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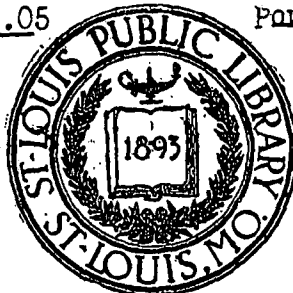
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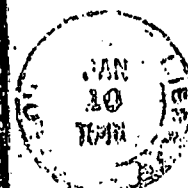
JANUARY
1946

POWER

GENERATION, TRANSMISSION AND APPLICATION OF ALL THE POWER SERVICES

v. 90, pt. 1

June June 1946



Central-station survey reveals design plans and construction progress in utility expansion program rivalling that of the late Twenties. Trend is toward condensing units operating at moderately high pressures — 700 to 900 psi—and high temperatures — 850 F and up. For a station-by-station roundup, see article beginning on page 64

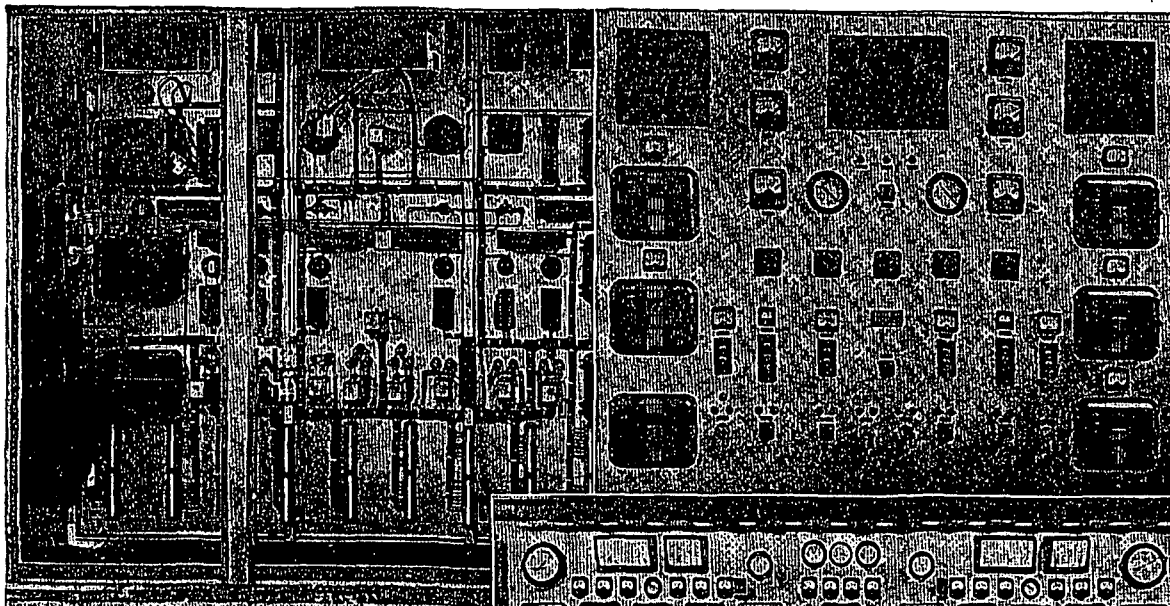
Gas-diesel principle now applied to supercharged 4-cycle units and to 2-cycle engines. Report on development makes special reference to performance, valving, fuel injection and control methods. Turn to page 71

Forming the heart of most gas-turbine power units, axial-flow compressors like this jet-propulsion element are much in the day's technical news. See articles on page 81 and page 103.

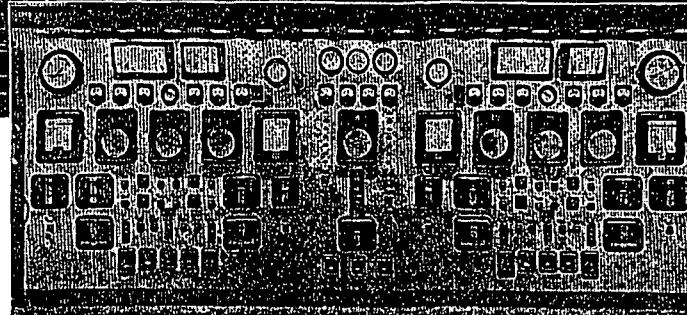
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Back and front views, at our plant, of Metermax Combustion Control section of a complete L&N boiler gauge board for Picway Station, Columbus & Southern Ohio Electric Co. Right—Two-boiler L&N Control Board installed at Westover Station, New York State Electric & Gas Corp.

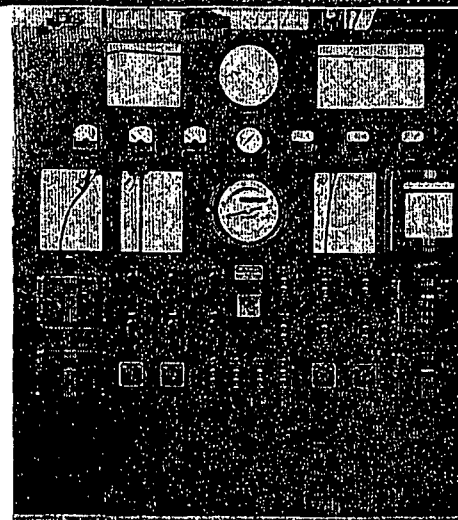


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These Panels arrive with Metermax (or Type P) Combustion Controllers and/or Micromax instruments installed. Major equipment items which we do not make can be supplied or not, but the entire Panel, down to the last wire, is connected and checked. Either with the Panel or ahead of it we send complete structural and wiring blueprints, which greatly reduce the recipient's engineering and drafting work. The Panel as received is ready to install.

Further information will be sent on request.



Labelled in Russian, this is one of eight boiler boards shipped as shown to U.S.S.R. Metermax Controllers and Micromax Instruments are mounted. Wiring for separately-shipped equipment can be seen, cabled and tagged, in cut-outs.



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VOLUME 90, NUMBER 1

A CROSS-INDEX OF SUBJECTS FOR THE MONTH

PLANT OPERATING METHODS, MAINTENANCE AND SAFETY
STEAM GENERATION, FUELS, FIRING AND COMBUSTION
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PIPING, VALVES AND SPECIALTIES
TRANSMISSION, LUBRICATION
STEAM SERVICES, HEATING
INSTRUMENTS, CONTROLS
PUMPS, COMPRESSORS

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Over photo, courtesy Wealinghouse Electric Corp.

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The Manual starter built on the premise all motors deserve equal protection

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Although the Cutler-Hammer 9115 is designed for motors that can be manually started, it has the same design, construction and operation as starters that have made Cutler-Hammer Magnetic Starters a standard wherever electric motors are used. Here you will find the same "drop-solder" eutectic alloy overload relay that distinguishes the Cutler-Hammer Magnetic Starter line . . . the same twin-break Vertical dust-safe contacts . . . the same pure, fine silver contact faces . . . the same snap action contact mechanism . . . the same simple design . . . the same dependability . . . the same attractive, clean styling. Only in the absence of the electro-magnetic closing mechanism is there any difference at all. Every motor in your plant no matter how small or "unimportant" has an essential role to play in production. Every motor deserves equal care and protection. Every manually started motor deserves this degree of protection. Yet C-H 9115 costs no more than ordinary starters. CUTLER-HAMMER, Inc., 1358 St. Paul Ave., Milwaukee 1, Wisconsin. Associate: Canadian Cutler-Hammer, Ltd., Toronto, Ont.

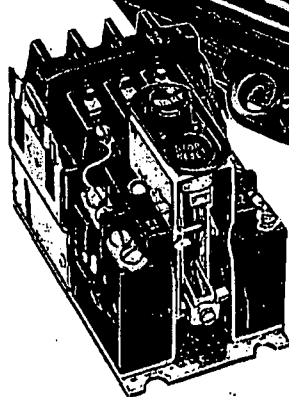


OPERATING MECHANISM—Available as skeleton for building into machines, etc. Metal parts rust-proof. Rubber mounting absorbs shocks. Mechanism removable as a unit by loosening one screw—for wiring, etc. Parts and terminals easily accessible.

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Feb.—Magnetic Drives

April—Pressure and Temperature Controls

June—Analysis of Power Trends. To include vital postwar statistics

Sept.—Gas Turbines.

Dec.—Boilers

To keep abreast of engineering developments as they happen, read:

POWER

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Cascade will be managed by Clyde A Retter. This firm will also act as distributors for Fairbanks-Morse electrical equipment.

Kennedy-Van Saun Manufacturing & Engineering Corp appoints Edwin A Wert general manager of Southwest region, made up of Ariz., Calif., Colo., Utah and N. M.

Wickwire Spenceer Steel Div, Colorado Fuel & Iron Corp, made Herbert D Rollo sales manager for New England District.

Bacharach Industrial Instrument Co, Pittsburgh, purchased the Practical Instrument Co of Chicago. Portable temperature, humidity and operation recorders formerly made by Practical Instrument Co will now be manufactured in the Bacharach plant. Production equipment and other physical property of the purchased company is being transferred from Chicago to Pittsburgh.

Swartwout Co established a new Chicago office to serve steam power-plant equipment customers. H P DeHart is in charge of this office at 120 S La Salle St, Chicago. Swartwout ventilator sales in Chicago area continue under L V Warner at 549 Randolph St.

Briggs Filtration Co acquires Briggs Clarifier Co. Officers of the new company, all of whom served with the old company, are Chase Donaldson, president; S W Briggs, vice-president; R C Zschiegner, treasurer; W. E. Furey, secretary-counsel; Cecil Hopkins, assistant secretary. Directors are Chase Donaldson, president; S W Briggs, vice-president; Richard P Dunn, partner, Auchincloss, Parker & Redpath; Bradley J Gaylord, vice-president, Pennroad Corp, Wilmington, Del; Clark W McKnight, Wilmington, Del.

Weston Electrical Instrument Corp appoints Harold L Olesen as general sales manager. H L Gerstenberger, who formerly served in that capacity, continues as vice-president in charge of sales.

Howard M Cutshaw has been made assistant sales manager and Thomas A Marsh manager of corporation sales of Iron Fireman Manufacturing Co. Mr. Marsh succeeds Karl Saboe, who recently transferred to St. Louis as branch manager.

Announcement was made recently of election of Fred A Jackle, works manager of Chase metal works and Chase rolling mill plants, as a vice-president of Chase Brass & Copper Co. He will act as a special consultant on the staff of Richard D Ely, vice-president in charge of production. Walter L Smith has been promoted to works manager of metal works and rolling mill plants in Waterbury.

Fisher Governor Co announces appointment of Puffer-Sweiven Co as its exclusive representative in Texas Gulf Coast area.

Cutler-Hammer Inc announces the election of E U Lassen as assistant chief engineer.

Eshelman & Potter appointed G S Myers a member of the chemical engineering staff. As service engineer, Mr. Myers' work will involve both Hagan combustion control and Hall Laboratories water conditioning in Southern areas, including the marine field.

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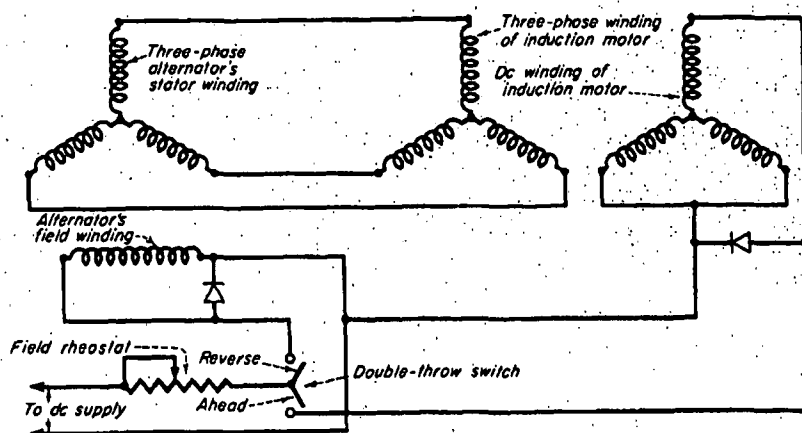
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15 Diagram of reversible magnetic drive that includes a synchronous alternator and an induction motor, as shown in 16. The motor has two distributed field windings

REVERSIBLE DRIVES

A cross-section of a reversible magnetic drive described in *Engineering* (London) Oct. 17, 1941, is shown in Fig. 16. It consists of an alternator and a magnetic coupling, the equivalent of an induction motor. The alternator's field poles *P* and the rotor *R* of the induction motor are fixed to the input shaft. The alternator's stator is supported in a frame bolted to the unit's bedplate. Field core and windings *W* for the induction motor are mounted on a spider keyed to the output shaft. This core is slotted on its outer periphery and has

two 3-phase star-connected windings. For one direction of rotation one winding is excited by dc, and for the other direction the other winding is excited by 3-phase ac, as indicated in Fig. 15.

For the output shaft to operate in the same direction as the input one, and at practically the same speed, the power unit is started and brought up to about half speed. Then, excitation is applied to the magnetic drive's dc winding, which produces magnetic poles in core *W* as with a salient-pole winding. As the squirrel-cage winding in core *R* rotates through the magnetic field, current is generated in it that reacts on the latter to produce torque as in an induction motor. This torque accelerates the output shaft in the same direction and up to about the same speed as the input shaft. In this direction of rotation, operation is the same as for the other 2-element magnetic drives described previ-

ously, the alternator remaining inactive.

For reverse direction of the drive, the dc winding of the induction motor is disconnected, the alternator's field is excited and its windings connected to the ac winding on the induction motor rotor. Current from the alternator generated at a frequency that produces a rotating magnetic field in the induction motor's rotor of twice the speed of the input shaft and in the opposite direction. This is necessary for reverse rotation, since mechanically the outer member of the magnetic coupling continues to rotate at input speed. A reversed magnetic field of twice input speed imposed on this motion then results in a reversed field of normal speed so that the output shaft runs at normal speed in reverse direction.

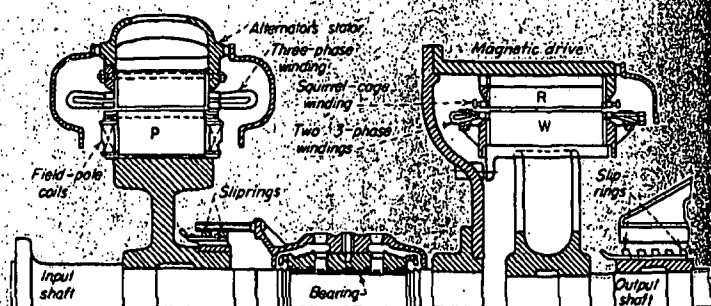
If the outer member connected to the input shaft has ten poles and is driven at 300 rpm when excited with dc, it produces a 25-cycle forward-rotating magnetic field. To generate a corresponding field in reverse direction it is necessary to apply a 50-cycle rotating magnetic field in relation to the outer member. However, owing to the forward rotation of the outer member, the over-all effect relative to the rotor is a 25-cycle reverse field and a corresponding speed.

Mechanically the coupling elements may be arranged in different ways. For simplicity the alternator has been shown separate from the magnetic coupling, but a commoner arrangement is a combination of the two in a single unit. This drive may be considered as a normal magnetic coupling in which an alternator on the input shaft supplies an induction motor on the output shaft. However, it has the advantage that the alternator is seldom used, and is idle during forward rotation of the propeller. Therefore it can be rated on a short-time basis and be considerably smaller than for the usual continuous-duty electric drive.

ACKNOWLEDGMENTS

In preparing material on magnetic clutches Power is indebted to Cutler-Hammer Inc, Dings Magnetic Separator Co, Stearns Magnetic Mfg Co, all of Milwaukee, Wis.; and to Twin-Disc Clutch Co, Racine, Wis.

Material from which the electric-coupling and magnetic-drive articles were written was supplied by Dynamatic Corp, Kenosha, Wis.; Electric Machinery Mfg Co, Minneapolis, Minn.; Elliott Co, Ridgway, Pa.; General Electric Co, Schenectady, N. Y.; and Westinghouse Electric Corp, East Pittsburgh, Pa.



16 Reversible constant-speed magnetic drive, with synchronous alternator on the left and an induction motor on the right, with two windings on rotor

**C. H. WHEELER
OF PHILADELPHIA**

STEAM CONDENSERS

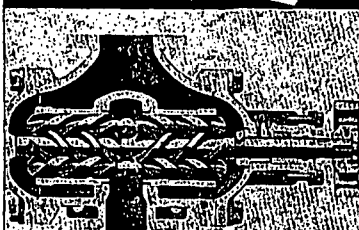
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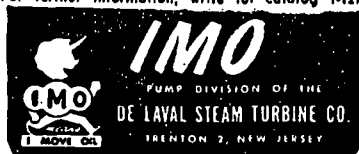
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Harvey T Hill was reelected executive director. New directors who were elected are A W McKinney, vice-president of National Supply Co, and G F Twist, vice-president and general manager of Atlas Imperial Diesel Engine Co. Continuing on board of directors are George W Codrington, vice-president of General Motors Corp; Charles E Brinley, chairman of board, Baldwin Locomotive Works; Robert E Friend, president of Nordberg Mfg Co; Norris H Schwenk, president of Busch-Sulzer Bros-Diesel Engine Co; Mr Schwannhauser, Mr Morse and Mr Lefebvre.

United Engineers & Constructors Inc elected Charles W E Clarke vice-president and consulting engineer, Stanley C Cook vice-president and construction manager, Benjamin S Thayer, vice-president and construction manager.

F A Wright has been named as chairman of Industrial Control Section of National Electrical Manufacturers Association. Mr Wright is assistant general sales manager of Cutler-Hammer, Inc.

Prof Marcel K Newman has been appointed associate professor of mechanical engineering in College of Applied Science, Syracuse University, Syracuse, N. Y.

OBITUARIES

George Bridges, 58, pump application engineer and an employe for 40 years of Worthington Pump & Machinery Corp, died Dec 19 at his residence in Nutley, N. J.

Alan Estes Flowers, 69, head of research and development dept of De Laval Separator Co, died on Dec 3 in Vassar Hospital, Poughkeepsie, N. Y.

Charles C Hall, 70, founder and vice-president of Durametallic Corp, Kalamazoo, Mich., died at his home Dec 26.

George W MacDow, 59, president and treasurer of Norwood Engineering Co, died at Brookline, Mass., on Dec 9.

William Price Macdonald, 53, manager at Nanaimo, B. C., for British Columbia Power Commission, died at his home there Nov 30.

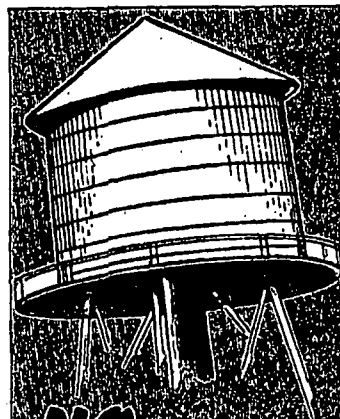
Frank C Angle, 45, manager of general machinery div field sales offices, Allis-Chalmers Mfg Co, Milwaukee, died recently after an illness of several months.

C Harold Wheeler Jr, 63, vice-president and general manager of C H Wheeler Manufacturing Co, died at the Presbyterian Hospital, Philadelphia, on Nov. 24.

J E Aldred, 82, one of the pioneers in field of hydroelectric development, died on Nov 21 at the Garden City Hotel, Garden City, L. I., N. Y., where he lived.

David S Boyden, 72, former superintendent of steam-heating dept of Boston Edison Co, died at St. Petersburg, Fla., on Nov. 26. He retired from Boston Edison Co in 1939 after 31 years on its staff.

James A Moyer, 70, for many years prominent in engineering educational activities, for 29 years director of the university extension div in Mass., died at Newton, Mass., on Dec. 1. Since his retirement he had been engaged in preparing a volume on high-speed diesel engines.



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CUTLER-HAMMER VERTICAL CONTACT STARTER

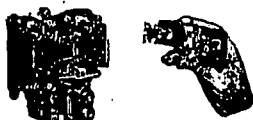
For Squirrel-Cage and Polyphase Supervised Cage Motors

An outstanding example of the
most advanced motor control in service
today

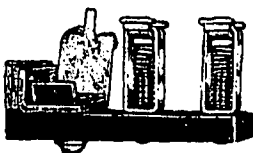


It can be no mere coincidence that the company oldest in specialized motor control experience is also the manufacturer of the famous 9586 Magnetic Starter. The Cutler-Hammer Vertical Contact design which plays so important a part in the outstanding performance of this small motor control unit came as a lesson learned, not among small a.c. motors, but in designing motor control for steel mill requirements. The renowned "drop of solder" overload relay, which protects your motor windings as no other relay can, was inspired by a clear understanding of operating needs. The 99-9/10% pure silver contact faces were selected because of their well-known immunity to oxidation. The same degree of specialized engineering is carried on throughout the design and manufacture of the 9586 Magnetic Starter. As a result, you get more work from your squirrel cage motors with full safety for your equipment at a minimum of expense, trouble and replacement in motor control. CUTLER-HAMMER, Inc., 1358 St. Paul Ave., Milwaukee 1, Wisconsin. Associate: Canadian Cutler-Hammer, Ltd., Toronto, Ont.

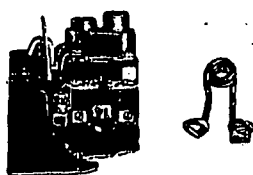
**Only years of experience
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Vertical Dust-Safe Contacts. The famous Cutler-Hammer construction that assures better performance and longer life. Clean, cool, accessible contacts are the mark of better motor control.



Heavy pure silver contacts result in new trouble-free performance in severe service. Lava insulators protect contact springs against even minor heat transmission, insuring full contact pressure *always*... an instantly accepted feature greatly extending the life of these working parts. Contact springs and contact supports now of stainless steel... a feature appreciated where corrosive atmosphere is a problem.

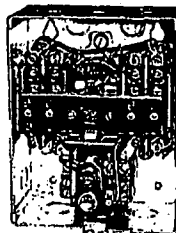


Famed C-H "Drop of Solder" overload relay has been further refined. New enclosed heater coil construction, new solder-alloy assembly easily and quickly removed for inspection. When an overload occurs, the red button pops forward, telling you at once why motor has stopped. Overload relay is free-tripping.

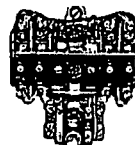
CUTLER-HAMMER

MOTOR CONTROL

CH



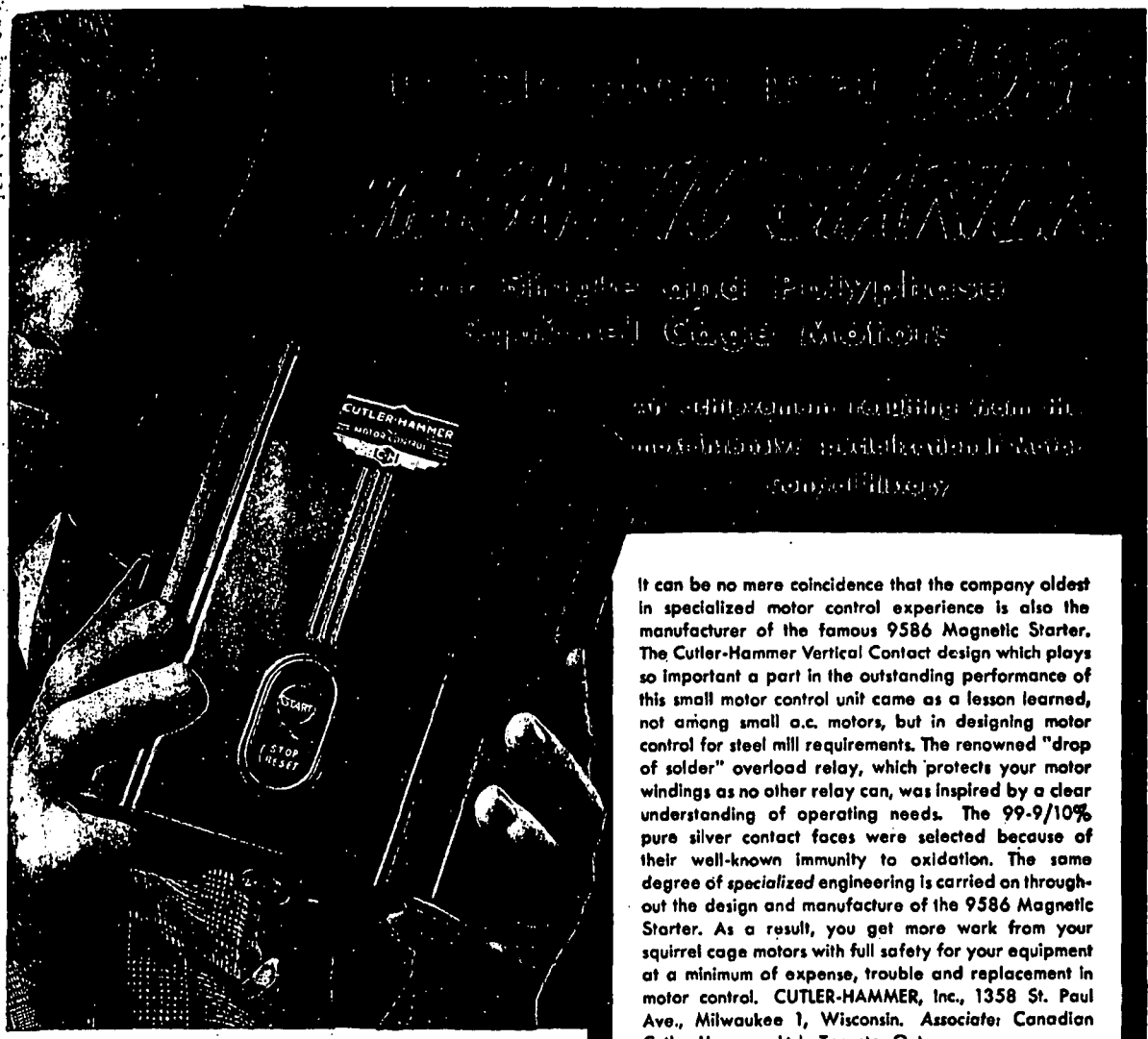
Densheath internal wiring gives exceptionally workmanlike appearance. From the handsome modern cover to the beautifully finished light interior, advanced design is used throughout. Case has solid back. Mechanism rubber mounted on dead-back panel.



The C-H 9586 Starter is available in all standard constructions, with or without pushbuttons in case, with transfer switch, in combination starter, and in skeleton construction for built-in application.

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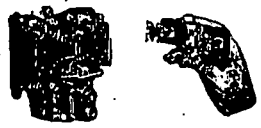


CUTLER-HAMMER 9586 MAGNETIC STARTER For Squirrel-Cage and Polyphase Supplied Cage Motors

an equipment handling from the
most important maintenance to
complete safety

It can be no mere coincidence that the company oldest in specialized motor control experience is also the manufacturer of the famous 9586 Magnetic Starter. The Cutler-Hammer Vertical Contact design which plays so important a part in the outstanding performance of this small motor control unit came as a lesson learned, not among small a.c. motors, but in designing motor control for steel mill requirements. The renowned "drop of solder" overload relay, which protects your motor windings as no other relay can, was inspired by a clear understanding of operating needs. The 99-9/10% pure silver contact faces were selected because of their well-known immunity to oxidation. The same degree of specialized engineering is carried on throughout the design and manufacture of the 9586 Magnetic Starter. As a result, you get more work from your squirrel cage motors with full safety for your equipment at a minimum of expense, trouble and replacement in motor control. CUTLER-HAMMER, Inc., 1358 St. Paul Ave., Milwaukee 1, Wisconsin. Associate: Canadian Cutler-Hammer, Ltd., Toronto, Ont.

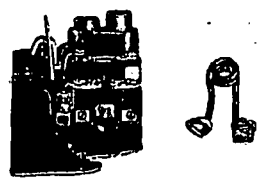
Only years of experience
can develop features like these



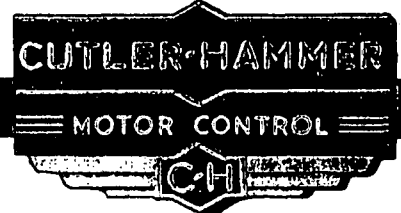
Vertical Dust-Safe Contacts. The famous Cutler-Hammer construction that assures better performance and longer life. Clean, cool, accessible contacts are the mark of better motor control.



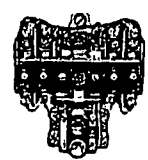
Heavy pure silver contacts result in new trouble-free performance in severe service. Lava insulators protect contact springs against even minor heat transmission, insuring full contact pressure *always*... an instantly accepted feature greatly extending the life of these working parts. Contact springs and contact supports now of stainless steel... a feature appreciated where corrosive atmosphere is a problem.



Famed C-H "Drop of Solder" overload relay has been further refined. New enclosed heater coil construction; new solder-alloy assembly easily and quickly removed for inspection. When an overload occurs, the red button pops forward, telling you at once why motor has stopped. Overload relay is free-tripping.



Densest internal wiring gives exceptionally workmanlike appearance. From the handsome modern cover to the beautifully finished light interior, advanced design is used throughout. Case has solid back. Mechanism rubber mounted on dead-back panel.



The C-H 9586 Starter is available in all standard constructions, with or without pushbuttons in case, with transfer switch, in combination starter, and in skeleton construction for built-in application.

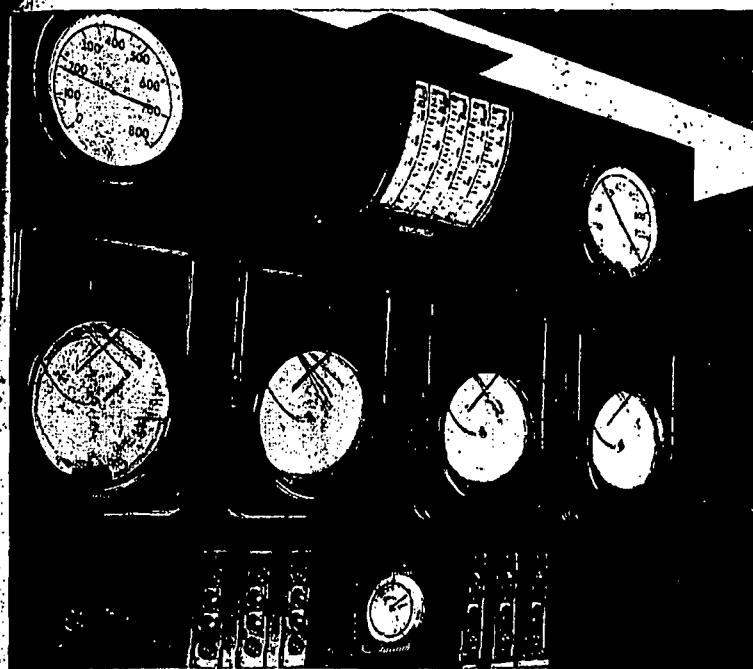


Fig. 4—New boiler's meter panel on which are mounted meters for recording steam flow and air flow; steam, combustion-air, flue-gas and feedwater temperatures; indicating draft pressure at five points in furnace, boiler and economizer; and for recording feedwater level in boiler to guide operator

other schedule can be selected on the control if desired, to suit operation.

Duplex drives are provided on the stoker, a 4-speed squirrel-cage motor and a constant-speed induction motor with a variable-speed transmission. Each con-

nects to the stoker-drive shaft by a roller chain and sprockets. Normally the induction motor through the variable-speed transmission drives the stoker because it gives better speed control.

By using forced- and induced-draft

fans on the boiler the plant's original stack has ample capacity for the increased load. These fans are driven by constant-speed motors, stoker draft being controlled manually by dampers in the stoker and extension-grate windbox connections. Furnace pressure is regulated by automatic control that positions the uptake damper between the induced-draft fan and breeching.

Outside of furnace-draft control, automatic control was not provided because normally the boiler will supply a base load of about 100,000 lb of steam per hour. However, in the boiler and its combustion equipment, provisions have been made for the installation of automatic combustion control if this becomes desirable.

About 60% of the boiler's feedwater is condensate return and 40% raw river water filtered through sand with no treatment. Condensate and makeup mix in a 300,000-lb-per-hr deaerating feedwater heater, are heated to 212 F and pumped (Continued on page 138)

PRINCIPAL STEAM AND ELECTRICAL EQUIPMENT

Boiler-Plant Extension of E B Eddy Co

BOILER AND AUXILIARIES:

Boiler Babcock-Wilcox & Goldie-McCulloch
Boiler: 2-drum bent-tube integral furnace; waterwalls made up of bare tubes, stud tubes and Bailey blocks; 12,267 sq ft of heating surface in boiler and waterwalls; economizer; 3720 sq ft of water-heating surface; rated steaming capacity 100,000 lb per hr, continuous; 460-psi design pressure, 175-psi operating pressure at superheater outlet; 5800 cu ft furnace volume; 25,000 Btu maximum heat release per cu ft per hr; superheater; drainable, 130-F superheat, 508-F total steam temperature
Boiler refractories Babcock-Wilcox & Goldie-McCulloch
Boiler heat insulation Atlas Asbestos Co
Boiler blowers Diamond Specialty
Ash gates Link-Belt Co
Boiler steel casing, ducts, breechings Babcock-Wilcox & Goldie-McCulloch

COMBUSTION EQUIPMENT:

Stoker American Engineering Co
Taylor, watercooled, underfeed, 17 ft, 5½ in. wide by 16 ft, 3 in. long; 10 returns; 45 tuyeres; actual grate area, 318 sq ft; projected grate area, 286 sq ft; combustion rate, 10,400 lb per hr
Stoker multispeed-motor drive Lincoln Electric Co
Totally inclosed, 5 hp, 440 v, 450 to 1200 rpm, squirrel cage
Motor control, remote Cutler-Hammer, Inc
Stoker motor on variable-speed drive Canadian General Elec Co
Totally inclosed, 5 hp, 440 v, 1160 rpm, squirrel cage
Motor-starter pushbutton Canadian General Electric Co
Extension-grate hydraulic dump Logansport Machine Works
Extension-grate dump control Eagle Sign Corp
Pump motor on grate dump Canadian General Electric Co
Totally inclosed, 5 hp, 440 v, 1160 rpm, squirrel cage
Motor starter, remote pushbutton Canadian General Electric Co
Safety switches on stoker motors Square D Co
Furnace pressure regulator A W Cash Co
Forced-draft fan, vane control Sheldon's, Ltd
Motor driven, 49,000 lb per hr at 3.25-in. wg and 100 F
Forced-draft fan motor Canadian General Electric Co
Totally inclosed, 100 hp, 1150 rpm, 440 v, squirrel cage

Consulting Engineers: Hardy S Ferguson & Co

Induced-draft fan Sheldon's, Ltd
One, 200,000 lb per hr, 7.4 wg at 425 F
Induced-draft fan motor Canadian General Electric Co
Totally inclosed, 125 hp, 1160 rpm, 440 v, squirrel cage
Motor starters, pushbutton Canadian General Electric Co
Safety switches Square D Co

VALVES, PIPING AND TRAPS:

Safety valves, Consolidated Manning, Maxwell & Moore
Nonreturn valves Crane, Ltd
Blowdown valves Edward Valves, Inc
Drain valves Crane, Ltd
High-pressure valves Crane Ltd
Feedwater valves Edward Valves, Inc
Piping insulation Insulation Products Co
Traps Trivice Mfg Co

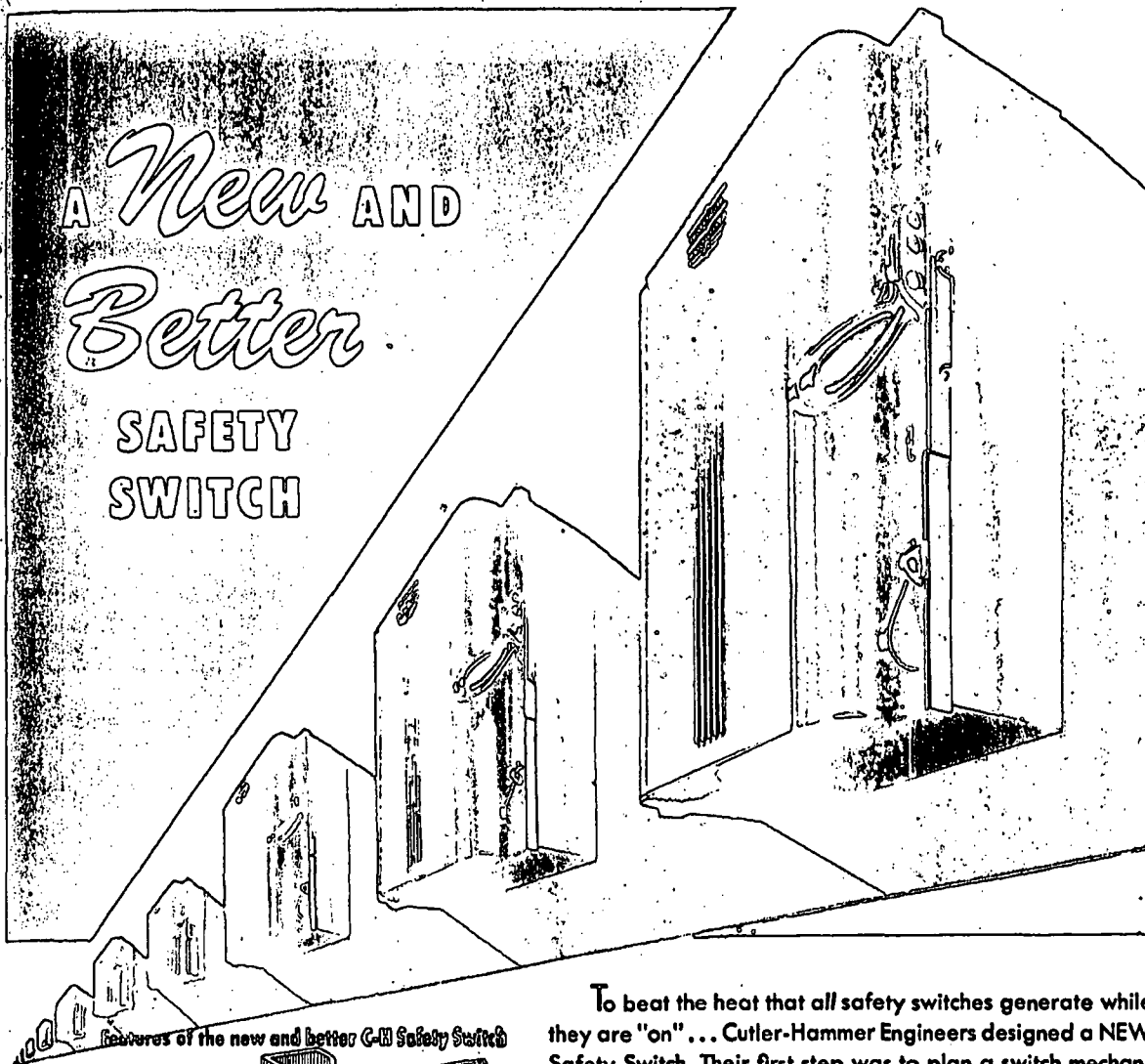
FEEDWATER SYSTEM:

Feedwater chemists W H and L D Betz Co
Feedwater acid pumps Milton Roy Pump Co
Acid-feeder control Canadian General Electric Co
Feedwater heater (Cochrane) Canadian Allis-Chalmers
Deaerating, 300,000 lb per hr, from 65 to 212 F
Feedwater automatic controls (Copes) Peacock Bros
Excess-pressure regulator (Copes) Peacock Bros
Water columns Diamond Specialty
Feed pumps, 2 Babcock-Wilcox & Goldie-McCulloch
One, turbine driven, 225,000 lb per hr, 350 psi
One, motor driven, 150,000 lb per hr, 300 psi (standby)

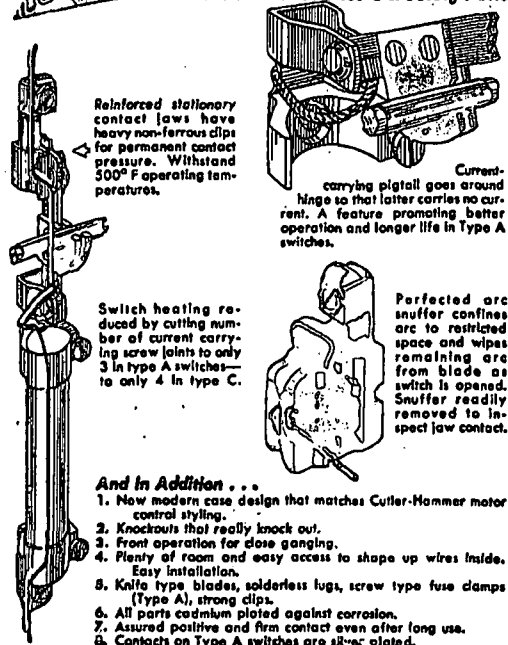
METERS:

Boiler meter and control panel Bailey Meter Co
Boiler meter (steam-flow air-flow), steam temperature and pressure recorders, flue-gas temperature recorders, 5-point draft gage and feedwater-level recorder Bailey Meter Co
Steam-pressure gage Manning, Maxwell & Moore
Hydraulic-pressure gage U. S. Gauge Co

A New AND Better SAFETY SWITCH



Features of the new and better C-H Safety Switch



To beat the heat that all safety switches generate while they are "on" . . . Cutler-Hammer Engineers designed a NEW Safety Switch. Their first step was to plan a switch mechanism that would carry its load with a new low minimum of heating. Their second step was to build the mechanism so that it would far better withstand the heat produced by the fuses in normal operation. Finally they added plus features which a thorough investigation over a long period of time showed that contractors, electricians and service men want.

The result is an outstanding switch that offers better performance, longer life, easier installation, better appearance, a new measure of safety . . . a switch such as you have never encountered before. Why don't you take the measure of its quality in your very next installation? At Cutler-Hammer wholesalers everywhere. CUTLER-HAMMER, Inc., 1358 St. Paul Ave., Milwaukee 1, Wisconsin.



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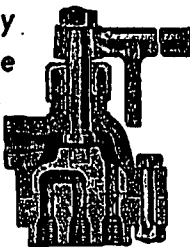
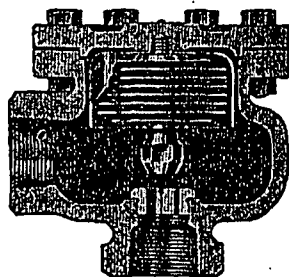
oratory

NICHOLSON TRAPS AND VALVES CAN "TAKE IT"

Feature Durability and Simplicity
→ that Maintenance Engineers Admire

NICHOLSON THERMOSTATIC TRAPS

—2 to 6 times greater valve area gives enormous discharge capacity. 5 types: sizes 1/4" to 2"; pressures to 225 lbs. Bulletin 544.



CYLINDER CONTROL VALVES — Types for many mediums; pressures to 5000 lbs. Catalog 543.

If you're suffering from traps and cylinder control valves that can't stand necessary abuse it's time to inquire about Nicholson units. In plain words, they have the kind of "guts" maintenance engineers admire. Precision-made throughout. For details of exclusive Nicholson features send for catalogs or see Sweet's.

W. H. NICHOLSON & CO. 125 OREGON ST. WILKES-BARRE, PA.



This Armored Floor Never Wears Out!

Hendrick's Mitco Armorgrids add great strength and rigidity to floors, platforms, ramps and drive-ways subject to shock, grinding loads and continuous wear. Floors of cement, asphalt, mastic or other compositions never require replacement when reinforced with

Mitco.

Mitco Armorgrids are completely fabricated units, requiring no bolts, rivets or assembly work—and unlike other floor armorings do not depend on fill for development of full strength. Write for Mitco Booklet today.



HENDRICK

Manufacturing Company

Perforated Metals
Perforated Metal Screens
Architectural Grilles
Mitco Open Steel Flooring,
"Shur-Site" Treads and
Armorgrids.

46 DUNDAFF STREET, CARBONDALE, PENNA.

Sales Offices in Principal Cities

Scoggins has been made district sales manager in Los Angeles. He succeeds T W Bell who became special sales representative in Los Angeles. W S Wainwright has been named district sales manager in San Francisco. W L O'Connell has been appointed resident manager of sales in South Bend.

Northern Equipment Co appoints Kissick Co, 1524 Chestnut St, Philadelphia, Pa., as sales and service representatives for Copes feedwater regulators, pump governors, de-superheaters and allied equipment. Territory includes southern New Jersey, southeastern Pennsylvania, eastern Maryland, Delaware.

Raybestos-Manhattan, Inc, announces that Harry E Smith of the Manhattan div, Passaic, N. J., corporation vice-president, will be in complete charge of corporation rubber product sales and marketing.

Robert S Green becomes president of A P Green Fire Brick Co, succeeding his father, Allen P Green, founder of the company, who moves up to post of chairman of board. An executive committee of the board of directors, composed of H B Plunkett, Lester J Miller, A D Bond, Walter G Staley and Allen P Green Jr, was created. Working with the new president will be a management committee in charge of operations. Members of this committee will be J Harrison Brown, D H Kreutzer and Neal S Wood, with Robert S Green as chairman.

A E Aldridge has been made general advertising manager of Sun Oil Co.

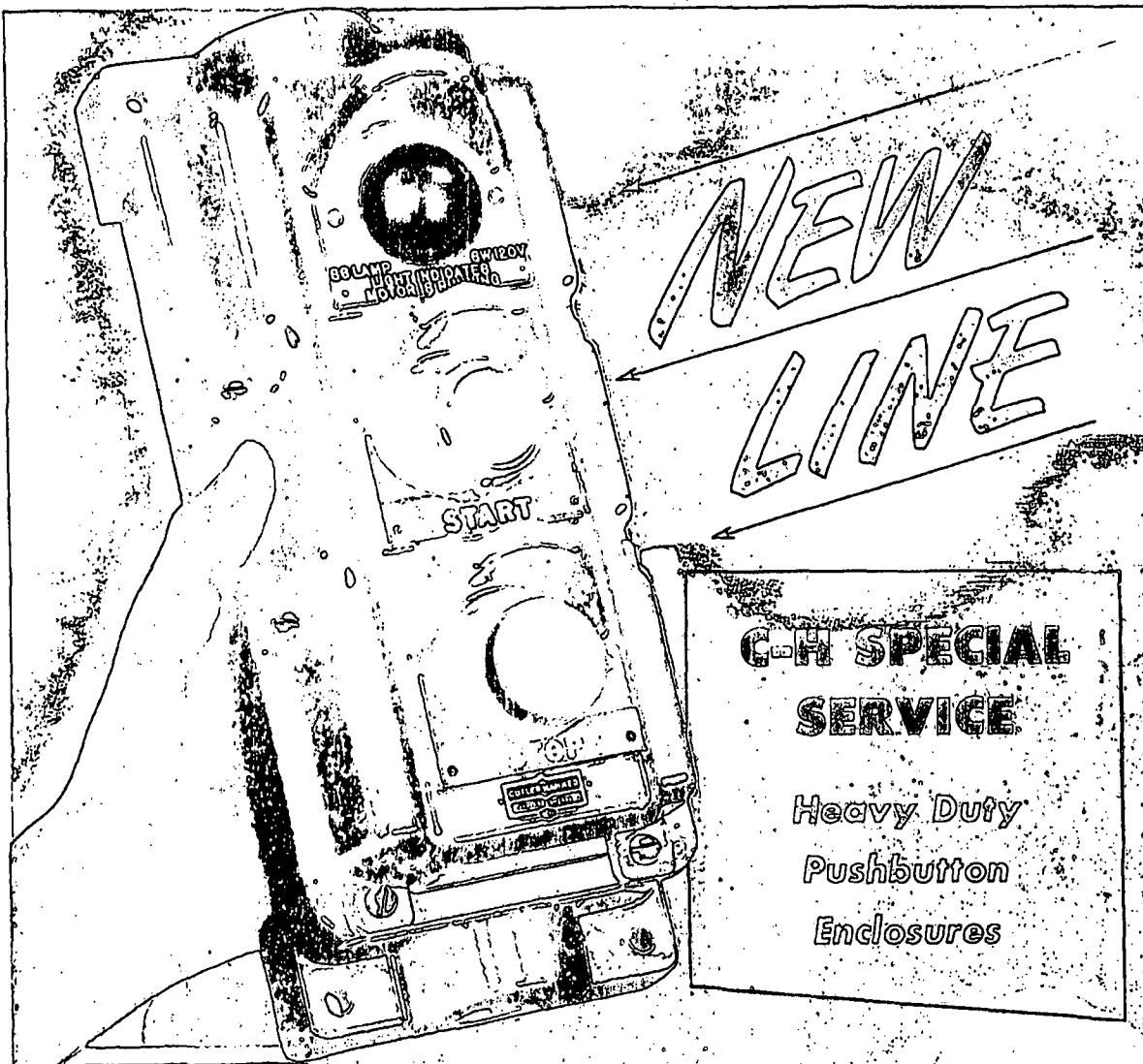
Cutler-Hammer, Inc, announce following appointments on their research and development staff: C T Evans as consulting engineer, C W Kuhn as assistant manager of development, R A Millermaster as assistant manager of development.

E P Wood has been made vice-president of Stevens & Wood, Inc.

H F Spoehrer, vice-president of Sporlan Valve Co of St. Louis, was elected president of Refrigeration Equipment Manufacturers Assn. Other new officers are Edward M Flannery of Bush Mfg Co, Hartford, Conn., vice-president; Guy J Henry of Henry Valve Co, Chicago, treasurer; and C H Benson of Imperial Brass Mfg Co, Chicago, treasurer. Newly elected to board of directors are K B Thorndike, manager of Chicago office of Detroit Lubricator Co; G E Graft of Ranco, Inc, Columbus, O.; R H Israel of Virginia Smelting Co, W Norfolk, Va.; H F Hildreth of Westinghouse Electric Corp, Springfield, Mass.; and J W Krall of Tyler Fixture Corp, Niles, Mich.

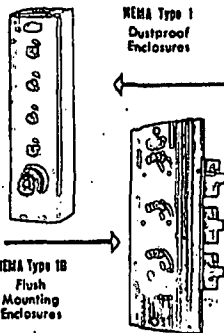
American Society of Heating and Ventilating Engineers appoints Clyde A McKeeman assistant to president.

Appointment of a synthetic liquid fuels technical advisory group, composed of eleven outstanding chemists and engineers from industry, was announced by Bureau of Mines. Members of the group are Eugene Ayres, staff chemist on process development for Gulf Research and Development Co, Pittsburgh, Pa.; George Creelman, research engineer for Pittsburgh Consolidation Coal



C-H SPECIAL SERVICE

Heavy Duty
Pushbutton
Enclosures



Also a complete line of one hole and base mounting elements without enclosure.

NEMA 4 Water-tight
NEMA 5 Dust-tight
NEMA 7 For Hazardous Vapors
NEMA 9 For hazardous Dust
From 1 to 6 Heavy Duty Elements

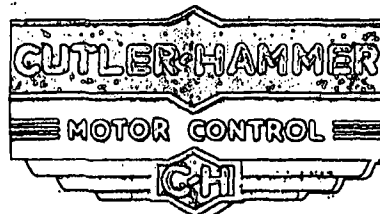
Cutler-Hammer now offers a broad range of pushbutton stations and pushbutton elements for special service of every kind.

Typical of the line, the oil-tight stations conforming to automotive and machine tool standards, offer superlative engineering. Oilproof Neoprene gaskets positively seal out oil; large rugged terminals abolish the need to form a loop in wiring; oversize mushroom type operating buttons

Also Oil-tight Construction

Oil-tight construction that really keeps oil out. Oilproof Neoprene gaskets positively prevent oil seepage.

with drip-hoods and guard flanges... these are just a few of the scores of construction, operation and installation superiorities that show why machine builders and machine users prefer Cutler-Hammer pushbutton elements and stations and say they have no equal. Write for full information today.



CUTLER-HAMMER, Inc., 1358 St. Paul Ave., Milwaukee 1, Wis.
Associate: Canadian Cutler-Hammer, Ltd., Toronto, Ontario.