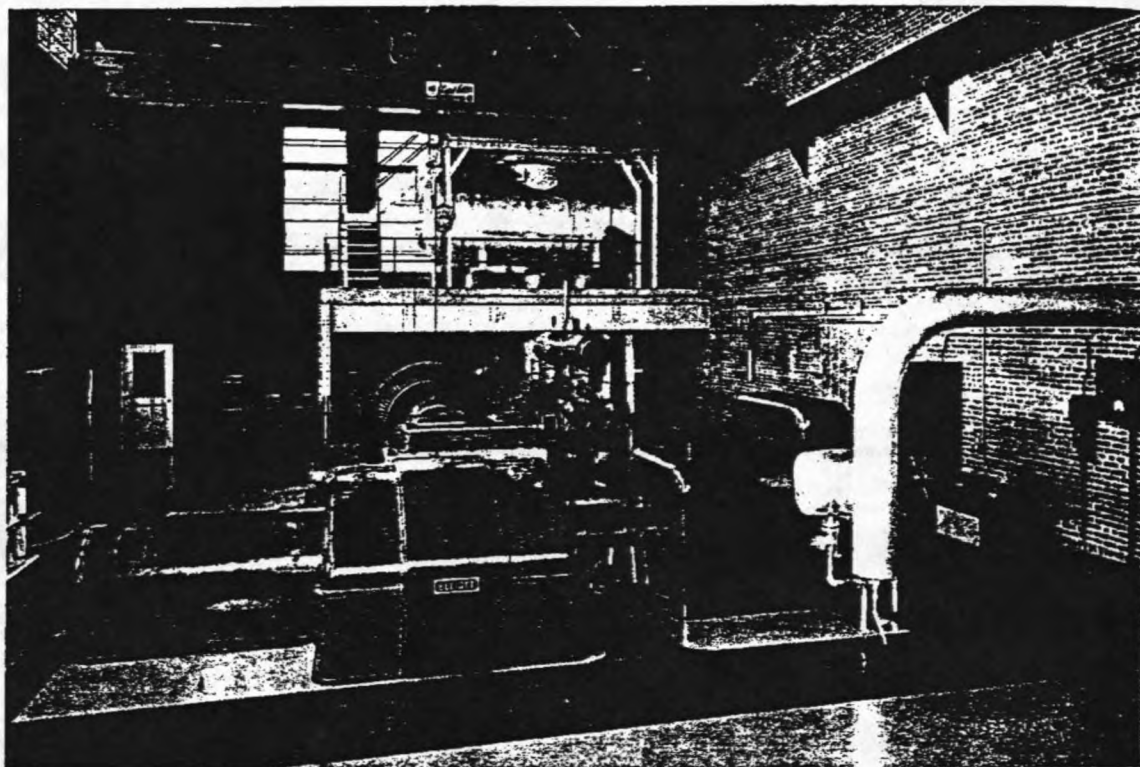
TURBINES IN GAS FIELDS

ELLIOTT steam turbines are at work in the gas fields in treating, processing, and cycling plants. They drive all sorts of pumps in many services and exhibit their versatility in their range of steam inlet and exhaust pressures, their easy speed, regulation, and governing arrangements. These typical installations are in Texas and New Mexico.

Above left—Three Elliott steam turbines driving hot oil pumps in field processing plant. These are heavy-duty, high-back-pressure turbines. Note the simple and effective installation of the atmospheric relief valves, which are located in the exhaust lines, just ahead of the shutoff valves.

These Elliott steam turbines are driving boiler-feed pumps in a gas-treating plant.

And these Elliott steam turbines are driving lean oil pumps in a cycling plant.



This view of the new Elliott 2000-kw turbine-generator unit also shows, in the background on balcony, the horizontal storage tank of an Elliott 200,000-lb-per-hr vertical deaerating feedwater heater which was installed several years ago when a new boiler plant was put in.

BACK-PRESSURE TURBINE-GENERATOR FOR MICHIGAN CARTON COMPANY

WITH the installation, in April 1951, of an Elliott 2000-kw turbine-generator, Michigan Carton Company of Battle Creek, Michigan, achieved a nice balance between power and steam-generating facilities.

To serve processing and heating demands, the company had been passing a large amount of steam through a pressure-reducing and desuperheating station. The exhaust steam from an existing 1250-hp turbine which drives a line shaft was not enough to satisfy process requirements, so the back-pressure turbine-generator nicely serves as a reducing

valve with the additional benefit of generating electrical power.

The turbine-generator operates in parallel with the local utility which maintains frequency and takes the electrical load swings. The load on the turbine is controlled by the demand for low-pressure steam. In winter, with the additional steam-heating demand, the turbine gives its rated capacity. The back-pressure regulator controls exhaust pressure exactly to the determined pressure as selected by process steam needs. Back pressure can be set anywhere between 30 and 60 psig, and the

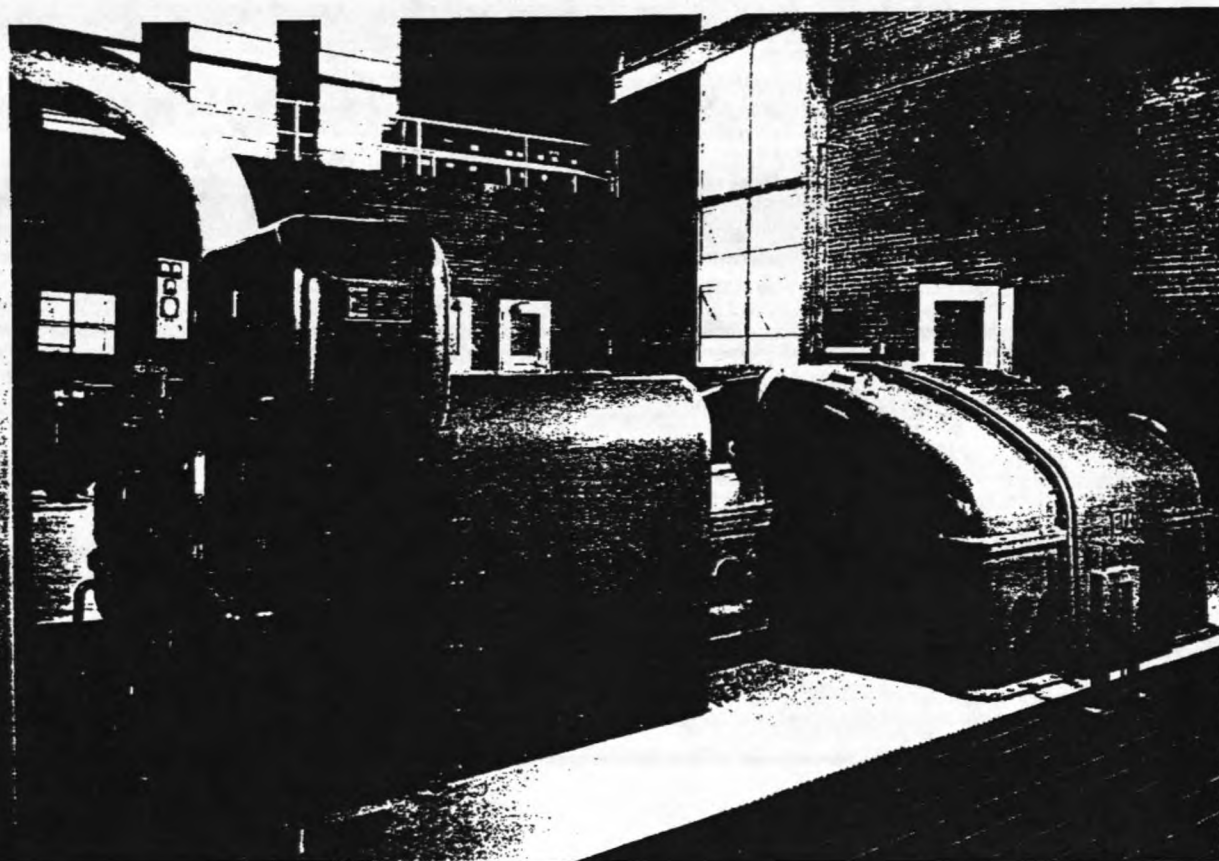
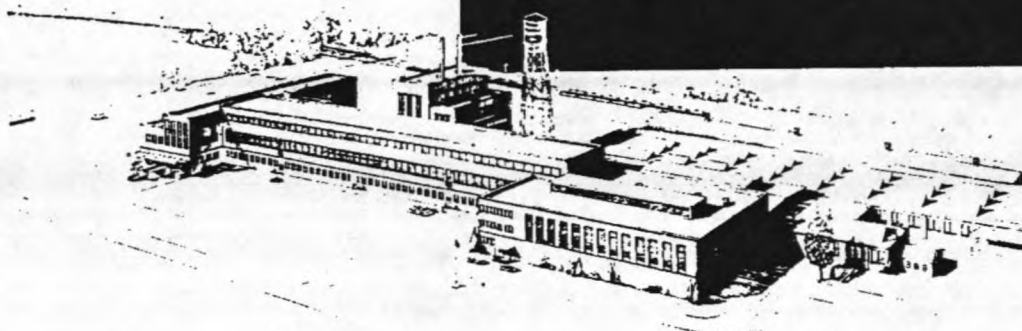
regulator controls to within four per cent of the set pressure.

The turbine-generator operates 24 hours a day, six days a week, this schedule permitting maintenance on week ends.

The Spring 1949 *Powerfax* recorded the installation of a 415 psig boiler, including an Elliott deaerating heater and turbines driving auxiliaries.

This Elliott 2000-kw back-pressure turbine generator operates in parallel with outside utility which maintains frequency and takes the electrical load swings. Steam conditions at the throttle are 400 psig, 563 F, and the turbine operates against a back-pressure of 30 to 60

Night photograph and architect's line drawing of the new Angel Street plant of Michigan Carton Company. This mill, located about two miles from the company's other plant in Battle Creek, went into service about four years ago and nearly doubled the output of folding boxboard.



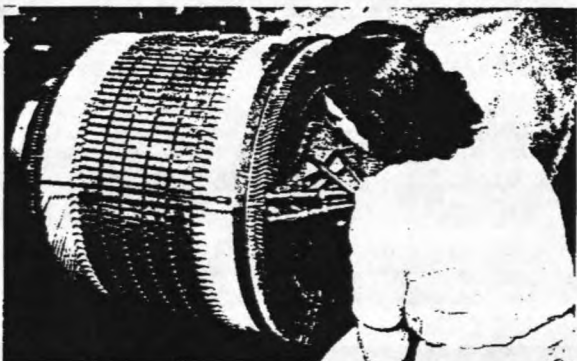
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On direct-current machines, the heavy, copper strap compensating-field connections are joined by silver-alloy brazing. The second workman is applying a flux, sometimes used when joining thick sections of metal.



Commutator risers, which take both mechanical and electrical abuse, are silver-alloy brazed to the coil ends.

Here the coils within phase groups of an a-c motor are permanently bonded together by silver-alloy brazing.



SILVER-ALLOY BRAZING MAKES BETTER MOTORS

AN electric motor or generator may include hundreds, sometimes thousands of electrical connections. Naturally, the strength, soundness, and electrical conductivity of each one of these individual joints is important.

A mechanically weak joint obviously is subject to failure, especially under the stresses, forces, and vibrations of service conditions. An electrically poor joint may mean high resistance, dangerously high local temperatures, or outright failure of an essential circuit.

Every step, then, in the direction of stronger and better electrical joints, contributes toward a more reliable machine. Such a step is the silver-alloy brazing of connections, as employed by Elliott Company.

Ordinary "soft soldering," familiar to us all, is conventionally used to make electrical joints. And soft solder is entirely suitable for connections which are not subject to serious mechanical or electrical abuse.

Where more extreme service conditions are anticipated, half-and-half solder or silver solder is often employed. Both have a higher melting point and produce connections that are generally superior to ordinary solder.

However, in certain applications where the electrical and mechanical loads applied to motor or generator windings are unusually severe, a truly permanent bond is needed.

In such applications, Elliott Company employs not a soldering, but a brazing operation in making electrical joints. Brazing is a method of joining two metals by the application of pressure and high temperature. A silver-alloy filler between the two hot metals melts and alloys with the metal surfaces. The result is a joint that is actually stronger than the un-joined metal. In addition, such a joint actually offers less electrical resistance than an equal length of the parent copper.

Severe overloads and unusual current surges cannot soften or weaken the brazed joint. And, being both strong and ductile, the silver-alloy connection is especially capable of sustaining vibration and mechanical or magnetic shock loads without damage.

Elliott Company has been pioneering the use of brazing in electrical equipment for more than ten years. The first application was in submarine propulsion equipment where duty was severe and failure unthinkable. Now, a majority of load-carrying joints in the larger Elliott motors and generators are made by silver-alloy brazing.

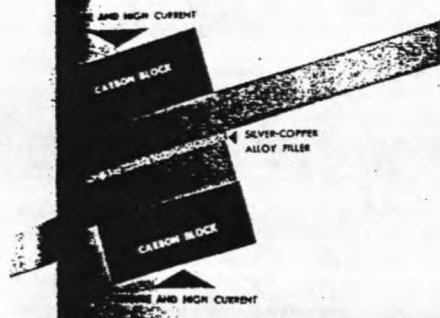
DRIND GENERATORS

What Is Silver-Alloy Brazing?

By definition brazing is:

"A group of welding processes which produce coalescence by heating to a suitable temperature above 800 F. and by using a non-ferrous filler material having a melting point below that of the base metals. The filler material is distributed between the closely-fitted surfaces of the joint by capillary action."

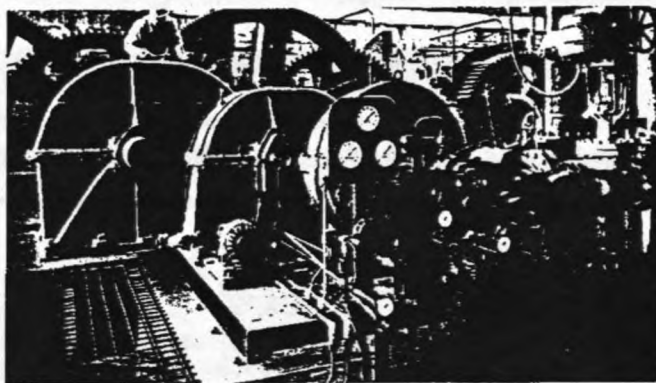
In the Elliott shops, brazing of motor and generator windings is done by current-carrying tongs, whose jaws



are carbon blocks. These tongs tightly grasp the two surfaces to be joined. Between the surfaces a thin shim of silver-copper alloy is placed.

When heavy current is applied through the jaws of the tongs, heat is quickly induced in the gripping carbon blocks and in the two metal surfaces to be joined. In seconds, the heat is sufficient to melt the filler and permit it to alloy with the metal.

When alloying is complete, refrigerated water is pumped through the tongs. This quickly cools the joint, traps all the brazing material in the joint for maximum strength and conductivity, prevents conducting heat to adjacent insulation.



The Elliott multi-stage turbine, showing the reduction gears in the background. Casings house the two reducers installed with the turbines and large gears in rear were used with old steam engine. Total speed reduction—4500 to 6 rpm.

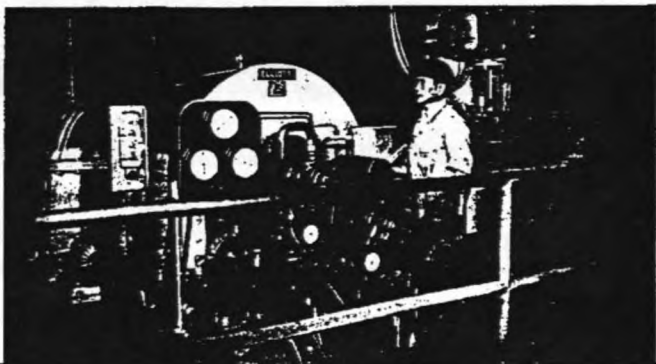
HAWAII'S FIRST TURBINE-DRIVEN SUGAR MILL

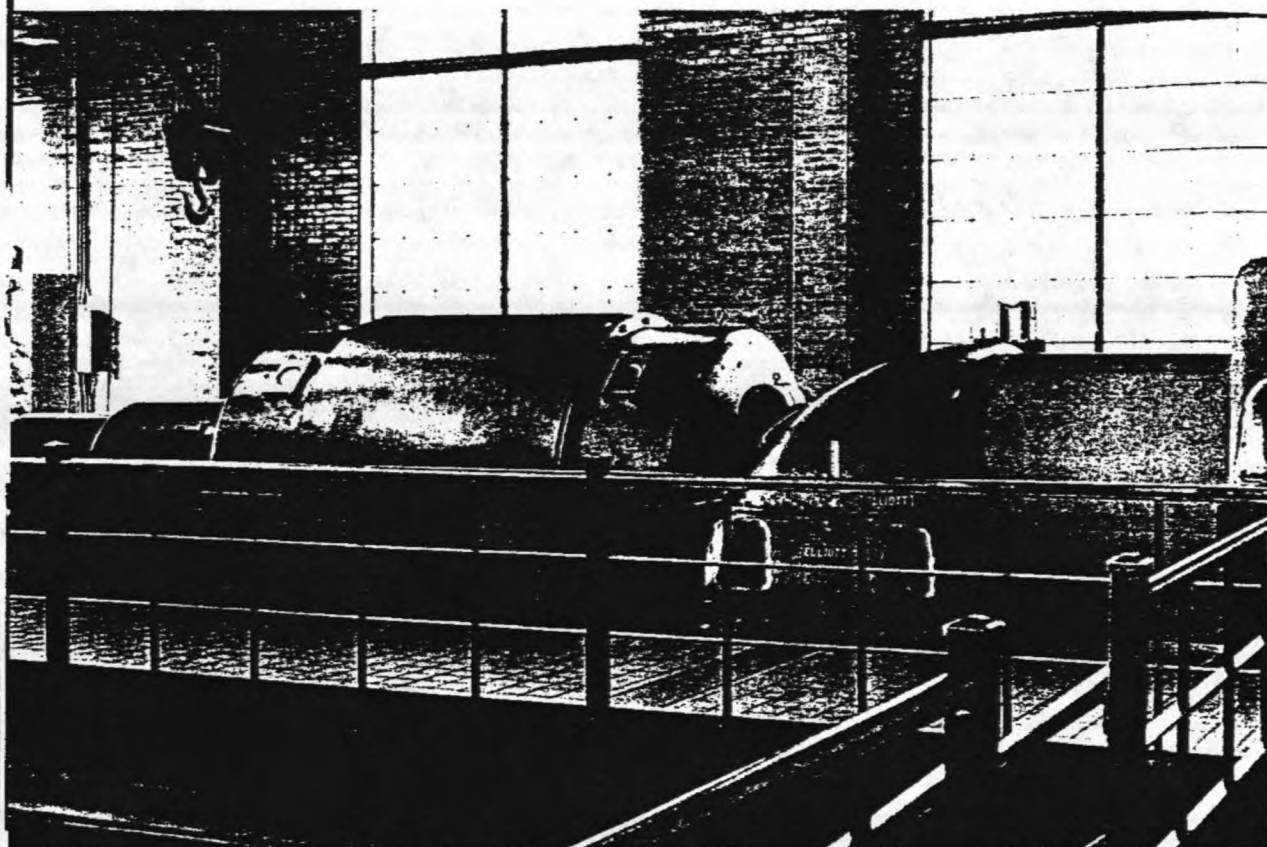
AN Elliott multi-stage, noncondensing turbine has the distinction of being the first turbine drive for a Hawaiian sugar mill. This installation on Oahu Island replaces a Corliss engine which had driven one of their tandem mills for the last 52 years. The new turbine is rated at 1430 hp, 4500 rpm. A series of reduction gears brings down this high speed in stages from 4500 to 1150, 1150 to 274, 274 to 23, and finally from 23 to 6 rpm, the speed at which the mill operates.

With the new turbine drive, oil in the exhaust steam, an inherent fault of a steam engine, is eliminated. Other advantages, according to the mill superintendent, include the ease of changing speed, the savings in maintenance and floor space, and the ability to operate the turbine by remote control. The cost of the new turbine was about one-third that of a new steam engine.

Improvements in arrangement also made during their off-season included moving this mill to a position in a direct line with the existing cleaning plant, thus eliminating four conveyor systems.

The turbine installation is completed and in operation. In the foreground of the picture can be seen the oil relay variable-speed remote controlled governor.





This view in the Frankfort station shows in the foreground the Elliott 6000-kw turbine-generator which was installed in 1942. In the background is the new 10,000-kw unit.

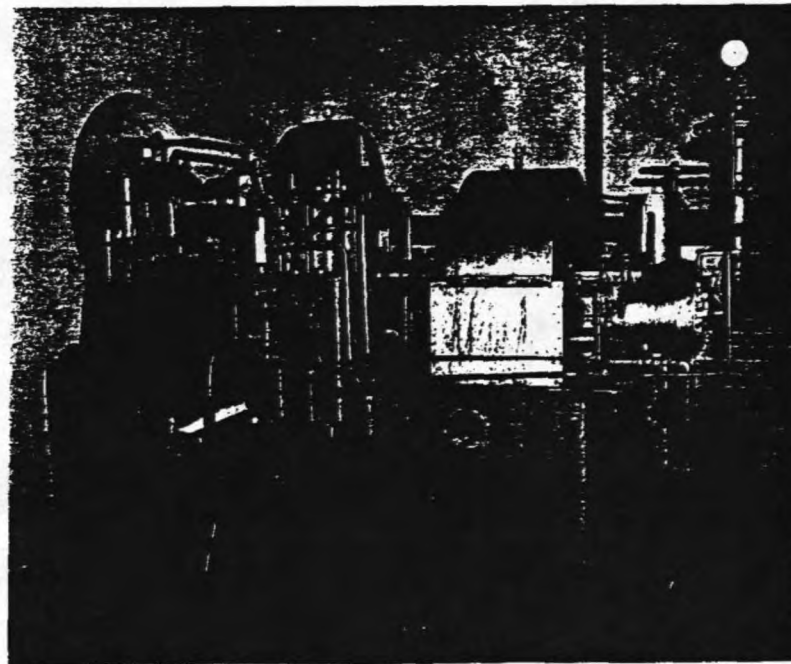


10,000-KW TURBINE-GENERATOR UNIT FOR FRANKFORT, INDIANA

A previous expansion of the generating station at Frankfort, Indiana, was covered by an article in the autumn 1943 issue of *Powerfax*. Just recently an Elliott 10,000-kw turbine-generator has gone on the line in this station. This unit, together with the preceding 6000-kw unit, is shown here. In connection with the new unit, Elliott turbines are used to drive condenser and boiler auxiliaries, as follows: a 210-hp geared turbine on the circulating water pump, a 20-hp turbine on the condensate pump, a 61-hp geared turbine on the forced-draft fan, and a 202-hp geared turbine driving the induced-draft fan. Similar Elliott turbines went in with a new boiler put on the line two years ago.

The new Elliott 10,000-kw turbine-generator unit.

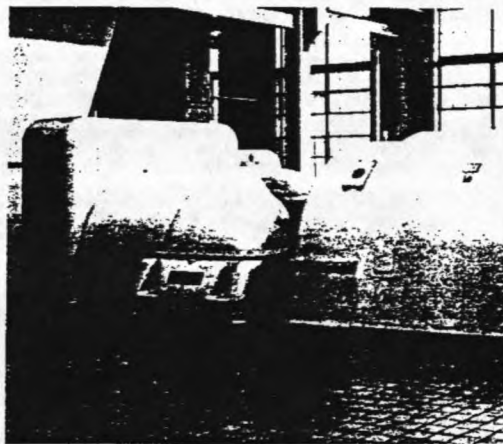
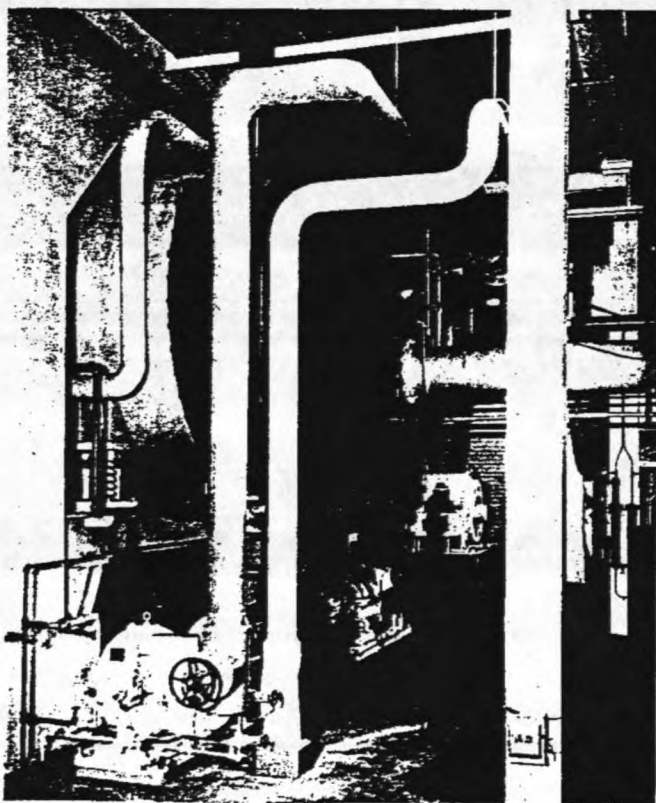
An Elliott 202-hp turbine, operating at 3828 rpm, drives the induced-draft fan at 1160-rpm through a separate vertically-offset reduction gear.



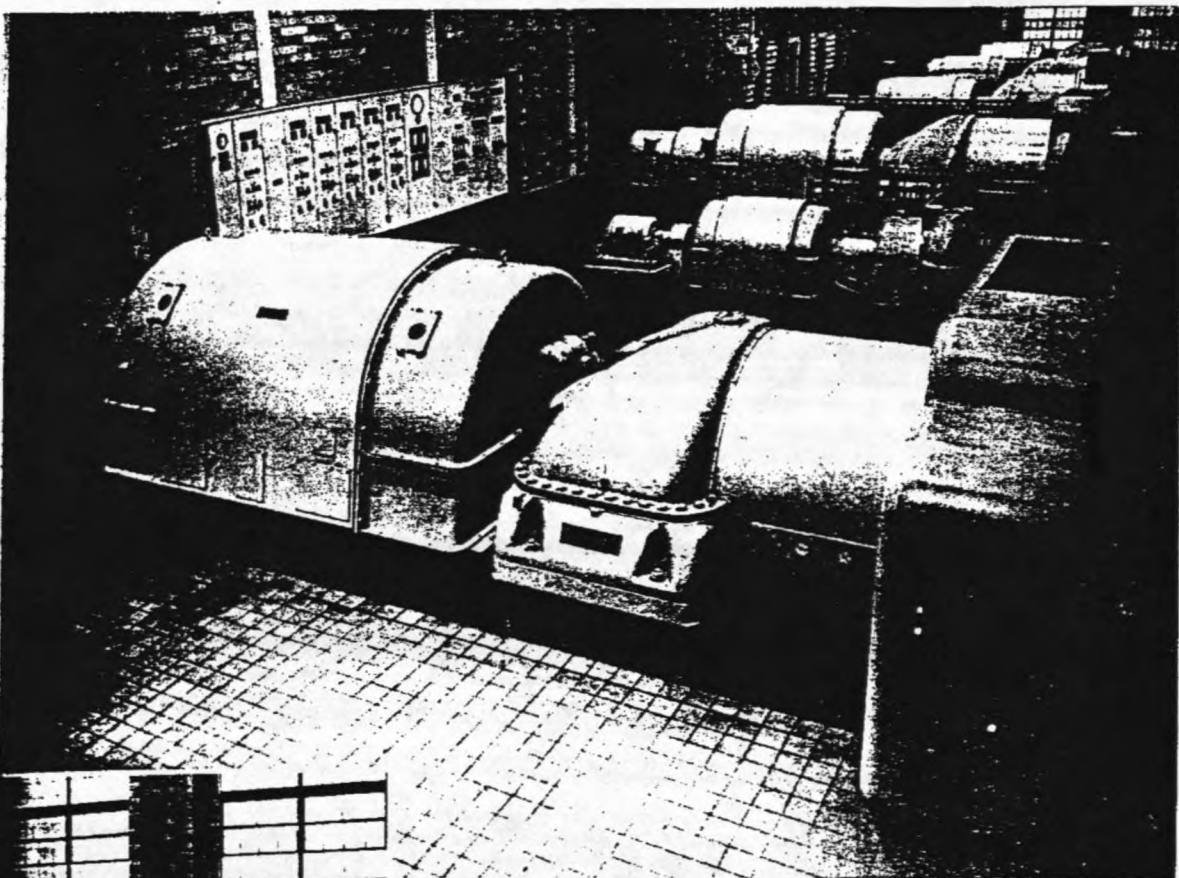
10,000-KW TURBINE-GENERATOR UNIT FOR PIQUA, OHIO

All-Elliott turbine-generator room features the Piqua, Ohio utility. Several articles in past issues of *Powerfax* have described this plant and its extensions. When first erected in 1934, the plant housed two 4000-kw units. In 1939 another 4000-kw unit was added. A 1946 expansion included a 7500-kw condensing turbine-generator and a 1000-kw noncondensing unit which was installed primarily to supply a 150-psig steam-heating main. The year 1951 saw the installation of a 10,000-kw turbine-generator, latest and largest in the station. The turbine is served by an Elliott 12,000-sq ft divided water-box surface condenser equipped with Elliott twin two-stage air ejectors. Elliott motors and turbines are used as dual drives on various auxiliaries.

A comprehensive article descriptive of the latest expansion of the Piqua plant is being published in the June issue of *Industry & Power* and the July issue of *Consulting Engineer*. This article by C. J. Lahman, mechanical engineer, W. I. Barrows and Associates, consulting engineers of Dayton, Ohio; and John P. Gallagher, director of municipal utilities at Piqua, contains a complete discussion of the thinking behind the expansion program. The article is illustrated by photographs and ten charts and curves illustrating studies of load, fuel costs, steam conditions, turbine size, and generating costs. We will endeavor to furnish reprints of this article to interested *Powerfax* readers.



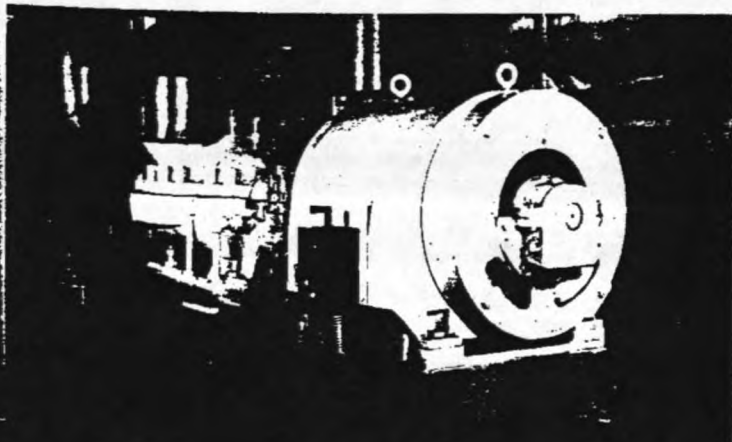
Reversing box end of the new Elliott 12,000-sq ft divided water-box surface condenser which serves the 10,000-kw turbine. Shown in the picture in the foreground is an Elliott 25-hp turbine driving one of the condensate pumps and in the middle foreground is an Elliott 25-hp motor driving another condensate pump. In the background may be seen an Elliott 200-hp motor driving the induced-draft fan.



This is how the Piqua turbine room looks at present with the 10,000-kw unit in the foreground followed by the 1000-kw noncondensing unit, a 7500-kw unit installed in 1936, and three 4000-kw units which went into operation in 1934 and 1939.



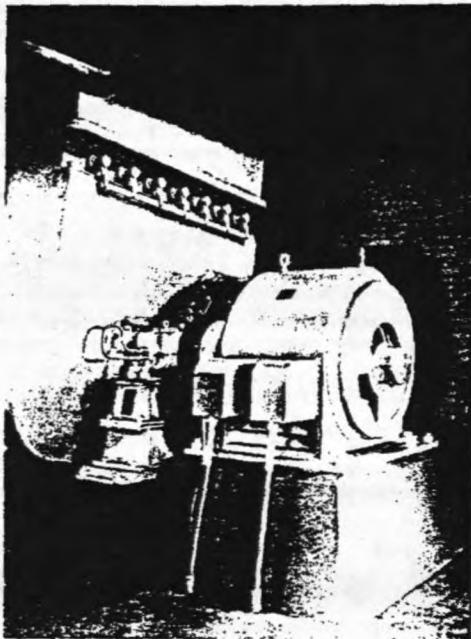
A close-up of the new 10,000-kw machine which was specified to include the next size larger generator.



An Elliott Crocker-Wheeler 200-hp, 3600-rpm motor driving a boiler-feed pump. Another boiler-feed pump is driven by an Elliott 200-hp steam turbine.

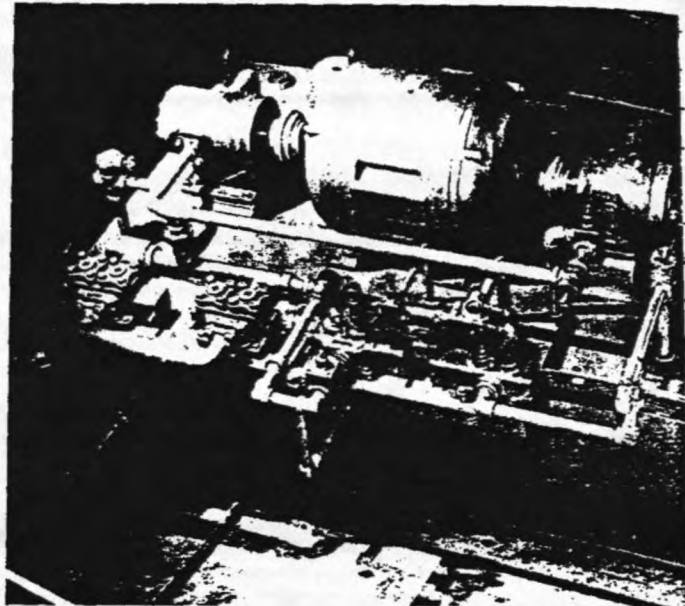
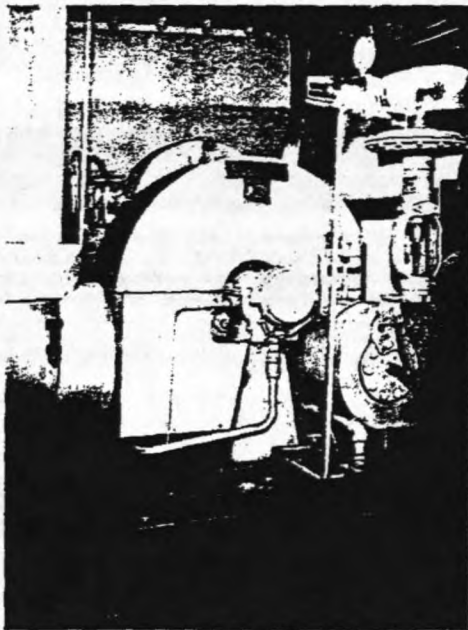
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This 200-hp motor drives the induced-draft fan. A 75-hp motor or geared turbine may drive the forced-draft fan.

This Elliott 200-hp, 3500/700-rpm geared turbine may also drive the induced-draft fan, in dual-drive arrangement.



HYDRAULIC PRESS FOR BAL

WE have all driven down the highway and looked at the automobile graveyards, and possibly wondered what becomes of these skeletons of old or wrecked cars after all usable parts have been stripped from them. If you pursued this question, you would find that even these twisted bodies and frames are not allowed to rust away in peace, but are really a vital part of the hundreds of shiny new cars rolling off the assembly lines in Detroit every day. They are part of that essential ingredient, steel scrap, needed in the making of new steel.

To make it easier and more economical to ship this scrap, the D and J Press Company, Incorporated, of Buffalo, New York, has built a scrap baling press that is large enough to take a modern automobile frame and all, together with other sheet metal scrap, and compress it into a 2-ft square by 5-ft long bundle weighing about one ton.

One of these hydraulic presses, shown operating in the yard of the Lancaster Iron and Metal Company, Lancaster, New York, has a charging box 6-ft wide, 5-ft deep, and 14-ft long. The compression is furnished by two 14-in. and two 17-in. 2000-lb cylinders. The construction is heavy boiler-plate welded, and the box and platens are lined with $\frac{3}{4}$ -in. "High Carbon" steel plates to resist abrasion where the greatest friction and wear occur.

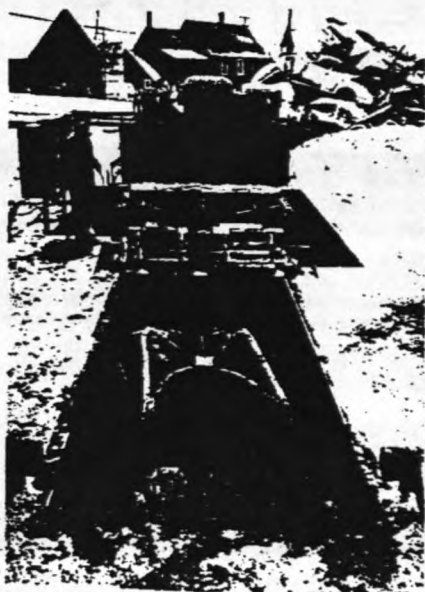
The power for this tremendous press is supplied by two 75-hp, 1150-rpm, Elliott Crocker-Wheeler, drip-proof, squirrel-cage, induction motors driving the 150-hp pumping unit. The cycle of compression is only 70 seconds. All work in the operation of this press is performed by the hydraulic cylinders.

An Elliott Crocker-Wheeler 75-hp, squirrel-cage motor mounted on top of a D and J hydraulic press pumping unit.



An automobile body being lowered into the charging box.

INTEEL SCRAP

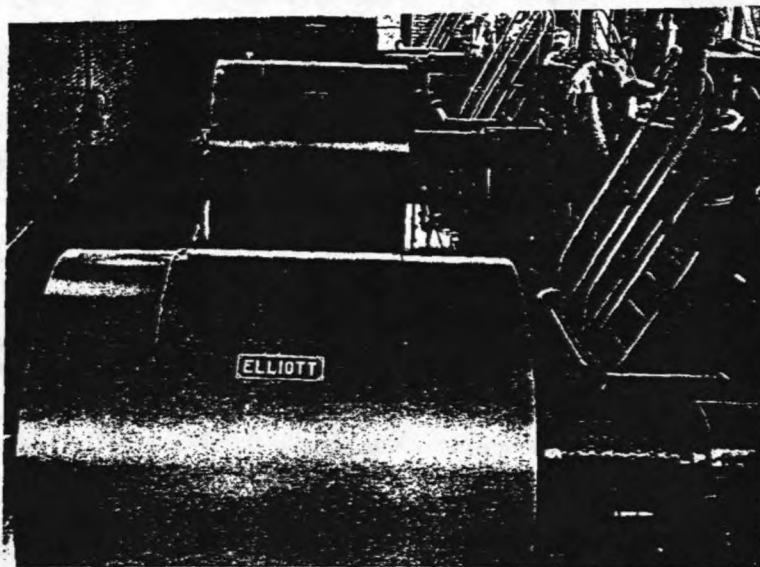


All loaded and ready for the "big squeeze."



Once-proud Buick reduced to bale of scrap ready for steel mill open hearth.

Editor's Note: The photographs shown here were taken before the equipment was enclosed.



Interior of the Wheelersburg, Ohio, compressor station of Texas Eastern Transmission Corporation shows three Elliott 2500-hp, two-pole induction motors directly connected to centrifugal compressors. These motors, specially designed for pipe-line service, are completely enclosed and base ventilated. The article below discusses advantages of this arrangement.

BASE-VENTILATED MOTORS FEATURE TEXAS EASTERN'S NEW COMPRESSOR STATIONS

SOMETHING new in centrifugal (blower-type) natural gas compressors has been introduced on Texas Eastern's pipe lines. Four compressor stations on the company's new 30-in. line and one of the two stations near Little Rock, Arkansas, wear a new look resulting from the elimination of the familiar brick wall separating compressors from the electric motors which drive them. The new arrangement is made possible by a pressurized motor-cooling system which completely isolates motors from air inside the compressor building.

At other Texas Eastern centrifugal station installations, motors are cooled by individual internal fans which circulate air from within the motor room, through the motors and back into the

room. Because working parts of such motors must be partly exposed to permit circulation of inside air, a room-length brick wall flush with all connecting surfaces serves as a barrier

A special waterless oil-cooling arrangement is used on these motors. The air-cooled oil reservoir is shown in this inside view of a bearing bracket. Heat-radiating fins lie in the path of incoming ventilating air. This feature eliminates the complexities of water circulation and the need for water, which is scarce in many pipe-line compressor station locations.



against any ignitable fumes should they ever be present in the gas-piping area of the building where the compressors themselves are located. Drive shafts connecting motors and their respective compressor units operate through airtight glands in the compressor building's brick wall.

The new-type compressor stations feature heavily encased, sealed motors cooled by outside air, forced under pressure in and out through airtight ducts. This development permits operation of motors and compressors in the same room, conservation of space, simpler maintenance procedure and makes possible "package" supervision of the entire motor compressor assembly in operation.

Because heat is dissipated more effectively by cooler and cleaner

air, (the air is filtered before it is circulated through the motors) the longevity of motors is enhanced and maintenance problems are reduced. Operating efficiency is increased, too. Because the operator has an over-all view of the compressor station interior. An incidental advantage is that motors operate more quietly.

A 54-in. fan, located outside the building and driven by a 15-hp motor furnishes cooling air for all motors in the station. The fans force air into concrete tunnels running underneath the compressor buildings. Built into these tunnels are outlets to the compressor motors. Pressurized air is forced up through the opening

into the motors. Here internal fans circulate the air throughout the motors to insure adequate ventilation and cooling of all parts. From the motors the air is forced into discharge tunnels which carry the ventilating air out of the buildings. Although motor ducts are connected to common intake and discharge tunnels, regulators control the intake and exhaust at each motor so that one motor does not use more than its share of the air intake to the detriment of the other motors. This intake and discharge of air is a continuous process and, should a station fan motor fail, a stand-by motor automatically goes into operation.

An extra measure of protection is

provided by the new centrifugal station design. Motors cannot be turned on until the fan system has been started and all old air within the motors has been exhausted outside the building.

Another feature incorporated into the design of the pressurized air circulation arrangement is the provision for space heating during cold weather by means of grilles and dampers over the exhaust tunnel which allows heat from ducts carrying the motor-warmed air to be circulated within the building.

EDITOR'S NOTE: The foregoing is condensed from an article which appeared in a recent issue of *The Inch*, published by Texas Eastern Transmission Corporation.

OUTDOOR STATION FOR CALIFORNIA UTILITY

THIS interesting photograph of California Electric Power Company's Highgrove Station was made by taking the picture twice. The first exposure was taken in daylight to bring out details and the second was a night shot from the same position with the lights on. Either by night with these gleaming plant lights or by day with its unusual desert tones of tan, dusty red, blue, and green, the station captures the eye of the many passing motorists. As visitors come

closer, they find the plant is surrounded by landscaped lawns and even boasts a small lake on the grounds.

This latest addition to the California Electric System went into operation in June of 1952. At present two 325,000-lb-per-hr boilers supply steam to the two 30,000-kw turbine-generators. With only four men per shift needed to operate these units, the plant seems to run itself. Designed and built by the Fluor Corpo-

ration of Los Angeles, this is the most completely "outdoor" power plant on the west coast. All component parts, with the exception of the operator's control room and the 2400-volt switchgear, are out-of-doors. With this construction we are able to get an unusually good view of the two Elliott deaerating feedwater heaters mounted above the boilers on the boiler-supporting steel structures. See page 2 for a close-up of one of the deaerating heaters.



HOW A TUBE CLEANER HELPS LICK GAS LEAKS

by I. S. WEBSTER, Public Service Electric and Gas Company, Newark, New Jer

HOW would you fix a leak in an underground gas pipe?

The answer would seem obvious—dig down to the pipe, then patch it or replace it.

However, in many urban areas, gas lines lie beneath paved streets and sidewalks, often snake their way among a maze of telephone, electric, and fire alarm ducts, as well as sewer and water lines. Under these circumstances, extensive excavation and repair work can be both difficult and expensive.

Some 20 years ago, experiments were begun by some utilities on a new method of replacement of faulty gas service lines which involved the insertion of a rigid or a soft liner inside the faulty service main. This method has now been successfully developed into an established maintenance procedure by the Public Service Electric and Gas Company, Newark, New Jersey.

The method employed by Public Service is, very briefly, this. First, the location of offset fittings in the faulty service is determined either from the utilities records or by probing with a rigid snake from the basement being served. Then, a small local excavation is made to permit cutting the

service line near the main. The line is cut and the main is plugged at that point.

Then, a 90-lb blast of compressed air is shot through the line from the basement, cleaning away all loose foreign matter. Any fittings previously located are removed. The next problem is to ream thoroughly the inside of the service to its nominal diameter. This is the most important step in the entire procedure and is accomplished by using a heavy-duty Elliott tube cleaner.

This small but powerful reamer consists of a cutting head driven by an air-driven motor. It is connected to a length of compressed air hose and is pushed through the gas line from the main toward the basement. It must be capable of removing all burrs at fittings as well as inside lap welds, hard scale, tar, and other restrictions.

The shell of the tube cleaner motor must be the same diameter as the soft copper tubing which is to be inserted in the old main. It thus serves as a plug gage to insure that all restrictions have been removed from the pipe which might interfere with the passage of the tube insert. The outside diameter of tube cleaner

motor and tubing must be $\frac{1}{2}$ in. less than the old service through which the tube is pulled. After the tube cleaner has been passed through the service line, the line is again blown out with compressed air.

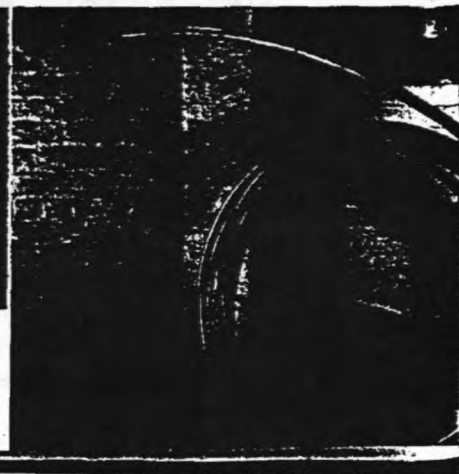
Next, a small air-driven hoist windlass is mounted in the excavation at the end of the old gas line. Flexible cable from the hoist is snaked to the basement through the pipe and attached to the copper tube insert. An ingenious, expandable gripper capable of an 1800-lb pull is then inserted in the end of the tubing, grasping it firmly.

The end of the copper tube covered with lubricant to ease passage through the pipe, and the tube is entered into the old service pipe in the basement. Then the hoist hauls the tube through the length of the service. Basement main connections are then made using special compression fittings designed for this purpose.

After more than 2000 renewals of this equipment and procedure have proved to be a very effective factor in reducing costs and man-hours both in normal maintenance work and for long range economic results in emergency renewals. While

An Elliott "Roto" heavy-duty tube cleaner with universal joint and drill head reams out scale, tar, and other obstructions from the old service line.

Copper tubing, covered with lubricant to ease its passage, is entered into the old service line from the basement.



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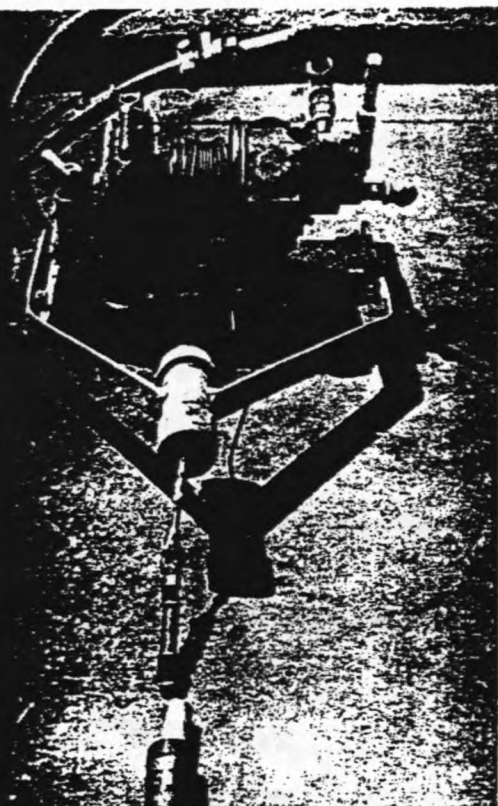
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financial savings of 50 to 65 per cent are very impressive, the increase in production of 350 per cent is of vital importance to the maintenance engineer today. The fact that service interruptions are cut 75 per cent by this method is also very important to the operating man and greatly improves customer relations.

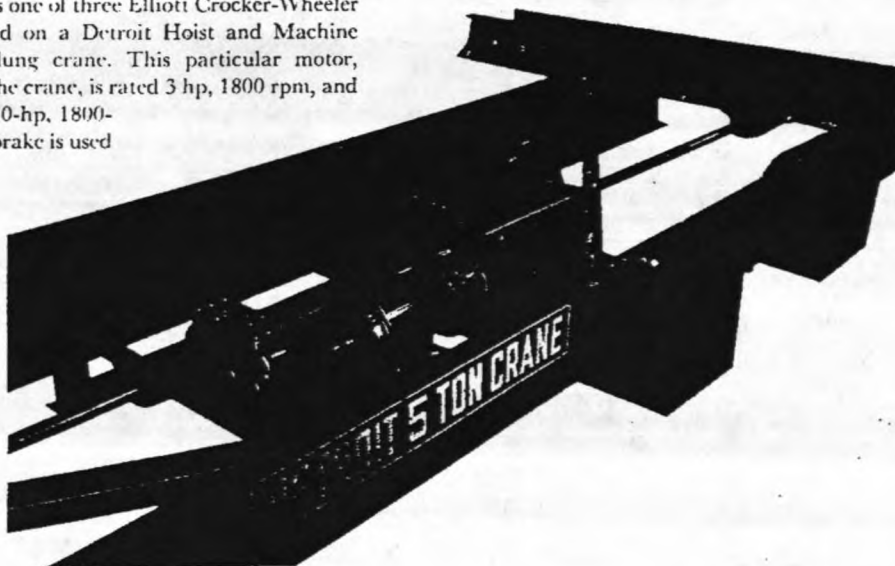
The necessary special equipment and tools required to realize the economic and physical results mentioned are available in "kit" form from the Mulcare Engineering Company, 53 Park Place, New York City. These kits cover renewals from 3/4 in. to 1 1/2 in. inclusive, utilizing the maximum size tubing with pressures ranging from 4 in. water column to 50 psi. These kits also include detailed step-by-step instructions to produce maximum economic results.

Indispensable to this program is the humble tube cleaner. Developed and pioneered by Elliott Company for removing scale from boiler tubes, the tube cleaner has since found hundreds of uses far removed from its original purpose and certainly never dreamed of by its designers. This tube cleaner is by far the most important tool in the kit required for this operation.

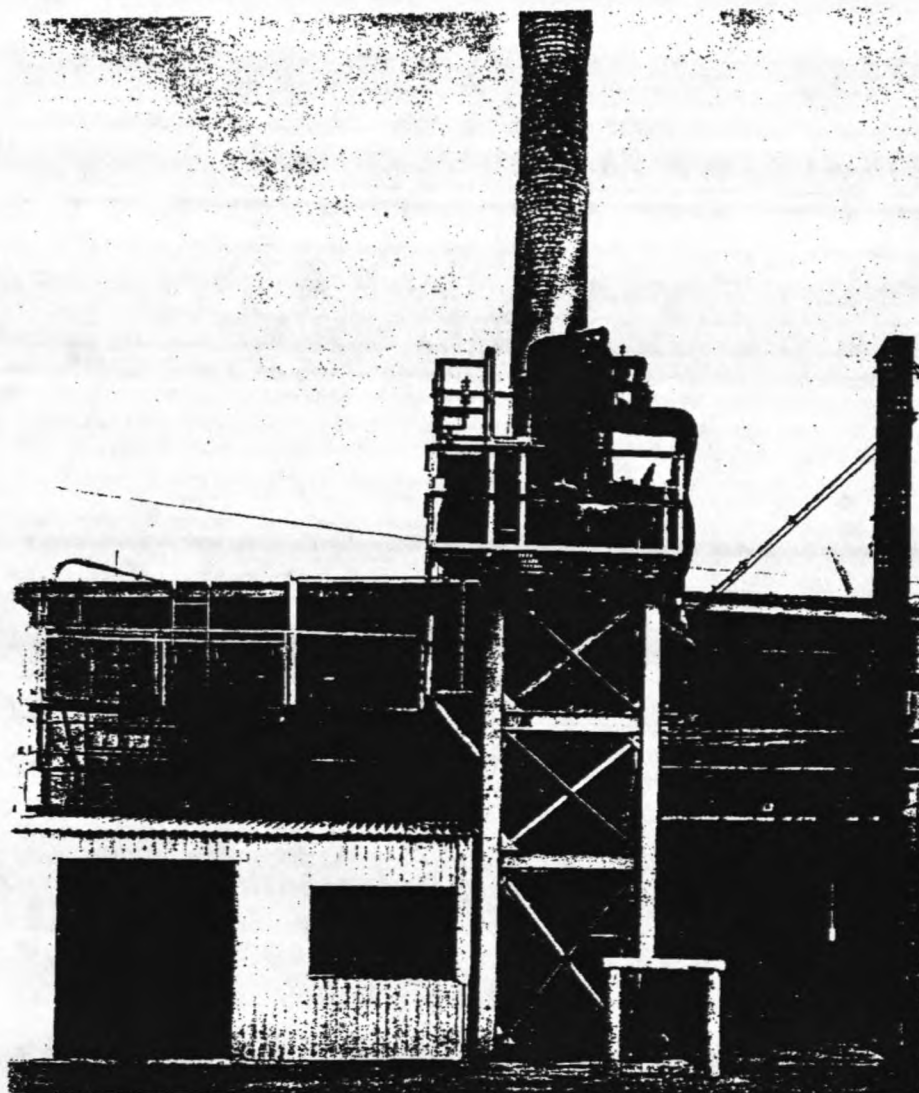
This air-driven hoist hauls the copper tubing insert through the old service pipe. Service line and new copper insert can be seen in the foreground. Note ingenious, expanding gripper on the end of cable.

BRAKE MOTORS ON CRANES

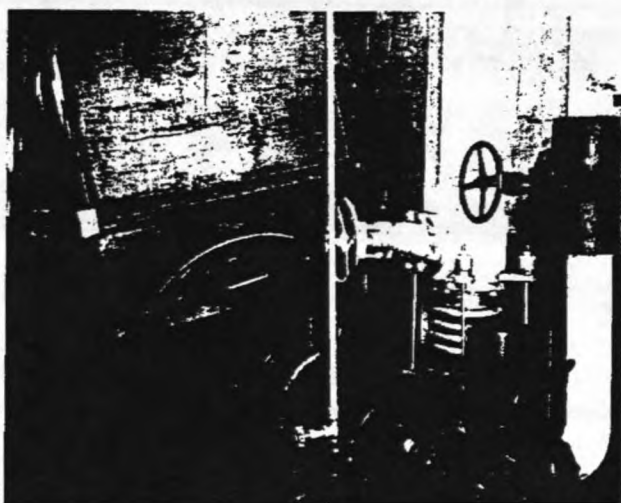
THE photograph shows one of three Elliott Crocker-Wheeler brake motors installed on a Detroit Hoist and Machine Company 5-ton underslung crane. This particular motor, located on the bridge of the crane, is rated 3 hp, 1800 rpm, and it has a 5-lb-ft brake. A 10-hp, 1800-rpm motor with 50-lb-ft brake is used on the hoist and a 2-hp brake motor on the trolley. All motors are of the wound-rotor totally-enclosed type.



This photograph shows the low headroom type of boiler plant and very nicely illustrates how the new Elliott 30,000-lb-per-hr deaerating heater was placed outdoors on a steel structure.



Elliott steam turbine drives are shown below. At left is a 14-hp turbine driving the newly installed induced-draft fan, and at right 25-hp turbine driving the boiler-feed pump. The turbines take steam at 80 psig, 324 F and exhaust against 101 psig back-pres



BOILER PLANT MODERNIZATION INCLUDES . . . DEAERATING HEATER AND TURBINE DRIVES

by J. P. ALLEN, Field Engineer, Elliott Company, Boston, Mass.

THE Socony-Vacuum Oil Company has recently completed the installation of a 30,000-lb-per-hr oil-fired Babcock & Wilcox water-tube boiler with turbine-driven auxiliaries as the final step in a boiler plant modernization program at its East Boston, Mass. tank farm.

The boiler plant, previous to modernization, included four horizontal return-tubular boilers, operating on natural draft, with closed feedwater heater and reciprocating steam-driven boiler-feed pumps. The first step in the program, completed in 1949, was the installation of an Elliott deaerating feedwater heater rated 30,000 lb per hr, consisting of a vertical tray heater with internal vent condenser mounted upon a large horizontal storage tank.

Since the boiler plant had low head-

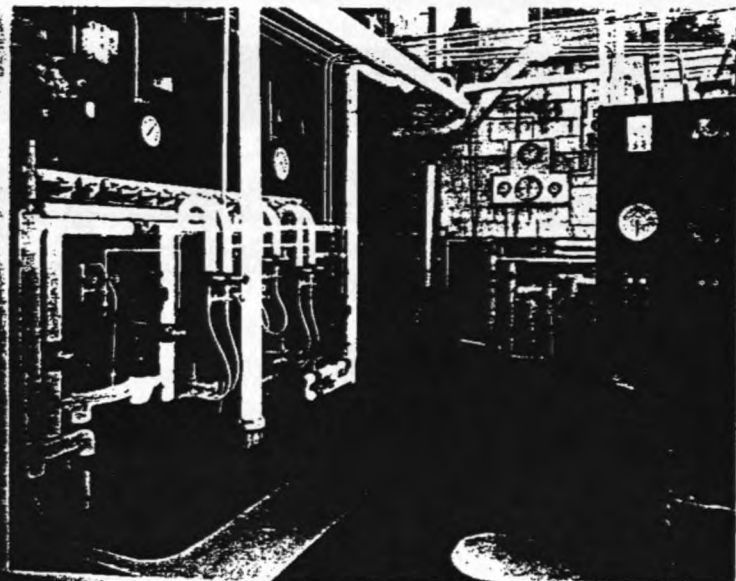
room and a minimum of free space, it was decided to locate the deaerating heater outdoors on a steel structure, thus permitting adequate submergence on the boiler-feed pumps without the extra expense of a penthouse or a building extension. Special attention was given to piping arrangement to prevent possibility of freezing in severe weather. A convenient gage board was located in the operating room to provide steam- and water-pressure readings as well as remote water level indication with high- and low-water alarms. Operation has been entirely trouble-free and substantial fuel savings have been effected by elevation of feedwater temperature using low-pressure steam which would otherwise have been wasted.

The final step in the program consisted of installing the water-tube

boiler in place of two of the old boilers. Since the existing stack was not adequate to serve the new boiler on natural draft, a Prat-Daniel induced-draft fan direct-connected to an Elliott turbine was installed with a unique arrangement of duct work to fit the space limitations, as shown in the photograph. Also an Ingersoll-Rand centrifugal boiler-feed pump driven by an Elliott turbine replaced one of the old steam pumps. A two-element boiler feedwater regulator, chemical feed pump, and automatic combustion control were included.

The turbines take steam at 80 psig, 324 F and exhaust against 10 psig back-pressure for feedwater, oil tank, and general heating.

Operation of the new boiler has been very satisfactory and additional fuel savings are being experienced.

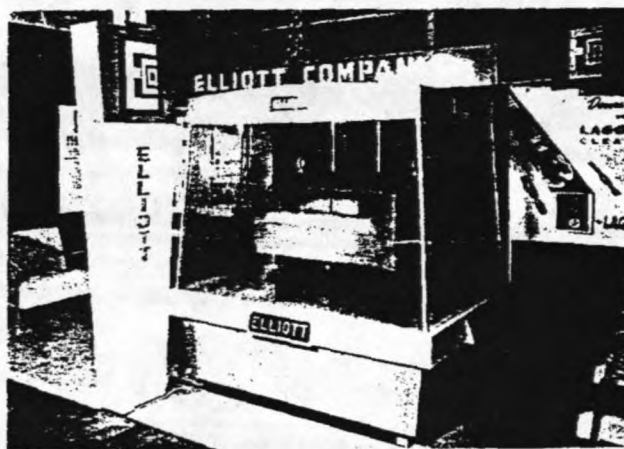


The new Babcock & Wilcox 100-psig, integral-furnace boiler, showing the three forced-draft, steam-atomizing oil burners. Also to the right of the boiler can be seen the combustion control panel.

INTERNATIONAL PETROLEUM EXPOSITION



Day before the show opens, R. L. "Bob" Henry of the Elliott Tulsa office checks the operation of the outdoor splashproof motor water-test display.



THESE photographs show a portion of Elliott exhibit at the International Petroleum Exposition, better known as the "Show," which is held in Tulsa, Oklahoma every few years. The show, which opened May 14 and continued for ten days, broke previous records for size and attendance. One of the world's biggest industrial displays. The Exposition covered 28 acres, boasted exhibitors showing equipment and machinery valued at \$100,000,000. A half-million people came to view the displays.

Elliott Company's exhibit featured a 10 hp outdoor splashproof (weather-protected) motor. This motor operated in a glass enclosed "torture chamber" while suffering a drenching downpour of water from a series of nozzles. Details of the ingenious splashproof motor enclosure were visible through a transparent air inlet chamber and end bracket.

Specifically designed for installation outdoors, this motor culminates more than 10 years of experiment, test, and development work by Elliott Company. Its enclosure excludes moisture and dirt from the motor interior, even under the severe operating conditions imposed by dust storms, salt blizzard, or downpour. This is accomplished without the cost and complexity of a fully enclosed construction.

The Elliott outdoor-splashproof motor makes it possible to eliminate costly building or housings, permitting both motor and unit to operate safely outdoors. No foundation or ventilating ductwork required. They are operating all over the country—Montana to Texas.

A closer view of the outdoor motor display. Heavy-duty truck-type windshield wipers were necessary to permit study of the motor while it operated under a deluge of water coming from nozzles in four



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Son: "Dad, what's a traitor in politics?"
Father: "A man who leaves your party and goes over to another."
Son: "What about a man who leaves another party and comes over to yours?"
Father: "He's a convert, son, a convert."
★
Some gals are discreet—up to a pint.
★
Wife: "I didn't like that new secretary of yours so I discharged her this morning."
Husband: "Before she got a chance?"
Wife: "Before you got a chance!"
★
Irate Golfer: "You must be the world's worst caddie!"
Caddie: "Hardly. That would be too much of a coincidence."
★
A psychiatrist says that talking will cure a lot of our troubles. We don't believe it. Talking was what started most of them in the first place.
★
Work—something that when we have it we wish we didn't; when we don't have it we wish we did, and the object of it is to be able to afford not to do any some day.
★
The bather's clothes were strewed by the winds that left her nude.
When a man came along,
And unless I am wrong,
You expected this line to be lewd.
★
Young Ez Tike's wife is a wonder—last year she knitted Ez a pair of socks out of an old bathing suit, and now she's knittin' herself a bathing suit out of one of those socks.
★
A woman with a newly developed interest in government wrote to the editor of a big newspaper: "I want to get into politics. Do the taxpayers have a party?"
The editor answered her letter, writing: "Very seldom, lady, very seldom."

He worked his way through college,
As heroes often do.
Now he's back where he started,
Working his son's way through.
★
A summer resort is often a pleasant strutting-ground where nobody knows how unimportant you are at home.
★
A scientist says that in another 100 years there will be no blondes left in this country. No doubt. It's hard to leave one now.
★
Jim—"What was all the excitement at your place last night?"
Tim: "Oh, a girl was playing a violin in her pajamas and a string broke."
Jim: "On her violin?"
Tim: "Naw, on her pajamas."

Seems like those flimsy negligees are becoming more and more negligible.
★
Asked what he did for recreation if and when he got to town, one of those long, lean Texas cowboys reluctantly confessed, "I most always go dancin' if there is one."
"Why, nobody'd guess you knew how to dance," the questioner exclaimed in surprise.
"Heck, I can't dance a lick," the cowhand admitted, "but boy I sure like to hold 'em while they do!"
★
"What," said the visitor, "do you have in that lovely vase on the mantel?"
"My husband's ashes," she replied.
"Oh, I'm so sorry," was the embarrassed rejoinder. "I didn't know that he had died."
"Dead? Who's dead? The bum's just too lazy to look for an ashtray."

★
Father: "Daughter, that young man who walks you through the park certainly doesn't look very polished."
Daughter: "Well, I'll admit he's a little rough around the hedges."

The most believable golf story of the year appeared on the sports page of a Daytona Beach newspaper recently. It read, "At this point the gallery deserted the defending champion to watch Miss Blank, whose shorts were dropping to the green with astonishing regularity."

When a reporter on a midwestern daily was sent out to round up opinion of the man on the street concerning the modern woman, the first person he queried on the subject was a man who had just passed his 101st birthday.
"I'm afraid I can't be much help to you," replied the centenarian regretfully. "I quit thinking about women almost two years ago!"

The man who never thought anything of walking ten miles a day now has a grandson who doesn't think so much of it either.



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