

COMBUSTION

DEVOTED TO THE ADVANCEMENT OF STEAM PLANT DESIGN AND OPERATION

Vol. 25

No. 7

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COMBUSTION

DEVOTED TO THE ADVANCEMENT OF STEAM PLANT DESIGN AND OPERATION

Vol. 29

No. 3

September 1957

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GERALD S. CARRICK
Business Manager

JOSEPH C. McCABE
Editor

GLENN R. FRYLING
Associate Editor

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No. 4

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COVER PHOTO

Copper coil strands are transposed around stainless steel tubing. Hydrogen gas passes through the coils. (Courtesy Allis-Chalmers Mfg. Co.)



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Why Trip Safeguards to Switch Power Sources? . . . 24

A. W. Hindenlang

One of the everyday operating plagues of a sudden power failure is answered by a dash of Yankee ingenuity

Furnace Safeguards Panel—I . . . 27

The off-the-cuff reactions of a dozen top operating men, burner designers and consultants to specific subjects such as purging, combustible meters—First of three parts

Optimizing a Regenerative Steam Turbine Cycle . . . 38

G. Chiantore, D. Borgese, F. Baldo and J. H. Potter

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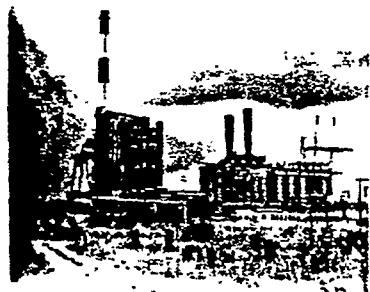
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COVER PHOTO

Sanford Plant, Florida Power & Light Co., shows interesting contrast between earlier and more recent power plant outlines



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Furnace Safeguards Panel—II . . . 18

The second part of a three-part, off-the-cuff report of the reactions of a dozen operating men, burner designers and consultants to light-off and control hardware

Key Point Inspection, Electrical Indicators Save Time in Fly-Ash Precipitator Maintenance . . . 30

R. W. Sickles

A ten-point, step-by-step series of suggestions to cut down precipitator maintenance checks

The Relation Between Boiler Cleanliness and Feedwater . . . 35

F. U. Neat

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J. W. Williams

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COVER PHOTO

First use of stainless steel in a condenser within the Duquesne Light Co.'s experience took place at their Elrama Power Plant.



A Gas Turbine CO Boiler Installation; Economic and Thermodynamic Analysis . . . 22

Charles Bultzo

Here is an interesting and fact-packed story of a number of tests run to determine the values and the savings from a combined cycle

Furnace Safeguards Panel . . . 31

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Pneumatic Material Handling System Solves Difficult Flyash Disposal Problem . . . 50

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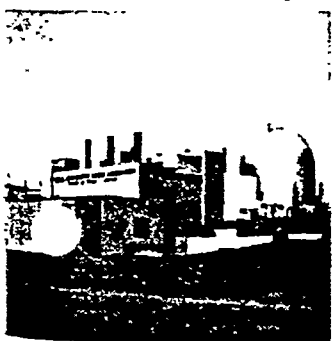
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COVER PHOTO

Construction is reported
almost complete at Elk River,
Minnesota, rural electric
atomic plant



(Photo courtesy Allis-Chalmers
Mfg. Corp.)

Observations and Experiences Resulting From A Precipitator Improvement Program . . . 22

M. J. Archbold

There have been many proposals, and fewer attempts,
to establish some standards for precipitator performance.
This paper, a follow-up to an earlier, basic offering by
the same author, gives performance data as against
equipment criteria to permit intelligent comparisons.

Economic Thickness of Insulation For Flat Plates and Pipes . . . 33

W. C. Turner

As the author states: "Depending upon cost of insulation
and the cost of heat, a certain definite thickness of
insulation provides the lowest total cost." He then
describes the procedure to determine this thickness.

Fluid Drives for Turbine-Generator Driven Boiler Feed Pumps . . . 38

Richard D. O'Neil

On-the-shaft drives whether mounted on the turbine-end
or the generator-end for boiler feed pumps will make their
mark for reliability as much as for economy. Here is a brief
description of most of the early applications.

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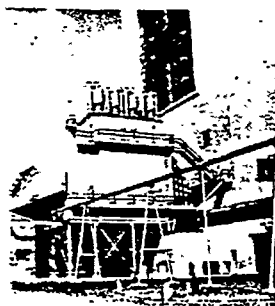
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COVER PHOTO

The compact
effect of close
design is illustrated
in this recent dust
collector installation



Detecting Service Failures in Power Plants—Part I . . . 24

Helmut Thielsch

First of a two-part roundup of the newest inspection
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In Furnace Protection—A Big Step Forward? . . . 34

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COVER PHOTO

The spray formation close to the nozzle of a swirl type nozzle is dramatically shown here.



Impurities in Steam from High Pressure Boilers . . . 18

R. C. Ulmer and H. A. Klein

Results of tests on operating units show relatively low vaporous carryover of sodium—lower than laboratory tests have indicated

Atomization of Liquid Fuel for Combustion—II . . . 27

Paul Eisenklam

Conclusion of a well-documented, mass transfer analysis of atomization

Incinerator Furnace Temperature . . . How to Calculate and Control It . . . 35

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A. J. Stepanoff and H. A. Stahl

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The Theory of Combined Steam and Gas Turbine Installations . . . 30

C. Seippel and R. Bereuter

*An excellent survey of the basic combinations worthy of
consideration and a scholarly discussion of their workings
and their thermodynamics*

A Concept of Combustion Control for Firing Two Solid Fuels . . . 43

Carl E. Rodenburg

*Controls of a single solid fuel aided by either a gas or an
oil fuel lend themselves to proved treatments. Two
solids, however, can mean problems. Here is one of the
better approaches we have seen.*

Application of Solid State Electric Control to Utility Boilers . . . 48

E. E. Swanson

*The age-old handling of boiler controls by separate checks
on separate functions has lost out to the need for full
process loop controls. This article discusses control
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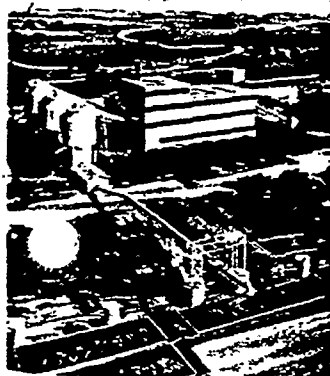
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*The first direct barge
loading coal mine in
Illinois, the Banner
Mine of the United
Electric Coal Companies*



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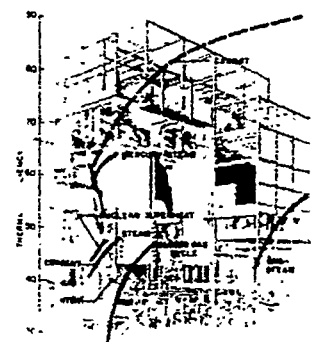
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COVER PHOTO

Superimposed on a wash drawing of a large operating boiler we have placed the efficiency curves of our known thermal, nuclear, MHD means of generating power



A Probe for Studying Deposition of Solid Material from Flue Gas at High Temperatures . . . 22

P. J. Jackson

Because no laboratory mock-up can approach the actual field conditions between boiler heat transfer surfaces and the fuel and flue gas exposed to them a practical, robust probe has been developed for field duty and field studies.

Removal of Slag Deposits from Screen Type Superheaters by Vibration Methods . . . 29

L. G. Kropp and D. L. Itman

The constant search for extending equipment availabilities have led the Russians to investigate vibration methods of cleaning superheater surfaces. Here is a how-to story.

Repeated Acid Cleaning of Boilers . . . 35

The July issue of COMBUSTION carried a paper by J. K. Rice in which he raised certain points and made some tentative conclusions. Eight very active men in the field of water conditioning had pungent comments to make. We print them all here together with Mr. Rice's closure.

Magnetohydrodynamic Power and Propulsion . . . 44

George W. Sutton and Per Gloersen

For the first time to our knowledge some of the parameters affecting MHD are spelled out in dimension form. The problems and the hopes are equally and ably stated. We confined them to bulk power applications.

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Combustion

DEVOTED TO THE ADVANCEMENT OF STEAM PLANT DESIGN AND OPERATION

JOSEPH C. McCABE, Editor and Publisher

A. W. HINDENLANG, Associate Editor

ROBERT D. TAFT, Business Manager

MISS MARY MORGAN, Circulation Manager

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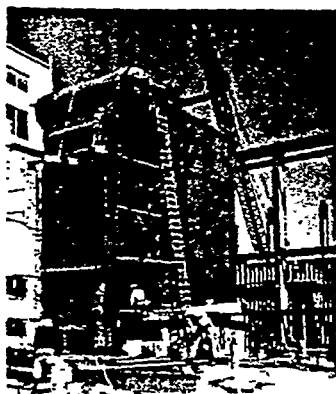
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COVER PHOTO

Construction view of the boiler unit for the 22 Mw plant described in detail on p. 46



volume 33 number 5 November 1961

Transportation of Electrical Energy vs. Transportation of Fuel . . . 30

W. E. Hopkins

The utility industry in its never ending search for better, more economical ways of doing business are now thinking about fuel availabilities at the power plant which means transportation costs as well as raw material charges.

A New Arrangement for a Steam Turbine By-Pass . . . 38

J. B. Prather and J. H. Potter

Close matching of steam and metal temperatures as an aid to quick startups has led many to take a sharp look at by-pass arrangements. Here is one for a 150 Mw, 2400 psi, 1000 F, 1000 F unit.

Steam Power Plant Clinic . . . 42

Igor J. Karassik

The author opens his discussion of where best to get feedwater for reheat attemperation by quoting "Progress is made by solving problems resulting from the making of progress." With this as a background several solutions are offered.

Record Completion Time for 22 Mw Power Plant . . . 46

D. N. Higgins

A lapsed time of seven months from confirmation of contract to completed plant promises an interesting story. The author fills in the details.

Twenty Second Annual International Water Conference . . . 51

Abstracts of all the papers felt by the editors to be of interest to steam-raising field.

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COVER PHOTO

Daylight view of the beautiful new Nichols Station of the Southwestern Public Service Co., near Amarillo, Texas



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Burner Controls for Automatic Power Plants . . . 20

Ross Forney

The author stresses the need for sound, practical thinking in developing the badly needed automatic control.

Furnace Protection—Caveat Emptor . . . 21

F. Cowan

Mr. Cowan gives something of the opposite face of the coin Mr. Forney discusses on page 20.

Roller Mills—A Contribution to the Assessment and Selection of Coal Pulverizing Mills . . . 26

W. Schöning

The calculation of the output and the power of a mill required for an unknown coal is one of the most difficult tasks of a project engineer. These difficulties are identified and stressed by the authors.

Steam Power Plant Clinic . . . 32

Igor J. Karassik

Once again the author takes on questioners from the field on the subject of pumps and power plant cycles.

Bureau of Mines Coal-Fired Gas Turbine Research Project . . . 35

T. Reed Scollon, Harry Perry, Earle P. Schoub, J. P. McGee

A progress report on the comprehensive program the Bu of Mines has going at Morgantown, W. Va.

Highlights of the Annual Meeting—I . . . 39

The Annual ASME Meeting is again reported by abstracts of papers held of value to readers of COMBUSTION.

Steam Turbine Controls . . . 45

J. D. Conrad, Jr.

With the marked changes in the boiler control picture—from demands for automation to the needs of supercritical and once-through designs—we have asked one of the leaders in the turbine field to give us a status report on their controls.

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COVER PHOTO

Workman busily making adjustments on a thermoelectric generator meant to power the blower of a domestic gas heating furnace



volume 33 number 8 February 1962

Needed—Research in Flame Safeguard System Applications . . . 24

E. S. Monroe

It is only of recent years that the zone of flammability has ceased to be a laboratory phenomenon and recognized as vital to flame safeguard systems. But the recognition isn't enough, says this author, we need research support.

Developing Techniques for Accelerated Starting of Pulverized Coal-Fired Units . . . 26

O. L. Gann, G. G. Halfinger, R. C. Sherrill and J. A. Donald

The growing spread between utility system base loads and peak loads has resulted in sizable units being relegated to peaking duty. Here is a three-pronged analysis of system economics, operating procedures and guides, plant design considerations.

Last Gleanings From the ASME Annual Meeting . . . 42

Steam Power Plant Clinic . . . 44

Igor J. Karassik

In this article the author gives his views on the role of the spare boiler feed pump.

American Power Conference Program . . . 47

The latest information on the papers scheduled for the forthcoming twenty fourth annual American Power Conference.

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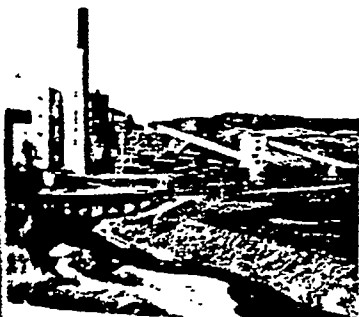
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COVER PHOTO

Otter Tail Power
Company's latest
station—
the 33,000 kw Hoot
Lake plant



The Challenge of an Engineering Career in the Exploding Technology of Thermal Electric Power . . . 22

By V. F. Estcourt

Systems engineering and all it implies is supplanting the less challenging, more evolutionary hardware and component developments of yesteryear's power engineer.

A New Steam Generator for Supercritical Pressure . . . 28

By Willburt W. Schroeder

The once-through unit has proved itself reliable, feasible and efficient for large steam generating units. But the use of the bypass for low load and start-up has hobbled its widespread application. Here the author presents a combined circulation design which eliminates the bypass, permits advantages of fabrication heretofore impractical.

Feeding Coal to a Gas Turbine . . . 40

By D. G. Strimbeck, J. Smith, R. W. Cargill and J. P. McGee

The first of several articles planned describing two separate systems for feeding coal to a gas turbine combustor. One is for a locomotive and the second for large generating stations.

Steam Power Plant Clinic—XXX . . . 45

By Igor J. Karassik

Two knotty but persistent problems—alternate source of condensate injection and monitoring pump deflection—are covered in this issue.

Grindability—A Unit for Coals or Equipment? . . . 46

By R. M. Hardgrove

An earlier COMBUSTION article on comparing roller mills seemed enough off base to prompt this helpful reply.

Power Symposium Program . . . 48

The theme "Power Automation in Use" plus top-flight engineers who will participate make this ISA, Fort Worth, Texas meeting an attractive one to all engineers.

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COVER PHOTO

Landmark lighting
in the Panhandle
plains is achieved
by the Nichols Station
of the Southwestern
Public Service Co.
near Amarillo, Texas



Cleaning the Iron System Using Ammoniated Citric Acid . . . 17

S. Alfano

*This author makes a strong case for this acid
since he holds it to be a specific for
cleaning iron and a stopper for any tendency of
iron to react with its own ferric salt*

Generation of Electricity By Unconventional Methods—I . . . 29

H. Billett, P. D. Dunn and H. C. Whitby

*From time to time COMBUSTION assays the research
world to report on what's new or what advances
have been scored in earlier reported researches*

American Power Conference in Review—I . . . 41

*Abstracts of the more interesting papers at
the recently concluded Chicago-staged Power
Conference are begun in this issue with a follow-
up next month*

Steam Power Plant Clinic—XXXI . . . 49

Igor J. Karassik

*The recurring problem of boiler feed pump
recirculation comes up again. This time its
the control valve and its location that is
commented upon*

Rotary Valve Transfers Coal in System for Feeding A Gas Turbine . . . 52

Jack Smith and Donald C. Strimbeck

*The basic essentials in a coal feed valve to supply
a stationary-sized gas turbine power unit*

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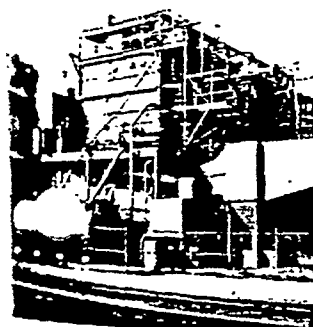
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COVER PHOTO

Florida Power and Light Company's sparkling Miami station—on the Miami River near its mouth



Utilization of Pipeline Coal . . . 20

D. J. Frey, James Jonakin and V. Z. Caracristi

The authors develop the case for transportation of pipeline coal and present an interesting evaluation of the various methods of handling and burning at the delivery point.

Measurements of the Water Circulation in a High-Pressure Natural Circulation Boiler . . . 25

Roy Carlson, Bernt Cederberg, Knut Ljunggren

Details are given of the first large scale radioactive measurement of circulation velocities in a steaming boiler.

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Stack Inspections and Maintenance . . . 37

George Setterlund

Precautions, points to check and maintenance tips for improved stack care are cited.

Generation of Electricity by Unconventional Methods . . . 41

H. Billet, P. D. Dunn and H. C. Whitby

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COVER PHOTO

Addition of Unit 5
to Con Edison's
Astoria plant raised
it to 1500 Mw
capability—the
largest steam electric
plant in the USA



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R. M. Hutcheson

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R. Loisin and R. R. Kissel

The data on the 1960 fundamental research at the International Flame Research Foundation is now being made available. (First of two parts)

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The three commercial size nuclear power stations in the USA are given a quick look and a report

Power Symposium a "Signal" Success . . . 39

The Fifth National Power Instrumentation Symposium bore evidence to the importance of this activity

The Case For Hydrochloric Acid . . . 46

I. B. Dick

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COVER PHOTO

The prize-winning International Fountain at the Seattle World's Fair



Observations on Experiments Carried Out on the Combustion of Pulverized Fuel-II . . . 20

R. Loisin and R. R. Kissel

Second installment on the 1960 findings of the International Flame Research Foundation looking into the fundamentals of the combustion process

New Steam Turbine Main Inlet Features Are a Bonus to Power Plant Operators . . . 27

G. B. Leyland and J. D. Conrad, Jr.

A brief description of one manufacturer's latest design features aimed at saving space, reducing maintenance, increasing accessibility

Solid Fuels for Power Generation—A History and a Review . . . 29

A. W. Hindenlang

The paper develops a prediction for coal usage based on the lessons of history and the trends of today

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Igor J. Karassik

Certain considerations that should go into writing pump specifications are offered and discussed

Economic Sizing of Cooling Towers . . . 41

A. G. Kelly and N. R. Lawless

Some discussion of cooling tower design factors is made and then the authors knuckle down to a practical example of the application of these factors

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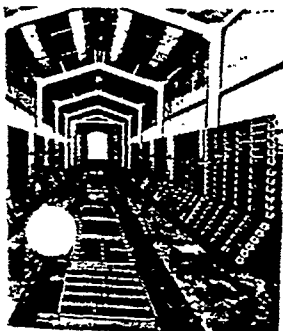
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COVER PHOTO

A view of the complete coal car thawing unit at the Avon Plant of the Cleveland Electric Illuminating Co.



Huntington Beach Control System to Date . . . 20

C. O. Giles and W. L. Chadwick

One of the best presentations we've seen on power plant automation points out oversights, omissions plus benefits and lessons for the future

Steam Power Plant Clinic—Part XXXIV . . . 24

Igor J. Karassik

Two moot questions—selection of drives for half-capacity pumps and start-up treatment of condensate injection seals—are handled in this issue

Design of Bunkers for Difficultly Flowing Fuels . . . 32

W. J. Reynolds and R. S. Carter

In which is discussed overcoming bunker discharge problems so that coal falls with level top surface and hang-ups are avoided

Cleaning Steam Plant Equipment In Situ . . . 40

Peter W. Sherwood

A roundup of cleaning methods apart from the chemical treatment often discussed in these pages

A Study of Steam Costs . . . 44

C. E. Feng

A precise, analytical study of what it actually costs to produce steam and why

Criticality Achieved in Indian Point Reactor . . . 49

Facts and figures on the world's first commercial pressurized water thorium converter reactor

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Profile of Panhandle Power . . . 28

A. W. Hindenlang

A sketch of an unusual utility with unusual problems

The BISRA Variable-throat Burner . . . 37

A. W. Durrant

Varying the area of the rectangular burner throat produces turndown rates equivalent to a whole series of fixed throat burners

Steam Power Plant Clinic—Part XXXVI . . . 43

Igor J. Karassik

A comparison of main shaft driven, and steam turbine driven boiler feed pumps on the basis of start-up requirements

Use of Coordinated Phosphate Treatment to Prevent Caustic Corrosion in High Pressure Boilers . . . 45

H. A. Klein

On the mechanics of iron water corrosion in high pressure boilers. The author also offers coordinated phosphate—pH control to fight caustic attack

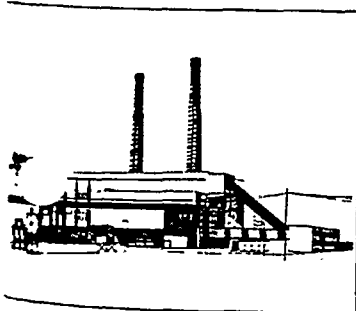
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COVER PHOTO

*Striking view of
TVA's Gallatin
Station at
Gallatin, Tenn.*



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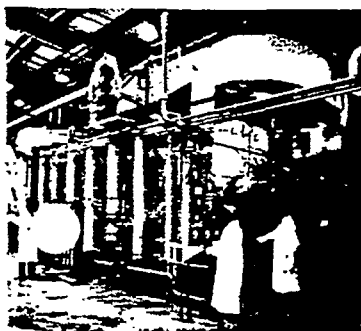
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Combustion Engineering research study package boiler firing and control problems at Windsor, Conn.



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DEVOTED TO THE ADVANCEMENT OF STEAM PLANT DESIGN AND OPERATION

JOSEPH C. McCABE, Editor and Publisher

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ROBERT D. TAFT, Business Manager

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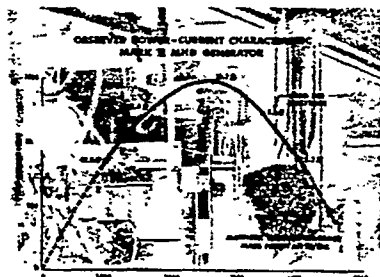
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Avco's Mark II MHD generator during test. Curve shows output power as total output current.



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COVER PHOTO

Striking dusk view of Ravenswood, final site for the recently ordered 1000 Mw generating unit



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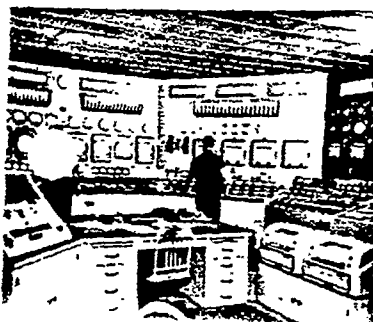
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*Imposing, efficient
control room at
TVA Widow's Creek
Plant, Unit No. 7*



Fans in Modern Steam Power Plants . . . 20

Hans Schlumphf

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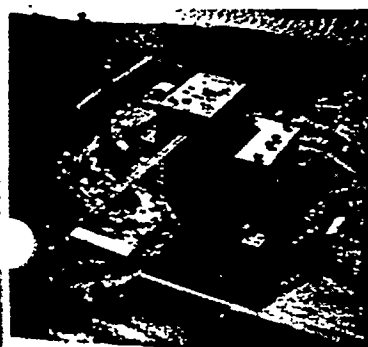
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Brayton Point Station,
New England Electric,
offers an increasingly
rare advantage today—
ample river water—for
its next, a 250 Mw unit,
due in May 1963



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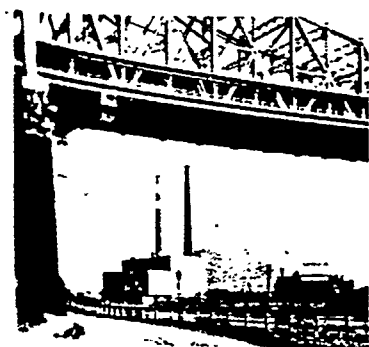
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COVER PHOTO

An arresting view of the Ravenswood Station of the Consolidated Edison Co. of N.Y. home of the 1000 Mw unit to be described in pp 34



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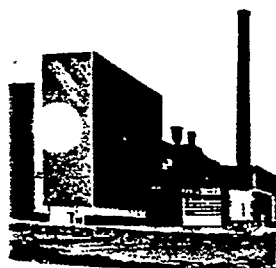
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The clean good looks of the
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Modern CO Boiler at
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Co. uses waste gas from
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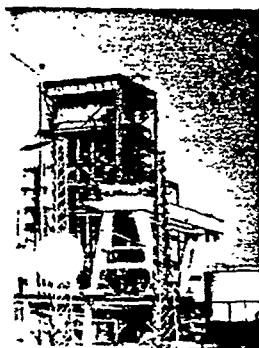
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California Electric Power
Co.'s Daggett, Calif. plant
taken by Donald Sims shows
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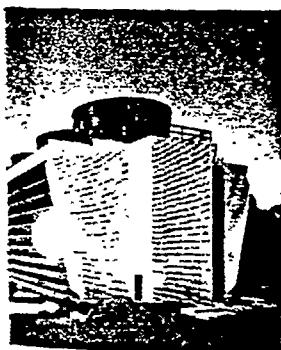
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Large cooling tower for Etiwanda of Southern California Edison manufactured by Foster Wheeler long, 60 ft wide, 57 ft high, it circulates 36,000 gal of water per minute



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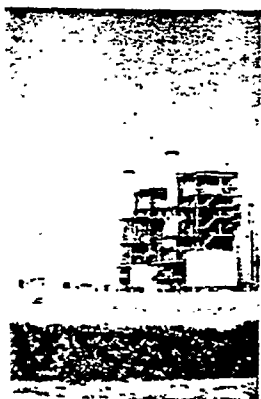
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A businesslike outdoor installation at California Electric Power's San Bernadine Plant



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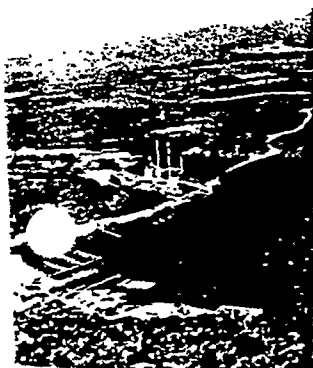
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Aerial view of Long Island Lighting's Port Jefferson Station shows compatibility with beaches, marina, boat basin



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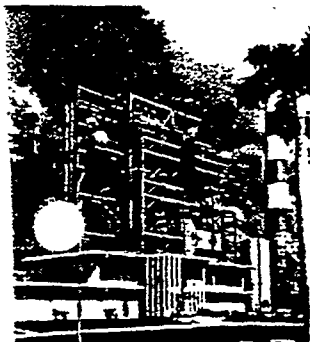
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The clean, attractive Port Everglades Station of the Florida Power & Light Co. show up well in this view



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COVER PHOTO

A good view shows the Central Termoelectrica de Palo Seco, P. R., to advantage



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