meramec plant

UNION ELECTRIC

Welcome to Meramec

We are happy to welcome you to the Meramec Plant—latest addition to our power plant family. Although it is the newest and most advanced in design, Meramec is only one of our seven steam and two hydro generating stations serving more than a half a million customers in a three-state area.

Most of us have come to accept electricity without giving it much thought. We have grown used to flipping a switch and having the power there at our fingertips . . . ready to perform its countless tasks in our homes, our farms, our shops, our factories and institutions.

Perhaps this little booklet will help to give a better idea of what lies behind that simple flip of a switch—the massive machines, the vast quantities of raw materials and the advances in science and industrial "know-how".

Behind that switch, too, stand the thousands of investors whose savings have made the electric power industry possible and the thousands of skilled employes whose knowledge and experience keep the current flowing day and night the year around.

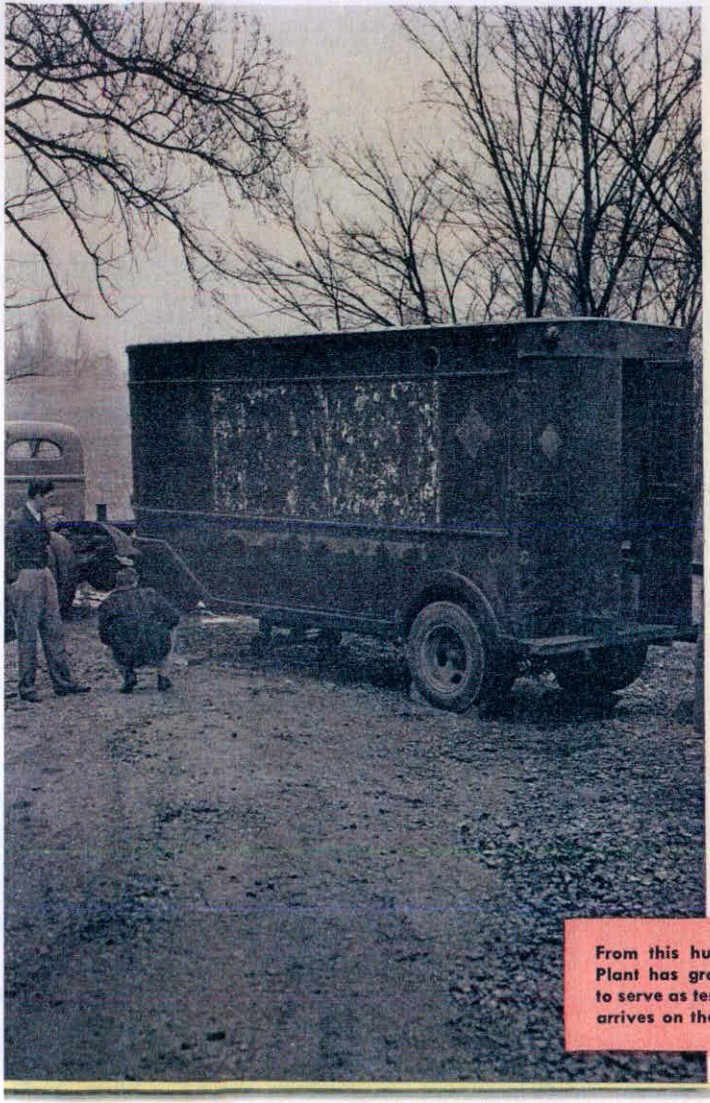
The Plant and the System

The Meramec Plant is a part of the integrated Union Electric System. At present, that System has more than $470,000,000 invested in other power plants, in transmission and distribution networks, in storerooms and shops, supplies and materials.

Before the first Meramec turbine began rolling, this System had a top capacity of over 1,250,000 kilowatts. Its customers were using over six and a quarter billion kilowatt hours of power annually and that rate of use is growing daily.

Meramec is Union Electric's first steam generating station to be built in Missouri since the Ashley Plant, completed around the time of the St. Louis World's Fair in 1903. Since Ashley, all new steam capacity has

Union Electric's newest power plant is located on a 374-acre site on the "Point of Fair Hope," where the Meramec River flows into the Mississippi, some 12 miles south of St. Louis.



From this humble beginning, the giant Meramec Plant has grown. Here, the trailer truck that was to serve as temporary headquarters for construction arrives on the site in June, 1950.

. . . Kilowatts from

been located on the Illinois side of the Mississippi. Improvements in river transportation over the past years and the acquisition by Union Electric of the Poplar Ridge coal mine at Sturgis, Kentucky, have made a Missouri location practical and economical.

This latest central generating station is located at the very southern tip of St. Louis County on a 374-acre site where the Meramec River flows into the Mississippi.

While the perfect plant site may exist only in the imagination of the designers, Meramec's comes mighty close to the ideal. It has an unlimited supply of water, but is generally above flood level. It's far enough away from other plants so that a single disaster can't knock out the whole System, yet it's close to the St. Louis

Coal

area. Coal can be delivered by barge or rail and there's a natural gas pipeline nearby. Finally, there's plenty of elbow room around the site.

Known in Missouri legend as The Point of Fair Hope, the Meramec site has enjoyed a colorful history. Three flags have flown over the area: the French, the Spanish and the Stars and Stripes. Settled by Phillip Fine, a Virginian who migrated to the site in 1782, the area was once the scene of a thriving settlement whose people had high hopes of building "Finetown" into a metropolis that would overshadow the young village of St. Louis, a dozen miles upstream.

The dreams of "Finetown" were never realized. Phillip Fine and many of his numerous offspring rest

At official ground-breaking ceremonies for the new plant, held on July 31, 1950, Pres. J. W. McAfee takes over controls of the power scoop as other Company officials look on.

Dirt really began to fly in late summer, 1950, as power scrapers and carry-alls begin the job of leveling the site and making the fill. Over 600,000 tons of earth were used for the main fill.

The Point of Fair

today in a tiny sheltered graveyard on the plant property, almost in the shade of the Meramec stack.

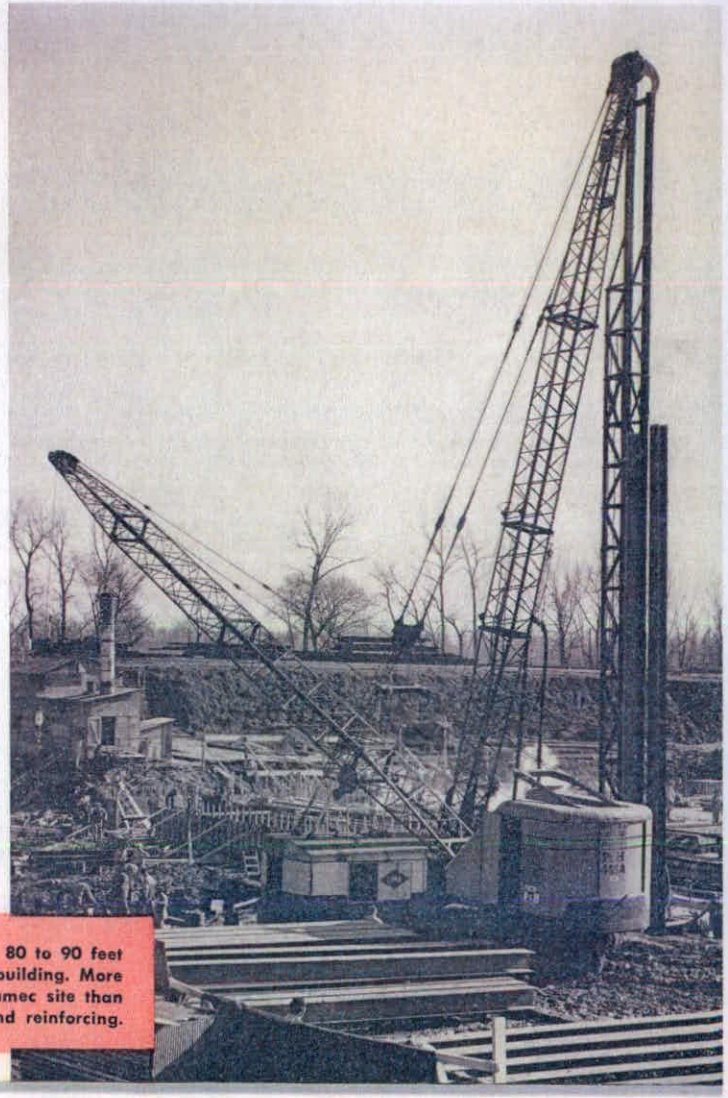
Other men have spun fine dreams about the Point of Fair Hope. Overlooking the plant are the ruins of terraced gardens, stone stairs, balconies and walks, part of the fabulous "castle" planned and begun by St. Louis businessman George F. Wood-Smith back in the 20's. Wood-Smith purchased what is now the Meramec site as a location for his dream castle—a private home to rival any ever built in America. Wood-Smith's dream was never realized but today the "castle's" crumbling walls and weathered balconies can still be seen high on the bluff overlooking the Plant.

When Union Electric began preliminary construc-

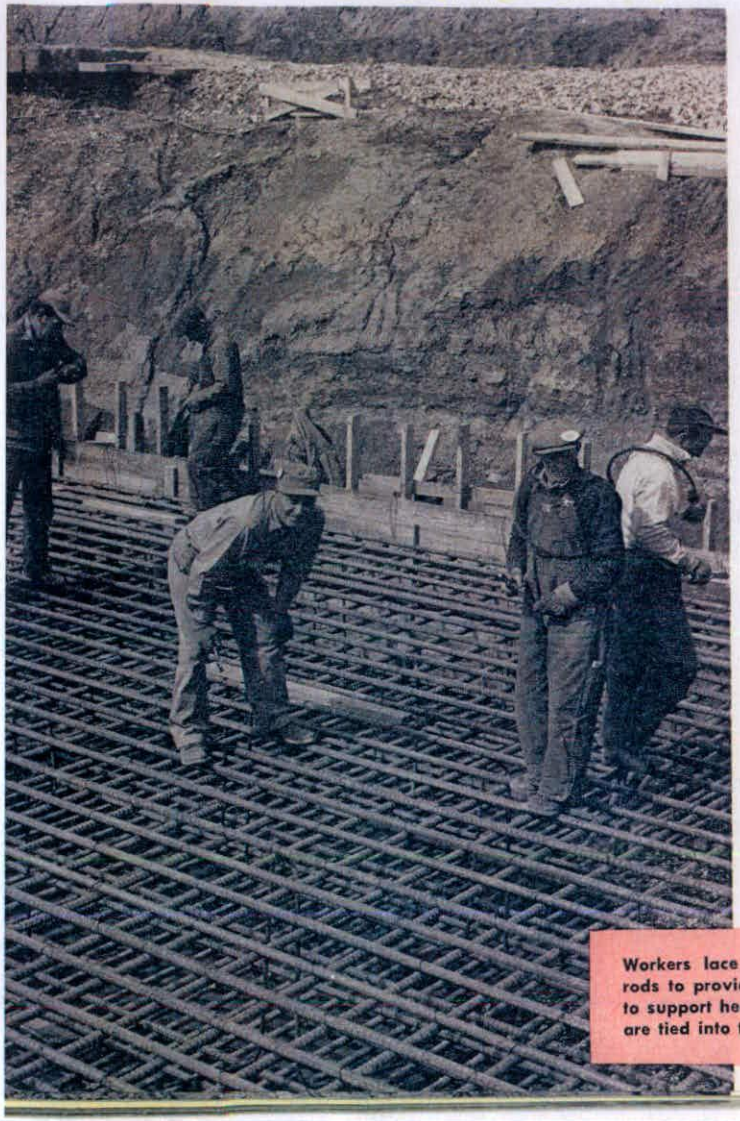
Hope...

tion operations in the spring of 1950, the site was still almost as untouched a spot as that which first met Phillip Fine's eyes in 1782. For months, the only evidence of the mighty structure to come was a small truck trailer which served as temporary construction headquarters. Finally, out of the underbrush and the mud, a modern power plant began to take shape. The Point of Fair Hope had finally realized its destiny.

Meramec Plant was designed to give the most for the money—in both original investment and in operating costs. In planning the plant, Union Electric engineers decided, on the basis of experience, that large units add up to the lowest total investment and operating costs in the long run.



Power pile drivers drive steel piers 80 to 90 feet down to bedrock to anchor plant building. More steel is below ground on the Meramec site than above, with 3700 tons of piles and reinforcing.

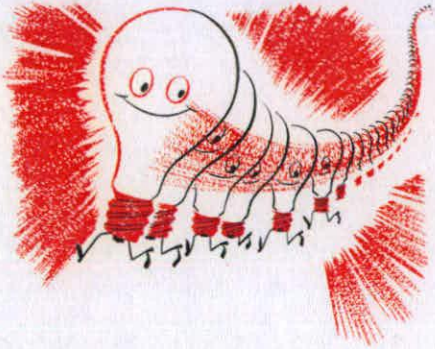


Workers lace together miles of steel reinforcing rods to provide greater strength for the floor slab to support heavy equipment and machinery. Rods are tied into the steel H-pilings.

Top-Size Turbine . .

The size turbo-generator that can be used depends, of course, on the size of the system it's going to be used in and the job it's going to do. Before Meramec, Union Electric's largest turbine had a nameplate rating of 80,000 kilowatts and a maximum capacity of 100,000. After careful study of all machines available and long consultation with various manufacturers, it was decided to install a machine with a nameplate capacity of 110,000 kilowatts—largest single shaft unit of its speed ever ordered anywhere in the world up to that time.

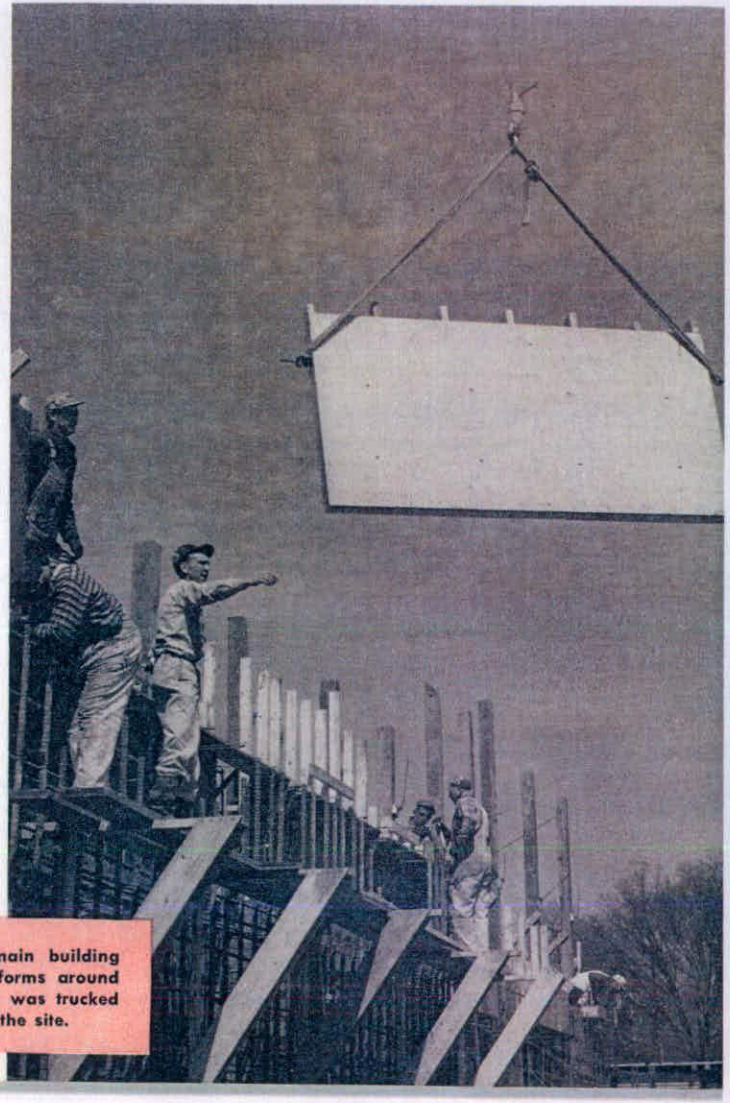
This unit can operate under actual working conditions at steady loads of 140,000 kilowatts and higher—



which is enough power to light up a million and a half 100-watt bulbs at one time.

As big and heavy as a locomotive, a turbo-generator is as delicately balanced as a Swiss watch. The Meramec unit now in operation is over 85 feet long, stands 10 feet high, measures 23 feet in width and tips the scales at a lusty 1,195,000 pounds.

A turbine is actually a series of fans or curved blades mounted on a shaft. High pressure steam pushing on these blades sets them spinning and, in turn, starts the shaft revolving. The outer rims of these moving blades travel at more than 900 miles an hour—faster than the hottest jet plane—faster even than sound!



Preparing for concrete pours of main building walls, workers assemble wooden forms around steel reinforcing. Mix for the pours was trucked to the job from a concrete plant on the site.

At the same time that concrete was being poured for the plant walls, steel was being erected for the huge cradle on which the first section's massive turbo-generator now rests.

12-Story Teakettle . .

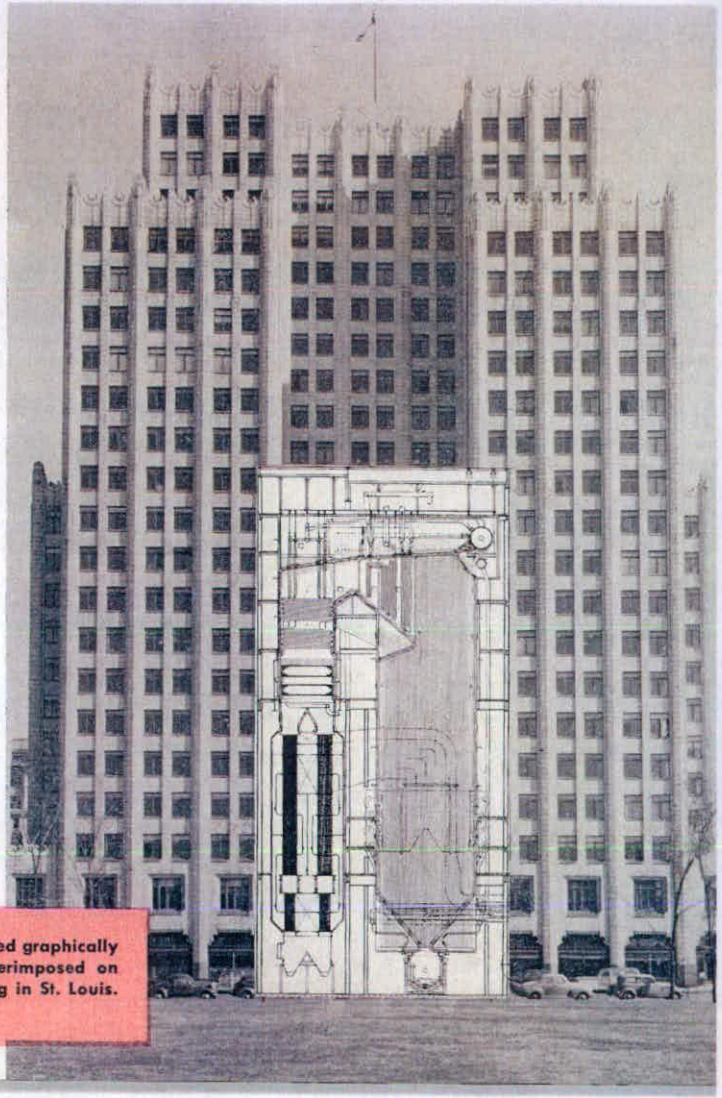
An alternating current generator is connected directly to the turbine shaft. The revolving part or "rotor" is a powerful magnet that spins between the heavy wire coils of the stationary part, or "stator". This action results in building up electrical pressure in the stator, called voltage. The result is electricity.

Unlike many earlier plants which required numbers of boilers for each unit, each turbine at Meramec is supplied by a single boiler, with no cross-connections. In many older plants, two or more boilers are required to furnish steam for each turbine. Modern advances in boiler design, however, have made it possible to build radiant type water wall furnaces like those at Meramec large and strong enough to withstand the

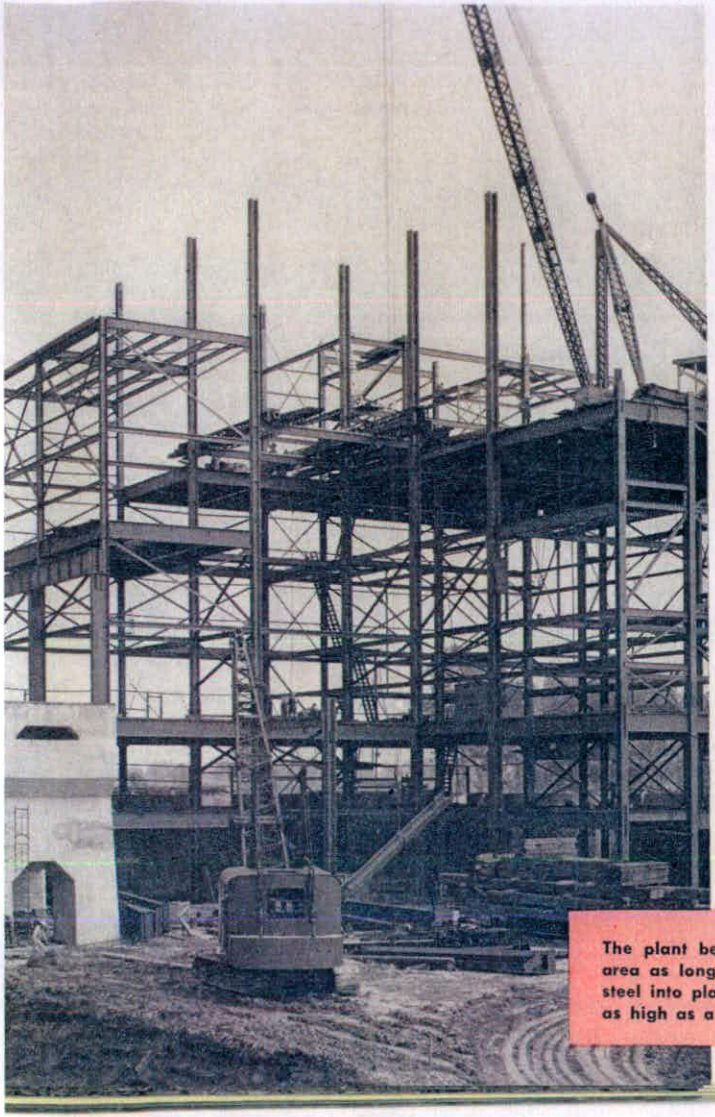
tremendous temperatures and pressures needed to spin one of today's high speed, powerful turbines.

Largest units so far installed anywhere for operation with Midwestern coals, the Meramec boilers are rated at 925,000 pounds of steam per hour. The furnace for the first unit at Meramec alone will burn about 1400 tons of coal a day. When both of the first two units are on the line, they will require about a million tons of coal a year.

In size, the Meramec boiler dwarfs those in use a decade or so ago. Towering as high as a 12-story building, it measures 38 feet wide by 28 feet thick. At top capacity, it will consume about 58 tons of coal an hour—pulverized as fine as face powder and blown



Size of the Meramec boiler is portrayed graphically by this illustration of the unit superimposed on the 21-story Missouri Pacific building in St. Louis. Boiler would reach 12th floor.



The plant begins to rise above the surrounding area as long-boom power cranes hoist structural steel into place. Exclusive of stacks, plant stands as high as a 15-story building.

Superheated Steam

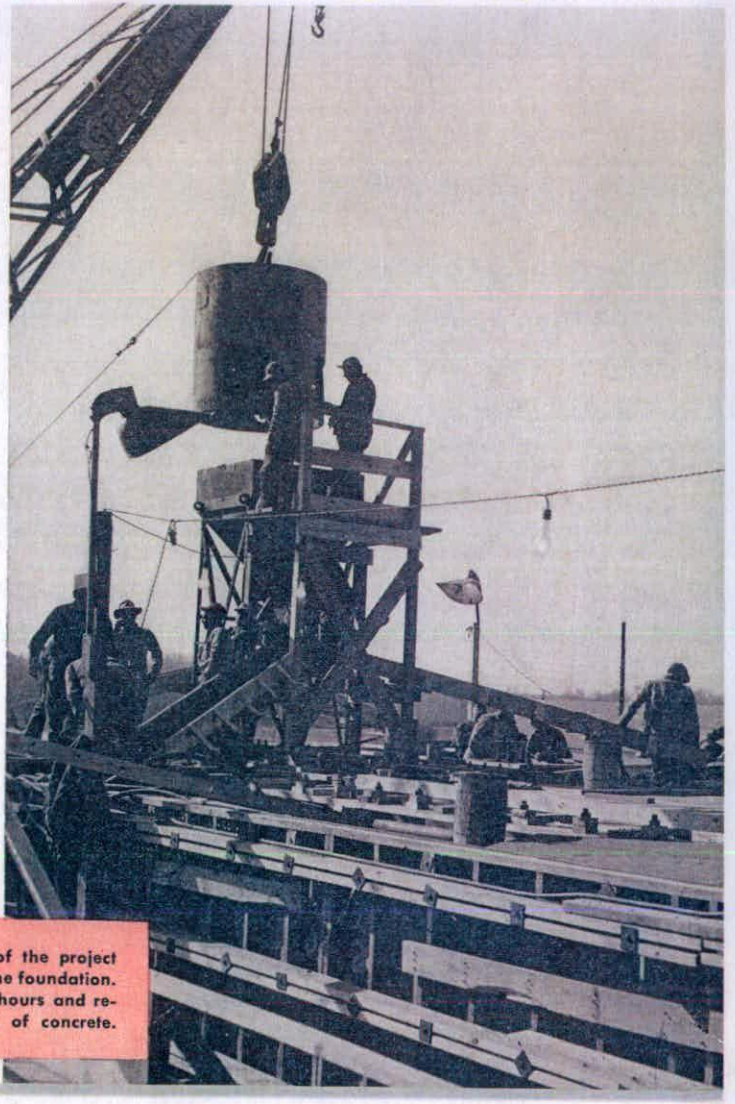
into the furnace by heated, compressed air. Over 170 standard freight cars of materials and equipment were required to build this one boiler. The boiler is equipped with a superheater, which raises the temperature of the steam until it becomes a dry gas so hot it would ignite a chunk of wood instantly. This dry steam also insures that no corrosive moisture enters the turbines.

The walls of this 12-story teakettle now boiling at Meramec are lined with over 97 miles of metal tubing, through which the boiler water is circulated. When the steam leaves this inferno, it is 950 degrees Fahrenheit and is under 1250 pounds of pressure to the square inch. Jetting out at those temperatures and pressures, this superheated steam packs a terrific wallop.

After this hot steam leaves the turbines, it enters the condenser, where it is reduced to water and starts back through the entire cycle again.

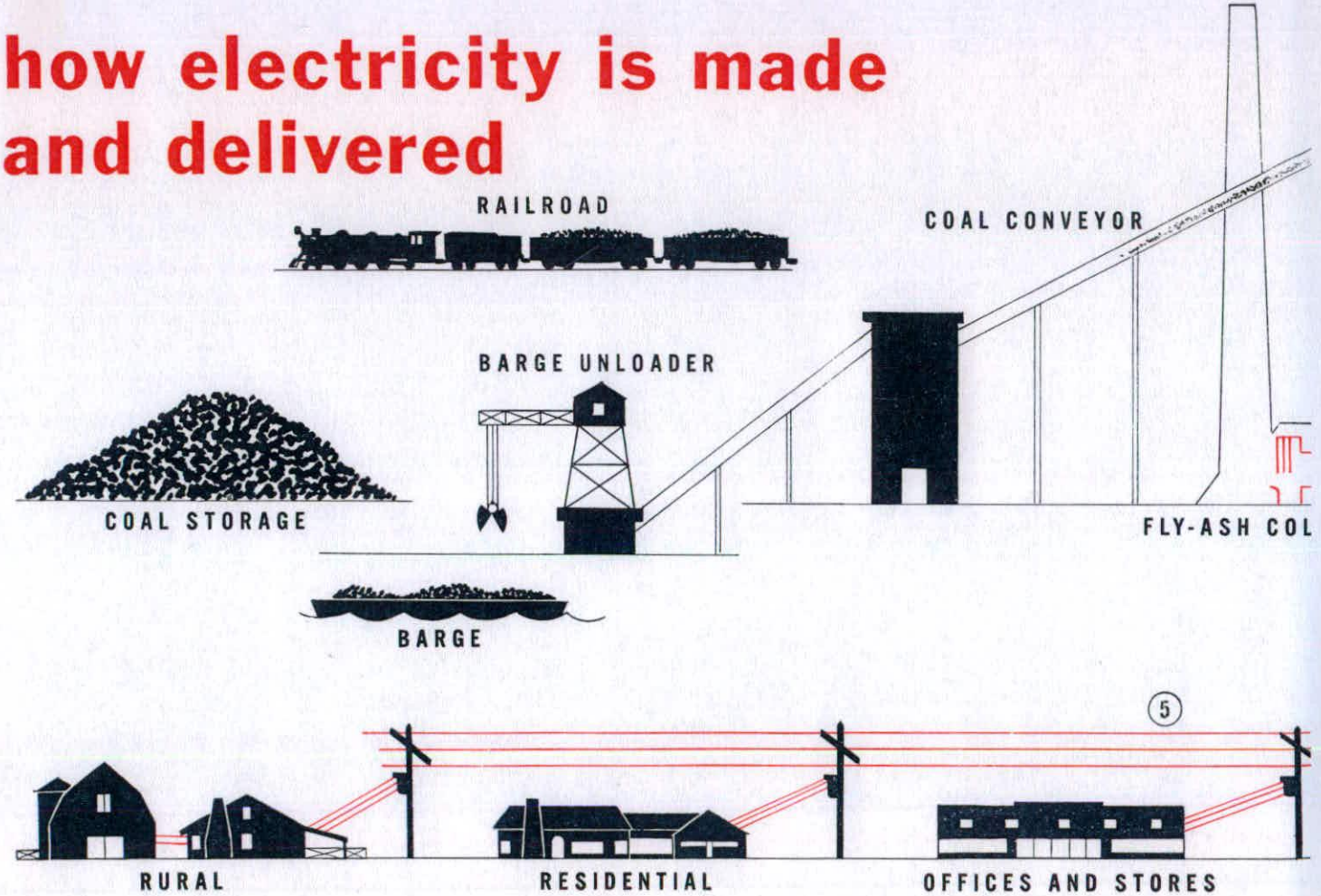
One of the most important raw materials in the manufacture of electricity is water. Abundance of water was one of the chief reasons for picking the plant site. In addition to treated water used in the boilers to make steam, river water is used in enormous quantities for condensing the steam and is also used for the raw water supply to the water-treating plant, for the ash sluicing system and for general plant use.

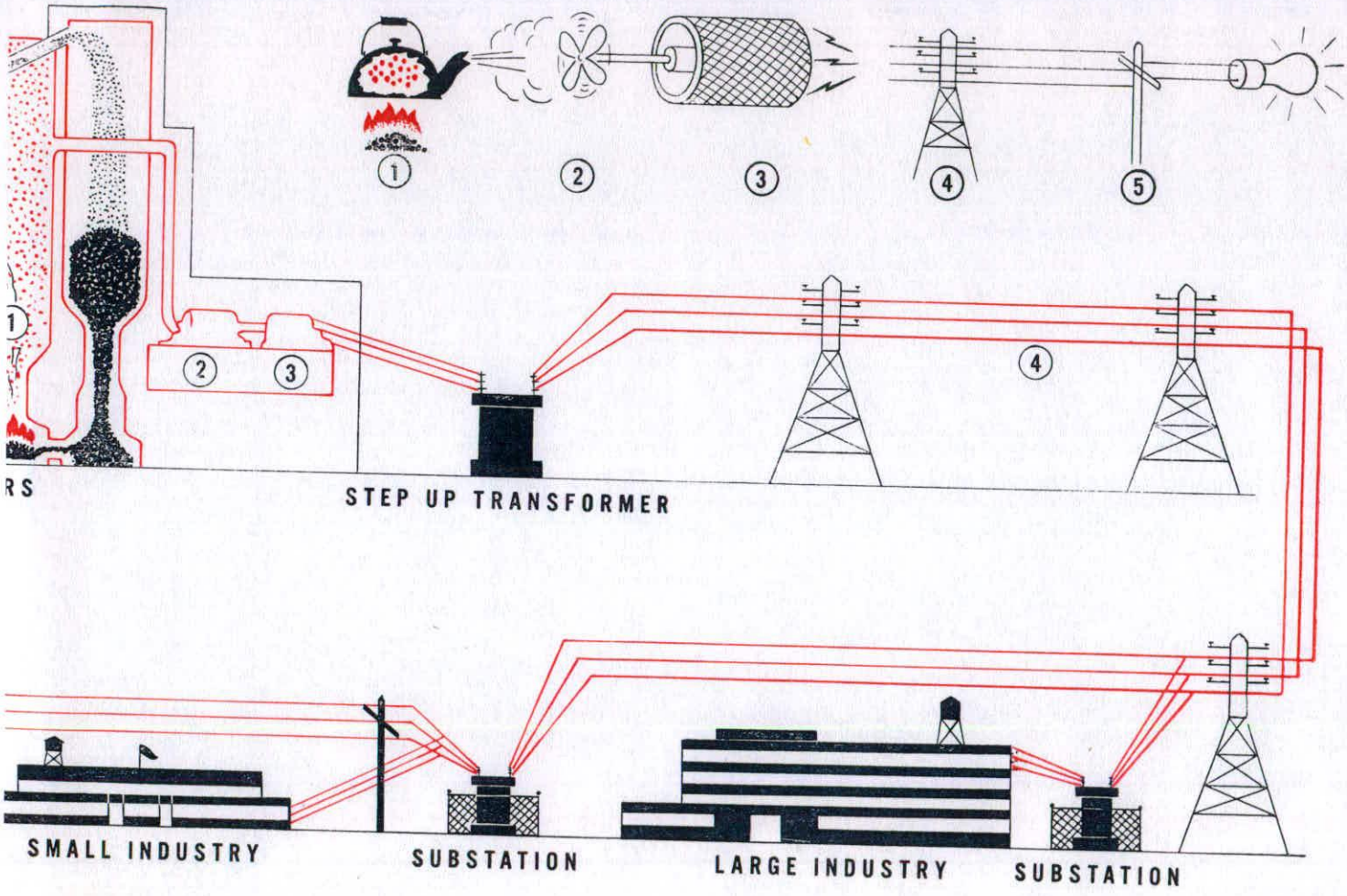
For all these purposes, the Meramec Plant will use more water daily than the entire city of St. Louis.



One of the most dramatic phases of the project was pouring the concrete for the turbine foundation. Pour went on non-stop for over 24 hours and required more than 944 cubic yards of concrete.

how electricity is made and delivered

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2
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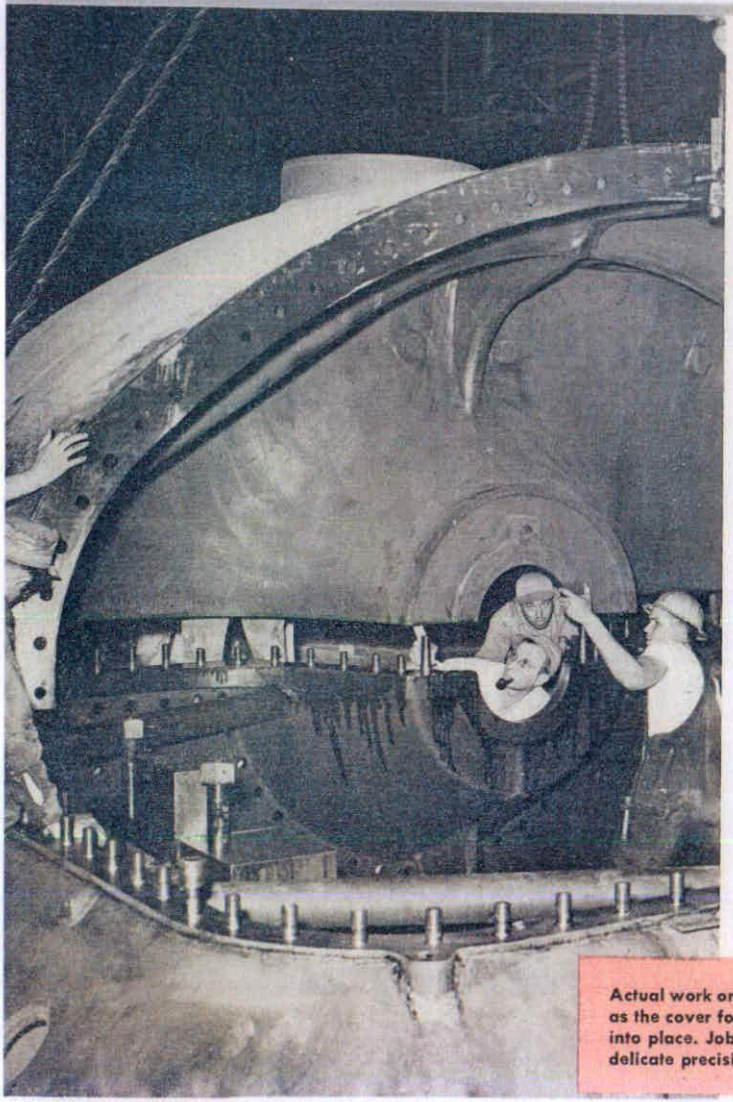
RS
STEP UP TRANSFORMER
SMALL INDUSTRY
SUBSTATION
LARGE INDUSTRY
SUBSTATION



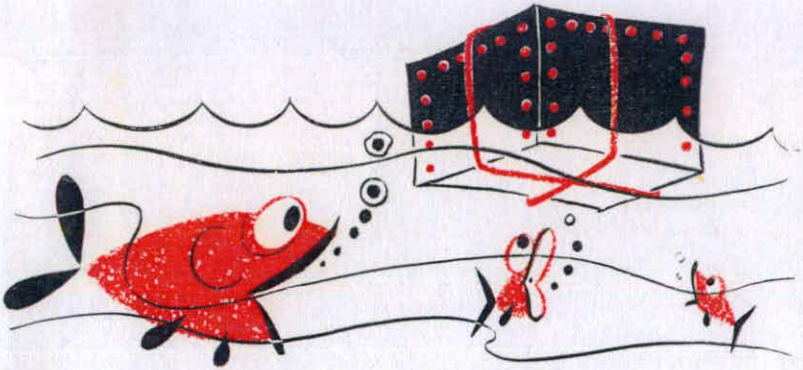
Actual work on installing the turbine gets underway as the cover for the low-pressure cylinder is guided into place. Job took both tremendous strength and delicate precision.

Water for Watts . . .

With the first two units in operation, about 230,000,000 gallons of water will be required daily—compared to the 162,000,000 gallon average daily usage of the entire city of St. Louis.

The treated boiler water is used over and over again. After the steam leaves the turbine, it is cooled and condensed and returned to the boilers to start the whole cycle again. After the untreated river water circulates through the condensers and cools the steam from the turbines, it is returned to the river.

River water is obtained at Meramec from an intake structure in the Mississippi, slightly upstream from the plant. Its construction was a tricky job—involving a running battle with river currents and depths and the

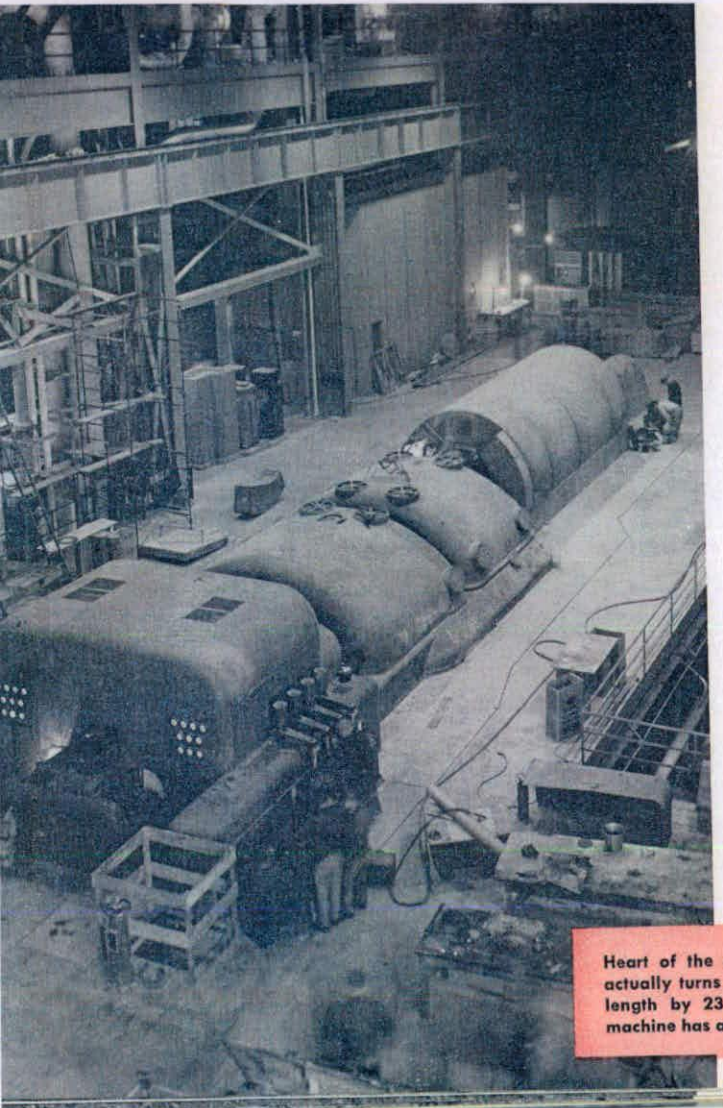


shifting, muddy bottom. The job was done by floating a caisson, or big steel box, into position over a hole blasted into the river-bottom bedrock and then sinking the box into the hole.

In sharp contrast to older power plants, with their imposing building structures, Meramec is a "ranch-style" plant, with as much as possible out of doors. All operations are confined where feasible to one level and the building encloses only part of the boiler. Much of the auxiliary equipment is completely out of doors.

As a further economy, the walls are of asbestos-protected, zinc-coated sheet steel, instead of more costly brick. Except in the office and shops, there are no windows in the entire plant. Corrugated architectural glass takes their place at a considerable savings.

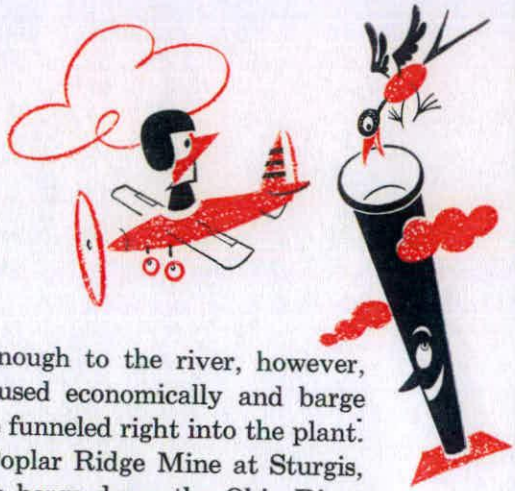
As winter drew near, plant was enclosed as much as possible to allow work to continue uninterrupted. Zinc-coated steel siding is used for plant walls instead of more costly brick.



Heart of the plant is the turbo-generator, which actually turns out the power. Measuring 85 feet in length by 23 feet in width, the Meramec Plant machine has a 140,000-kilowatt maximum capacity.

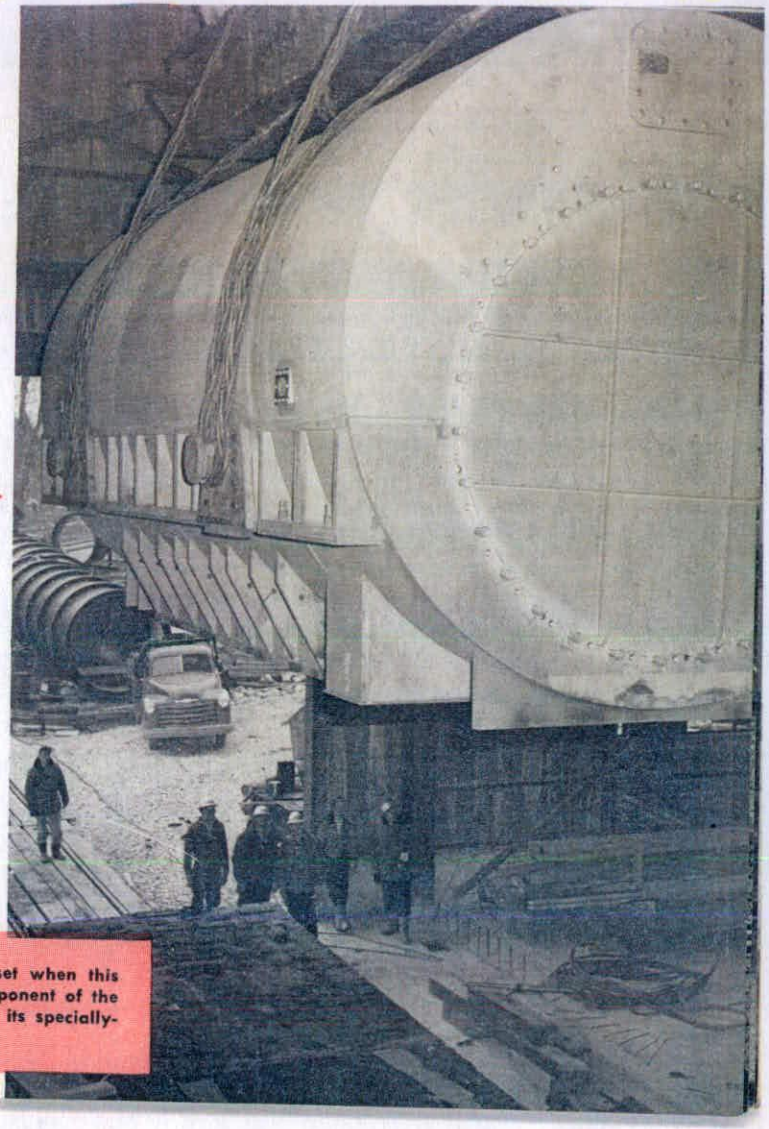
Skyscraper Stacks . . .

Standard symbol of steam power plants everywhere is the towering stack. Those at Meramec, one to a boiler, stand 250 feet high, with inside diameters tapering from 12 feet at the bottom to ten and a half feet at the top. Unlike many other plants, where the stacks are mounted on the roof, Meramec's chimneys rest right on the ground—which means much less strain on the roof structure, much less building construction, and, as a result, much less cost. Here, too, is another instance where the site's ample room paid off. Meramec's location, high above the river level, also means savings in waterproofing costs and the reduction of possible flooding.



The plant is close enough to the river, however, hat its water can be used economically and barge hipments of coal can be funneled right into the plant. Coal produced at the Poplar Ridge Mine at Sturgis, Kentucky is shipped by barge down the Ohio River nd up the Mississippi right to Meramec's back door.

After the coal makes its 261-mile river journey, it s unloaded by a ten-ton power scoop at the Meramec arge docks, dumped into the hopper and carried by ubber conveyor belts to the breaker house. There, the uel can be suitably crushed and sent directly into he plant or can be carted out to the storage area by he large, rubber-tired "Euclid" carriers. The stock-iling area can hold as much as 200,000 tons, which



A new weight-lifting record was set when this 180-ton stator, heaviest single component of the first unit generator, was lifted from its specially-built flat car into place by crane.

Masked worker makes weld deep inside the labyrinth of boiler tubes. More than 1800 steel tubes form the water wall of the first unit boiler, where steam to turn the turbine is produced.

97.5% Pure...

will serve as reserve fuel source in the event of any interruption of coal deliveries. Located right on the Missouri Pacific Railroad, with a spur leading into the plant, Meramec can also receive coal by rail.

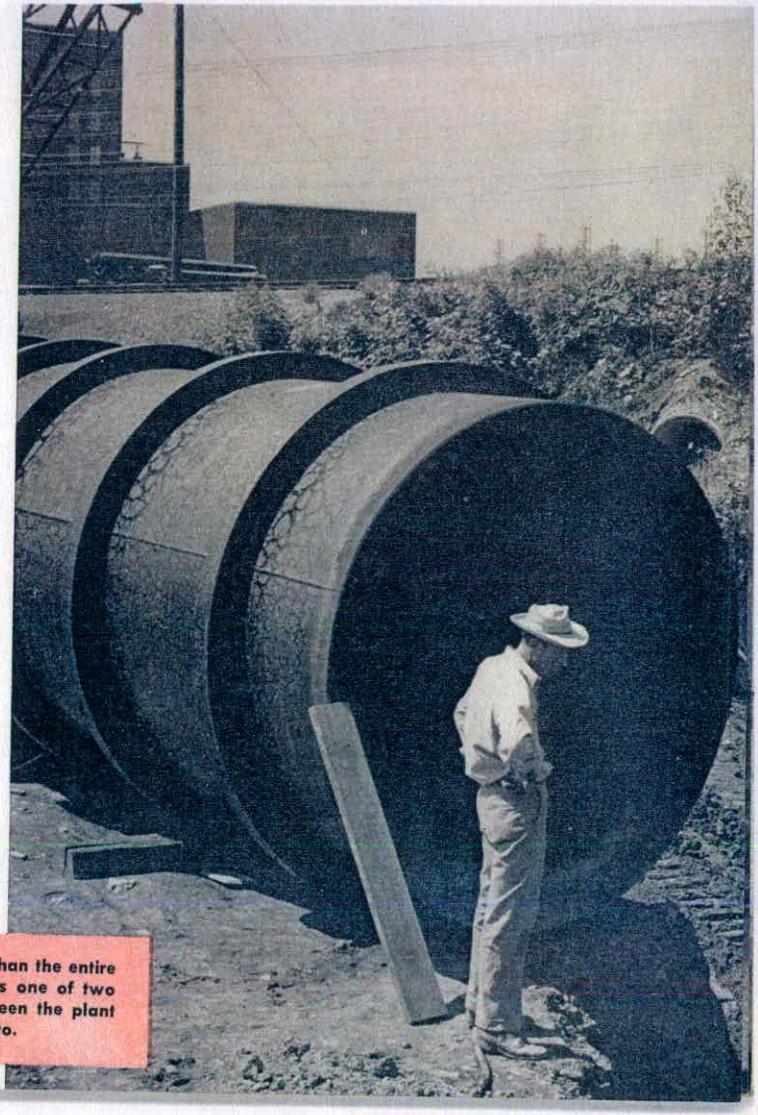
During the past few years, Union Electric has spent millions of dollars on its fly-ash elimination program at all System steam plants. Meramec has the latest type of modern electrostatic fly-ash precipitators built into each unit. The equipment now in use on the first unit is guaranteed to remove 97.5 per cent of the fly-ash in the stack discharge—which is many times more efficient than required by local ordinances.

Meramec will be the first plant in this area with centralized control . . . the latest and most efficient

nethod of power plant operation. All controls for both nit boilers, turbines and associated equipment will e concentrated in one central, air-conditioned and ound-proofed control room.

There, surrounded by dials and switches, instrument oards and control panels, the station operator has omplete and detailed data on all phases of plant opera- ion at his fingertips. At any given instant, his instru- nents will be telling him exactly what is going on every- here. If anything goes wrong, he will be able to take nstant corrective action without leaving his station.

One operator will be responsible for the centralized ontrol of each unit. Roving attendants, inside and utside the plant, handle local adjustments under his



Plant will require more water daily than the entire city of St. Louis. Pipe shown here is one of two circulating water lines leading between the plant and river. Note size of man in photo.

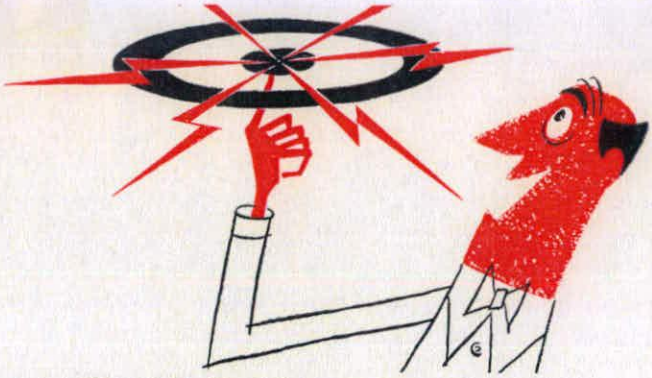
Over 11,000 one-inch tubes, each nearly 30 feet long, make up the condenser, which reconverts turbine steam into pure water, which is returned to the boiler where the cycle is repeated.

Centralized Control

direction. In addition to the constant stream of routine data flowing into the room, automatic alarms have been built in for emergencies. If anything goes wrong, illuminated messages will flash on the appropriate panel and a highly audible signal will go into action.

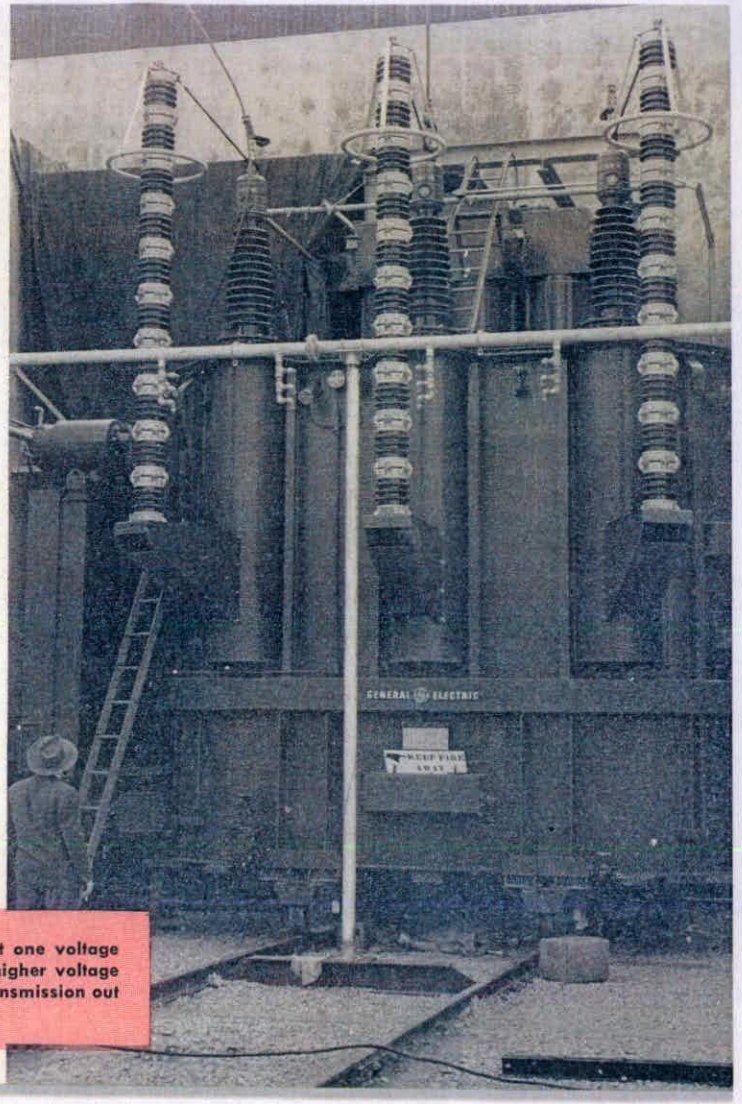
A public address system, covering the plant, will enable the operator to reach his roving assistants instantly. With these automatic devices, only about 125 men will be required for both of the first two units.

No matter how much power is produced, it doesn't do much good until it gets to the customer. At the same time that the first preliminary planning for the Meramec Plant was launched, design of the substation and transmission lines to get all the newly-hatched kilowatts out to the consumer was begun.

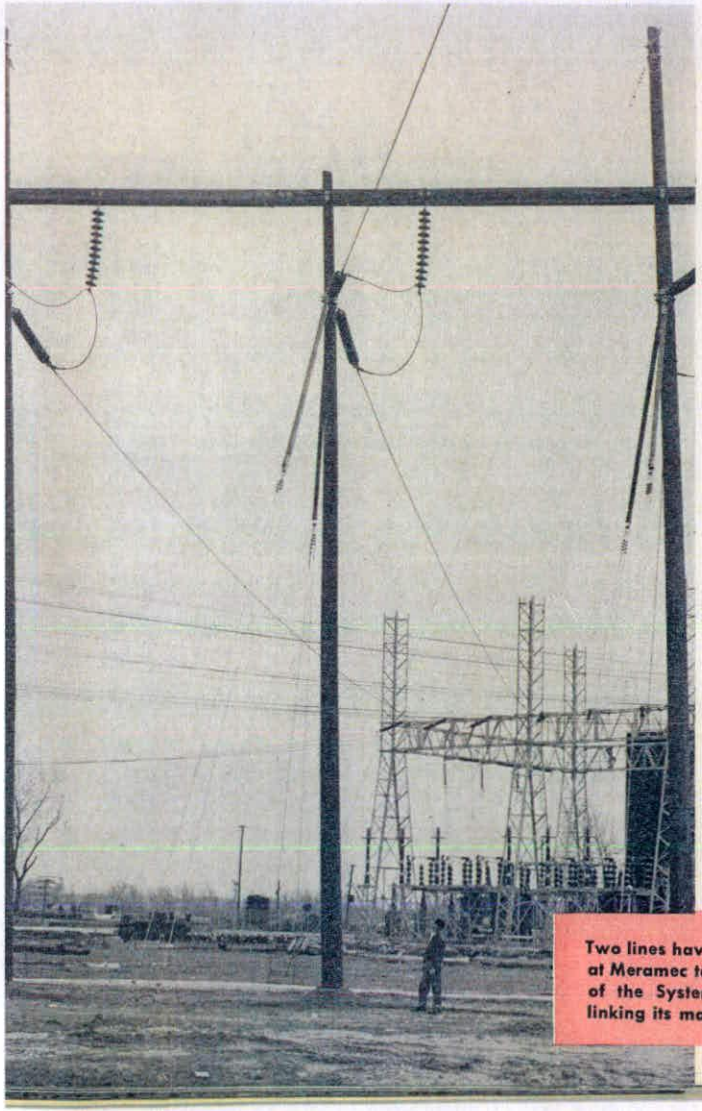


Electricity produced by the Meramec generators is routed through the electrical bay into huge transformers. There, the current, generated at 16,500 volts is stepped up to 138,000 volts for more efficient and economical transportation. From the main transmission lines, Meramec power flows out to the System's many substations, where it is broken down into lower voltages for distribution to consumers.

Two main transmission lines have been built to transport Meramec power into the System. One connects Meramec with the Rivermines Substation and the other taps into the line connecting the Cahokia Plant and the Watson Substation. The entire Union



Power produced by the generator at one voltage is stepped up in transformers to a higher voltage for efficient and more economical transmission out to where it can be put to work.



Two lines have been built to carry power generated at Meramec to the consumer. These lines form part of the System's 138,000-volt transmission loop linking its major power plants.

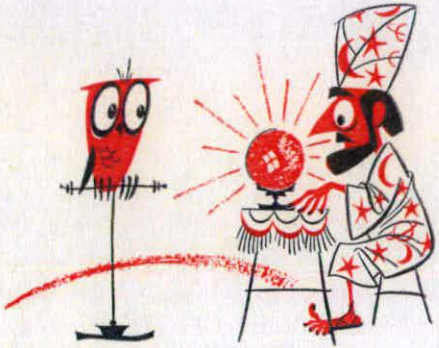
Building for the

Electric System has 700 miles of high-tension transmission lines which link all of its generating plants into one interconnected power pool.

Meramec is just one project in Union Electric's long-range expansion program to keep pace with growing demands for electric service in the area we serve. Over the period from 1947 to 1962. a half a billion dollars is being spent by the Company for new and expanded facilities. Construction expenditures for new plants, transmission lines, substations, distribution systems and other facilities amounted to 212 million dollars during the period from 1945 to 1952 alone.

As more and more people continue to use more and more electricity in the factories and shops and the

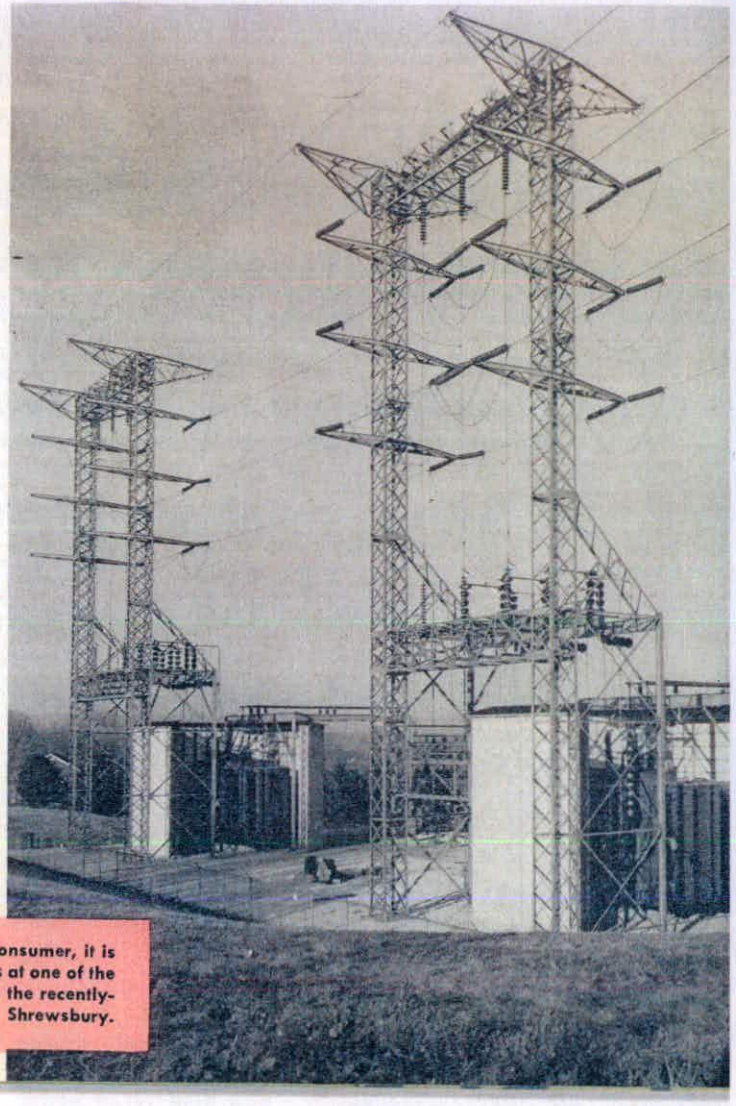
Future...



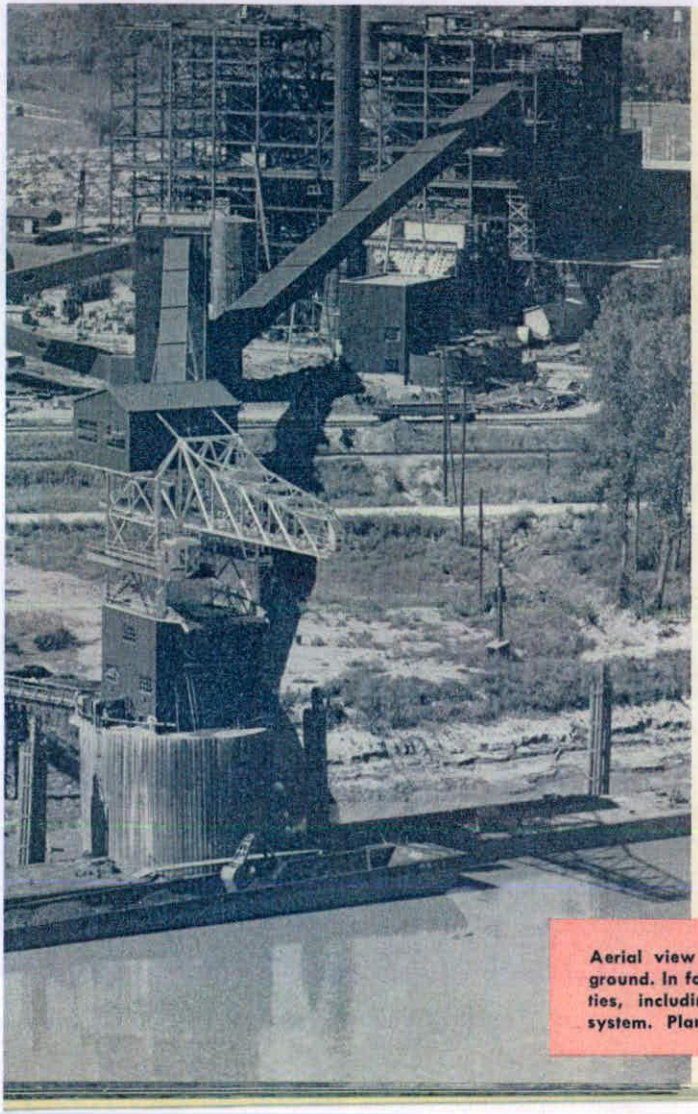
homes and farms we serve, System capacity will have to expand not only to keep pace but to keep ahead. Present plans call for spending $150,000,000 for new facilities over the next five years.

An expanded Union Electric System will mean increased payrolls in this area, increased payments to the firms who supply the Company, more tax support for federal, state and local governments and greater investment opportunities for the thousands of peoples whose savings provide the money for expansion.

Because Union Electric has faith in the future of the communities it serves, it is constantly planning ahead and building ahead to insure dependable service for future needs.



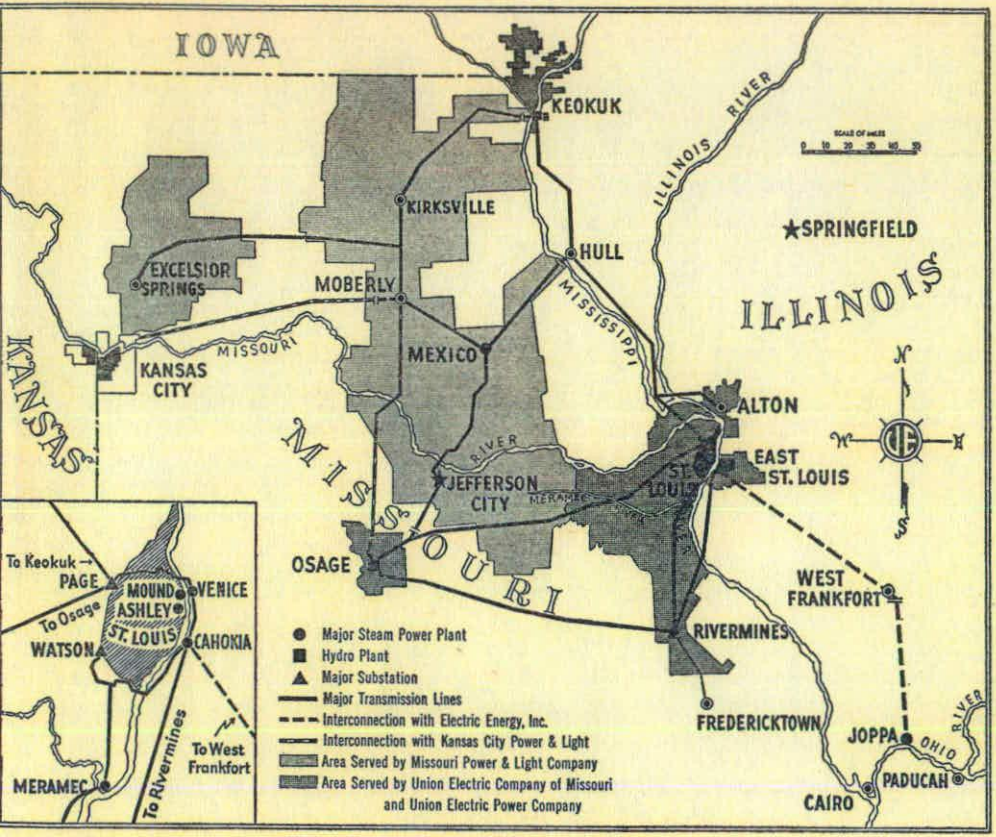
Before Meramec power reaches the consumer, it is stepped down again to lower voltages at one of the System's many substations. Above is the recently-built Watson Substation in nearby Shrewsbury.



Aerial view of site shows main plant in background. In foreground are the coal-handling facilities, including the barge docks and conveyor system. Plant also has facilities for rail coal.

Behind the Scenes

Union Electric's Engineering & Construction Department designed the Meramec Plant, working in close cooperation with the Power Production Division. This cooperation resulted in lowering construction costs and in promoting ease and economy of operation. The structural design was done by Sverdrup & Parcel, Inc., under the supervision of Union Electric's structural engineers and actual construction is being handled by United Engineers and Constructors of Philadelphia and their sub-contractors.



DATA ON FIRST UNIT OF THE MERAMEC PLANT

TURBINE GENERATOR

Manufacturer	Westinghouse
Nameplate Capacity	110,000 kw
Capability	140,000 kw
Speed—rpm	3,600 rpm
Throttle Pressure, psi	1,250
Weight	1,195,000 lbs

Overall Size (Approximate)

Length, feet	85
Width, feet	26
Height, feet	10

GENERAL OPERATIVE DATA ON FIRST UNIT
(Based on 130,000 kw for 24 hours)

Generation	3,120,000 kwh
Steam	22,200,000 lbs.
Coal Consumption	2,760,000 lbs.
Circulating Water	115,000,000 gal.

BOILER

Manufacturer	Combustion-Engineering
Type	Re-heat-radiant water wall
Steam Capacity	925,000 lbs. per hr.
Heating Surface	44,470 sq. ft.
Volume (gross)	96,000 cu. ft.

CONDENSER

Manufacturer	Ingersoll-Rand
Type	Two pass, vertical divided
Condensing Capacity (steam)	651,571 lbs. per hr.
Condensing Surface	90,000 sq. ft.

STRUCTURAL STEEL DATA, POWER PLANT BLDG.
(Figures include first and second units)

Steel Piling	3700 tons
Building and Coal Bunkers	4870 tons
Volume (Enclosed Plant)	5,450,000 cu. ft.

LIVE BETTER – LIVE ELECTRICALLY