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ELECTRIC HEATING

Units and Devices



DISCOUNTS

Applying to Publication GED-650A

G-E ELECTRIC HEATING UNITS AND DEVICES

GENERAL

Prices and discounts subject to change without notice.

All prices are f.o.b. point of shipment.

Terms: Net 30 days.

Discounts apply to only one type of heating unit or device. Unlike types of material (cartridge units, immersion heaters, strip heaters, thermostats, panels, switches etc.) may not be aggregated in the valuation of the order when determining the discount.

PAGES 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 19, 20, 22, 36, 37, 39, 43, 44, 46, and 47.

Less than <u>\$25</u>	\$25 and less than <u>\$200</u>	\$200 and less than <u>\$1000</u>	\$1000 and more <u> </u>
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* Heaters only.

† Control only.

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SHIPMENT

Applying to Publication GED-650A

G-E ELECTRIC HEATING UNITS AND DEVICES

Material	Page No.	Shipment	* Shipping Point
Calrod units.....	6 and 7	Stock	Pittsfield, Mass.
Equipped with bushings.....	8	1 wk	Pittsfield, Mass.
Equipped with sealed terminals.....	8	1 wk	Pittsfield, Mass.
Immersion heaters			
For water (screw-in type).....	9	Stock	Pittsfield, Mass.
For water (self-protecting type)			
230 volts.....	10	Stock	Pittsfield, Mass.
115 volts.....	10	5 wk	Pittsfield, Mass.
For oils, noncirculating.....	10	Stock	Pittsfield, Mass.
For oils, circulating.....	11	Stock	Pittsfield, Mass.
For oil tempering baths.....	11	Stock	Schenectady, N. Y.
For alkaline baths.....	12	Stock	Pittsfield, Mass.
For electroplating solutions.....	13	Stock	Pittsfield, Mass.
For mild acid solutions.....	13	Stock	Pittsfield, Mass.
For soft metals.....	33	1 wk	Pittsfield, Mass.
Insertion heaters			
230 volts.....	15	Stock	Pittsfield, Mass.
115 volts.....	15	5 wk	Pittsfield, Mass.
Air-heating and clamp-on units.....	15	Stock	Pittsfield, Mass.
Cartridge units.....	16	Stock	Pittsfield, Mass.
Lubricating paint for.....	17	Stock	Pittsfield, Mass.
Strip heaters.....	19	Stock	Pittsfield, Mass.
Accessories for.....	20	Stock	Pittsfield, Mass.
Fin Calrod units.....	22	1 wk	Pittsfield, Mass.
Unit heaters			
Natural-convection type.....	24 and 25	Stock	Pittsfield, Mass.
Control.....	25	Stock	Schenectady, N. Y.
Forced-convection type			
Portable style.....	27	Stock	Pittsfield, Mass.
Suspension style.....	28	Stock	Pittsfield, Mass.
Control equipment.....	29	Stock	Schenectady, N. Y.
Oven heaters.....	30	Stock	Schenectady, N. Y.
Metal-melting pots.....	31 and 32	Stock	Schenectady, N. Y.
Cast-in immersion heaters.....	33	1 wk	Pittsfield, Mass.
Gluepots.....	34 and 35	Stock	Pittsfield, Mass.
Soldering irons.....	36 and 37	Stock	Pittsfield, Mass.
Heating cable.....	38	Stock	Schenectady, N. Y.
Cat. No. 4980281G18 thermostat.....	38	Stock	Schenectady, N. Y.
Control equipment			
Snap switches.....	39	Stock	Pittsfield, Mass.
Magnetic switches.....	40	Stock	Schenectady, N. Y.
Disconnection switches.....	40	Stock	Schenectady, N. Y.
Control circuit transformer.....	40	Stock	Ft. Wayne, Ind.
Thermostats.....	43 and 44	Stock	Schenectady, N. Y.
Plug assembly, Cat. No. 4900739G1.....	47	Stock	Schenectady, N. Y.
Bracket assembly, Cat. No. 4964229G1.....	47	Stock	Schenectady, N. Y.
Melting-pot switches.....	48	Stock	Schenectady, N. Y.
Melting-pot panels.....	48	Stock	Schenectady, N. Y.

* Points indicated are points of manufacture. In many cases, your nearest G-E warehouse can ship from stock.
The use of Lcode, the Electrical Industry Telegraph Code, is recommended for telegraphic communication.



ELECTRIC HEATING UNITS AND DEVICES



*Everything Needed for Small Heating Jobs and All
Obtainable from One Dependable Manufacturer*

**GENERAL ELECTRIC COMPANY
SCHENECTADY NEW YORK**

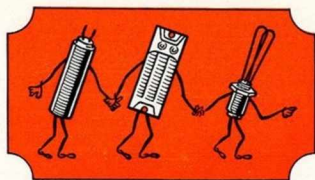


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Prices and data subject to change without notice

● **NOTE** So conservative is the heat density selected for the indicated applications, and adopted for the units and devices described in this catalog, that continuous excess voltage as high as five per cent will not produce temperatures injurious to them. Unless otherwise stated in this catalog, all units and devices are single-heat.



SPOT STRIP DIP
The G-E Midget Heating Units

HERE, in one small book, are the answers to the hundreds of small heating problems that arise daily in industrial plants to puzzle electrical engineers, superintendents, foremen, owners, and maintenance men.

Before General Electric originated and developed this line of small heating units and devices, the installation of a "spot," or "handful," or "zone" of heat in machinery, processes, and isolated buildings was a complicated and expensive job—usually necessitating considerable piping and equipment. Often, too, it was necessary to operate an expensive steam boiler during the summer months solely to supply heat to machines or processes.

Now, you can turn to this convenient catalog, pick out the electric unit which will best do the job, order by mail, and, when the unit arrives, install it according to the simple directions given herein. Instead of piece-by-piece buying, you may find it profitable before long to order a small stock of the more commonly used units so that, when one is needed, it may be picked right off your storeroom shelf.

You will swear by electric heat the first time you try it. You will keenly appreciate its cleanliness, convenience, flexibility, accuracy, safety, and economy. It requires no tinkering to keep it just right; no skilled operator hovering over it to adjust it. Simply touch a button, and the precise, automatic control will do the rest.

You will like these electric heating units and devices. There is a wide enough variety to satisfy almost any conceivable heating requirement. They have been designed for the utmost convenience of installation. They are built to the highest standards of G-E craftsmanship—yet in such large volumes as to be very reasonably priced. Moreover, when purchasing machines that utilize process heat, it will pay you to specify "Equipped with G-E heating units."

We hope you will be pleased with this handy catalog and with the equipment it lists—and that we may be privileged shortly to serve you.

The "Useful Information," pages 52 to 56, will help you to select quickly the Midget heating unit or device best suited for your job.

Should this catalog fail to solve your heating problem, consult your power company or your local G-E representative.

MISCELLANEOUS G-E CALROD HEATING UNITS

The G-E Calrod heating unit is the most outstanding development in the field of electric heating during recent years and has established an imposing record for dependability, economy, and durability.

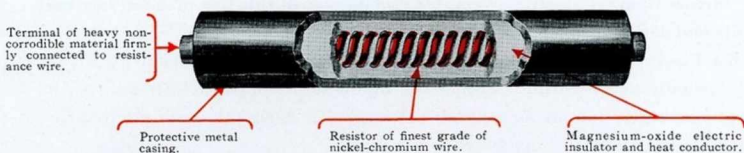
The Calrod unit is constructed by taking a helical coil of highest-quality resistance wire and stretching and centering it in a seamless metal tube. Magnesium-oxide powder is then shaken and packed down into the tube around the helical resistance coil. The entire tube is then compressed so that its diameter is reduced

and the magnesium-oxide powder is packed to the solidity of rock.

Magnesium oxide is a nonconductor of electricity but has the property of transferring heat from the coil to the metal sheath very quickly. It entirely fills the interior of the metal tubing so that air cannot reach the resistance wire, and oxidation is consequently prevented.

Sealed away from air, and thoroughly guarded against physical damage, the Calrod unit is practically indestructible.

HOW G-E CALROD UNITS ARE MADE



G-E Calrod units of some rating, material, or form can be applied to practically every low-temperature (1500 F or lower) requirement, whether it be the heating of liquids, air, soft metals, or metal surfaces.

The sheath, or tube, of the unit is made of different metals and alloys, depending upon the conditions under which it is to be used.

A steel sheath is used when the unit will not exceed a sheath temperature of about 750 F, such as in heating air, hot plates, ironing machines, etc. It is also used in heating mineral oils.

A special nickel-silver alloy sheath, which is rustproof, is used where the unit may be subjected to sheath temperatures up to 1000 F.

A rust-resisting chrome-steel sheath is used where the unit is operated at sheath temperatures up to 1200 F.

A nickel-chromium alloy sheath is used where the

unit is operated at sheath temperatures up to 1500 F.

A copper sheath is used for immersion in water and similar liquids.

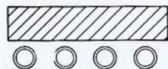
A nickel-plated copper sheath is used for heating vegetable oils, such as are used in frying doughnuts.

It is frequently necessary to provide a unit with a large radiating surface which will be evenly heated and will withstand relatively high temperatures. For such cases, a steel-sheath Calrod unit is cast into iron and is known as a cast-in unit. This is done by actually placing the unit in the mold and pouring the molten iron around it. Units of this nature are used in electrically heated pots for melting tin, lead, babbitt, and solder. They are also used as hot plates for heating mixing cylinders, autoclaves, molds, and many other devices. Such casting into special shapes can be done by purchasers. G-E cast-in Calrod immersion heaters are described on page 33.

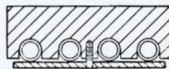
Installation and Application

A few suggested applications of straight-length Calrod units are mentioned in the table on page 6, but the field of utility is practically unlimited. A

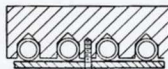
common use for the straight-length Calrod unit is in the heating of metal plates, as illustrated below.



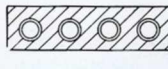
Indirect heating using air as the conductor. Especially suited for medium- and low-temperature work where uniform heat distribution is essential.



Straight-length G-E Calrod units are readily applied in machined grooves, in the manner illustrated, for heating flat metal plates.



Formations of Calrod units, placed in grooves, which are more readily cast than machined.



Unit cast integral. This arrangement, because of better heat distribution and transfer, is the most effective method of mounting, where it can possibly be utilized.

Four methods of heating a metal plate with G-E Calrod units are shown above

MISCELLANEOUS G-E CALROD HEATING UNITS



FORMING G-E CALROD UNITS

In many cases, a straight unit can not be used. In fact, by far the larger proportion of G-E Calrod units in use are bent into different shapes. The G-E Calrod construction lends itself especially to such applications, as it permits forming the unit in practically any shape without injury. Neither the sheath nor the core will crack or break, and the heating element remains centrally located in the tube as shown in the x-ray view. Some of the forms and types of G-E Calrod units in use today are illustrated below.

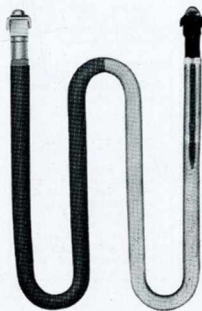
General Electric has extensive facilities for forming Calrod units into practically any desired shape consistent with bending limitations. The units can be bent on a minimum radius equal to the diameter of the sheath.

Orders should be accompanied by a sketch showing the formation desired, with permissible limits of variation. If an otherwise standard unit is involved, it should be referred to by catalog number.

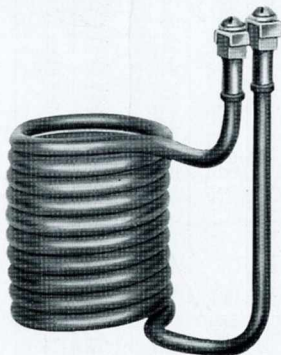
Price: \$0.15 per bend, per unit, plus \$1 per bend, lot set-up charge.

Example: A straight unit listed at \$10 to be given a formation of 6 bends.

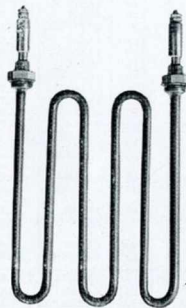
Quantity of Units Ordered	Total Price per Unit
1	\$16.90
10	11.50



X-ray view of formed G-E Calrod unit

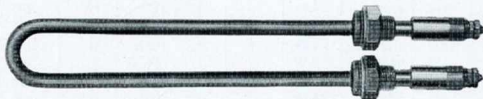


G-E Calrod unit showing possibilities of unusual formation

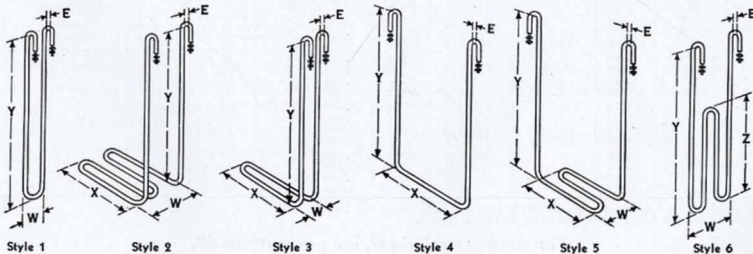


Calrod unit formed in a grid shape

Calrod unit formed in a hairpin shape
(Note bushing for bringing out terminal and mycalex seals —see page 8)



OTHER POPULAR FORMATIONS OF G-E CALROD UNITS



Style 1

Style 2

Style 3

Style 4

Style 5

Style 6

MISCELLANEOUS G-E CALROD HEATING UNITS

In the following tabulation are mentioned a few of the more common applications, and for each is listed a variety of sizes and ratings of units with the sheath material and heat density (watts per square inch of sheath) usually considered proper for the application.

Straight-length, Calrod Units

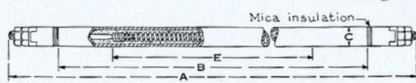


Fig. 1

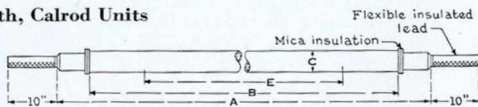


Fig. 2

Watts	* Volts	Cat. No.	Price	Approx. Ship. Wt. in Lb.	See Fig.	APPROXIMATE DIMENSIONS IN INCHES			E (Effective Heating Length)	Watts per Sq. In.	Sheath Material	Suggested Applications	Maximum Allowable Sheath Temperature
						A	B	C					
500	115	4A275	\$3.30	2	1	24	22	0.333	17 1/4	27	Steel	Contact heating of metal surfaces	750 F
230	4A275G2	\$3.20	2	1	24	22	.333	17 1/4	27				
1500	115	4A276	\$6.30	3	1	31	29	.333	25 1/2	28			
750	230	4A276G2	\$6.60	3	1	31	29	.333	25 1/2	28			
1000	115	4A277	\$5.00	3	1	43	41	.333	38	25			
550	230	4A277G2	\$5.00	3	1	43	41	.333	38	25			
550	115	4A284	\$7.00	4	1	37	35	.375	21	22			
230	4A284G2	\$4.70	4	1	37	35	.375	21	22				
1000	115	4A278	\$6.90	3	1	39 1/4	37 1/4	.496	31	20			
1000	230	4A278G2	\$6.90	3	1	39 1/4	37 1/4	.496	31	20			
1500	115	4A279	\$10.20	4	1	55 1/4	53 1/4	.496	48 1/2	20			
1500	230	4A279G2	\$10.20	4	1	55 1/4	53 1/4	.496	48 1/2	20			
2000	115	4A287	\$12.30	5	1	70	68	.496	51	25			
2000	230	4A287G2	\$12.30	5	1	70	68	.496	51	25			
2000	115	4A280	\$13.10	5	1	75 1/4	73 1/4	.496	67	20			
2000	230	4A280G2	\$13.10	5	1	75 1/4	73 1/4	.496	67	20			
2500	115	4A281	\$14.70	5	1	87 1/4	85 1/4	.496	78 1/2	20			
2500	230	4A281G2	\$14.70	5	1	87 1/4	85 1/4	.496	78 1/2	20			
5000	230	4A282	\$24.00	10	1	157 1/4	155 1/4	.496	114	28			
2000	230	4A283	\$25.90	10	1	154 1/4	152 1/4	.550	108	11			
1000	115	4A285	\$4.40	4	1	34 1/4	32 1/4	.375	19 1/2	44			
1000	230	4A285G2	\$4.40	4	1	34 1/4	32 1/4	.375	19 1/2	44			
1500	115	4A286	\$6.60	4	1	49 1/4	47 1/4	.375	34	38			
1500	230	4A286G2	\$6.60	4	1	49 1/4	47 1/4	.375	34	38			
3000	115	4A288	\$12.30	5	1	70	68	.496	51	38			
3000	230	4A288G2	\$12.30	5	1	70	68	.496	51	38			
5000	230	4A289	\$17.60	9	1	97 1/4	95 1/4	.550	68	42			
5000	115	4A289G2	\$17.60	9	1	97 1/4	95 1/4	.550	68	42			
250	115	4A263	† \$13.90	6	1	126 1/4	124 1/4	.333	112	2			
500	115	4A290	\$6.10	3	1	46	44	.333	40	12			
500	230	4A290G2	\$6.10	3	1	46	44	.333	40	12			
750	115	4A291	\$8.20	4	1	66	64	.333	60	12			
750	230	4A291G2	\$8.20	4	1	66	64	.333	60	12			
1000	115	4A292	\$9.80	5	1	86	84	.333	80	12			
1000	230	4A292G2	\$9.80	5	1	86	84	.333	80	12			
1000	115	4A293	\$13.30	4	1	59	57	.496	53	12			
1000	230	4A293G2	\$13.30	4	1	59	57	.496	53	12			
2000	115	4A294	\$23.00	8	1	113	111	.496	107	12			
2000	230	4A294G2	\$23.00	8	1	113	111	.496	107	12			
500	115	4A295	\$9.60	2	2	102 1/4	101	.280	95	6			
500	230	4A295G2	\$9.60	2	2	102 1/4	101	.280	95	6			
650	115	4A296	\$9.10	2	2	94 1/4	93	.280	73	10			
650	230	4A296G2	\$9.10	2	2	94 1/4	93	.280	73	10			
2500	115	4A297	\$20.50	10	2	226 1/4	225	.318	212	12			
1000	115	4A620	\$10.40	4	1	39 1/4	37 1/4	.600	31	17			
1000	230	4A620G2	\$10.40	4	1	39 1/4	37 1/4	.600	31	17			
1500	115	4A621	\$15.50	5	1	53 1/4	53 1/4	.600	48 1/2	17			
1500	230	4A621G2	\$15.50	5	1	53 1/4	53 1/4	.600	48 1/2	17			
2000	115	4A622	\$19.10	6	1	70	68	.600	51	20			
2000	230	4A622G2	\$19.10	6	1	70	68	.600	51	20			
2000	115	4A623	\$20.20	6	1	75 1/4	73 1/4	.600	67	17			
2000	230	4A623G2	\$20.20	6	1	75 1/4	73 1/4	.600	67	17			
2500	115	4A624	\$22.90	6	1	87 1/4	85 1/4	.600	78 1/2	17			
2500	230	4A624G2	\$22.90	6	1	87 1/4	85 1/4	.600	78 1/2	17			
5000	230	4A625	\$38.80	11	1	157 1/4	155 1/4	.600	114	23			
600	115	4A298	\$3.00	2	1	19 1/4	17 1/4	.333	14	41			
600	230	4A298G2	\$3.00	2	1	19 1/4	17 1/4	.333	14	41			
1000	115	4A299	\$3.20	2	1	23 1/4	21 1/4	.333	18	53			
1000	230	4A299G2	\$3.20	2	1	23 1/4	21 1/4	.333	18	53			
1500	115	4A300	\$5.40	3	1	31 1/4	29 1/4	.496	23 1/2	41			
1500	230	4A300G2	\$5.40	3	1	31 1/4	29 1/4	.496	23 1/2	41			
2000	115	4A301	\$6.90	3	1	39 1/4	37 1/4	.496	31	41			
2000	230	4A301G2	\$6.90	3	1	39 1/4	37 1/4	.496	31	41			
2500	115	4A302	\$8.70	4	1	47 1/4	45 1/4	.496	39	41			
2500	230	4A302G2	\$8.70	4	1	47 1/4	45 1/4	.496	39	41			
4500	115	4A303	\$14.70	5	1	87 1/4	85 1/4	.496	79	41			
5000	230	4A303G2	\$14.70	5	1	87 1/4	85 1/4	.496	79	41			

* 230-volt units of diameters 0.496 in. and larger can be operated in series on 440 volts.

† This unit has glass seals and terminals as illustrated in Fig. 4, page 8.

For control equipment, see pages 39 to 47.

MISCELLANEOUS G-E CALROD HEATING UNITS



FOR APPLICATIONS REQUIRING UNIT TEMPERATURES AS HIGH AS 1500 F

The high-speed, high-heat Calrod unit, perfected by General Electric engineers for General Electric and Hotpoint ranges, is now offered in the sizes listed below for industrial heating applications that require unit temperatures up to 1500 F. Typical of such applications are high-temperature air heating, industrial ovens (oven temperatures up to 1000 F), industrial hot plates, heating metal surfaces.

Features

- They heat up quickly and save much time.
- The special high-speed sheath is strong and durable.
- They are easy to install. Heat can be placed exactly where required.
- They provide—conveniently and inexpensively—the highest heat obtainable from an insulated heating unit.

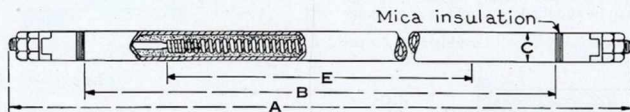


Fig. 3

Straight-length Calrod Units

Maximum Allowable Sheath Temperature—1500 F

Watts	Volts	Cat. No.	Price	APPROXIMATE DIMENSIONS IN INCHES				
				A	B	C	Effective Heating Length E	Watts per Sq. In.
750	115	4A419G2	\$5.20	32	30	.333	18	40
750	230	4A419	5.20	32	30	.333	18	40
1000	115	4A420G2	6.20	38	36	.333	24	40
1000	230	4A420	6.20	38	36	.333	24	40
1250	115	4A421G2	7.50	44	42	.333	30	40
1250	230	4A421	7.50	44	42	.333	30	40
1500	230	4A422	8.70	50	48	.333	36	40
1750	230	4A423	9.70	56	54	.333	42	40
2000	230	4A424	10.50	62	60	.333	48	40
2500	230	4A425	12.10	74	72	.333	60	40
3000	230	4A426	13.50	86	84	.333	72	40
3500	230	4A427	15.00	98	96	.333	84	40
750	† 230	4A628	8.70	32	30	.440	18	30
1000	† 230	4A629	10.90	38	36	.440	24	30
1250	† 230	4A630	13.10	44	42	.440	30	30
2000	† 230	4A631	15.60	50	48	.440	36	40
2300	† 230	4A632	17.60	56	54	.440	42	40
2650	† 230	4A633	19.50	62	60	.440	48	40
3300	† 230	4A634	23.00	74	72	.440	60	40
4000	† 230	4A635	26.00	86	84	.440	72	40
4700	† 230	4A636	29.00	98	96	.440	84	40

† These units can be operated two in series on 440 volts.

Bushings to facilitate sealing G-E Calrod units in tank walls, etc. are listed on page 8.

Mycalox Sealed Terminals to protect the ends of the unit against the entrance of liquids or chemical fumes, are also listed on page 8. (Glass seals are not recommended for these units.)

Formed Units can be supplied at the additional prices shown on page 5. It is recommended that these units be formed at the factory because of the difficulty of the operation.



MISCELLANEOUS G-E CALROD HEATING UNITS

SEALED TERMINALS FOR G-E CALROD UNITS

Where unit terminals are subject to accidental contact with oil, water, or other liquids, it is highly desirable that the ends of the unit be sealed against the entrance of such liquids. Similar precaution must be taken against carbonaceous or chemical fumes. Such protection can be obtained by the glass seal (Fig. 4) or the mycalex seal (Fig. 5), both developed by General Electric.

Where such operations as casting-in, brazing, etc., are required, they should be performed at the factory prior to the incorporation of the seals.

To order, specify on requisition, "Cat. No. with (mycalex or glass) seals."

Glass Seals

As illustrated below, the glass seal is put *inside* the tube or sheath of the Calrod unit. Standard terminals are then assembled—the nut-type, Fig. 1, is usually supplied, though the screw-type, Fig. 4, can be supplied on request at no change in price.

Additional Price for glass seals at both terminals: \$1.50 per unit, plus \$1 lot set-up charge.

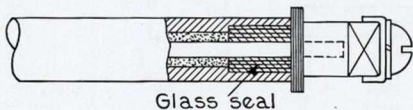


Fig. 4

Mycalex Seals

As illustrated at the right, the mycalex-sealed terminal is assembled to the end of the unit. The large connection post

and the ability of the molded mycalex material to withstand mechanical abuse makes this the strongest seal possible. There are two sizes of seals as indicated below.

Additional Price for mycalex-sealed terminals (either size) at both ends of unit—\$2 per unit, plus \$2 lot set-up charge.

Note:—When Calrod units are equipped with mycalex seals, the listed "A" dimension in Fig. 1 or Fig. 3 is decreased one inch.

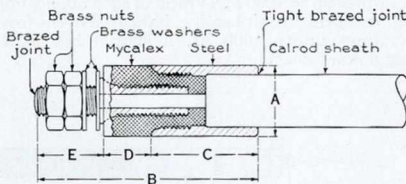


Fig. 5

Size of Calrod Units	DIMENSIONS IN IN. (See Fig. 5)					Size of Brass Nuts
	A	B	C	D	E	
0.400 in. diam and less	$\frac{1}{2}$	$1\frac{1}{8}$	$1\frac{1}{2}$	$\frac{3}{8}$	$\frac{1}{16}$	$\frac{1}{4}$ in.-28, $\frac{1}{4}$ in. thick
Larger than 0.400 in. diam	$\frac{3}{4}$	$2\frac{1}{2}$	$1\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{32}$	$\frac{1}{16}$ in.-24, $\frac{3}{16}$ in. thick

BUSHINGS TO FACILITATE SEALING G-E CALROD UNITS IN TANK WALLS, ETC.

There is frequent call for fittings to facilitate sealing G-E Calrod units in tank walls. Accordingly, there has been developed the arrangement shown in Fig. 6 and 7. This arrangement consists of (at each end of the Calrod unit) a threaded bushing (brazed to the unit), a nut, and a gasket, which, together, provide a leakproof seal and a suitable anchorage for the unit. A steel bushing is used on steel sheaths,

and brass bushings are used on copper and nickel-silver sheaths.

For installing, it is necessary only to provide unthreaded holes in the tank wall, of a size sufficient to accommodate the bushing.

Additional price for bushings, gaskets, and nuts assembled at both ends of unit: \$2.50 per unit, plus \$2 lot set-up charge. For price of seals, see above.

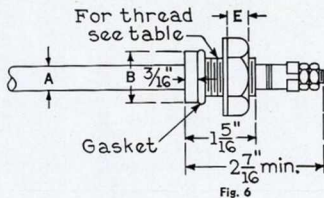


Fig. 6

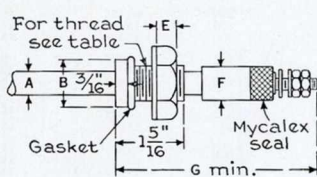
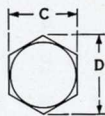


Fig. 7

APPROXIMATE DIMENSIONS IN INCHES

When Mycalex Seals Are Not Used						* When Mycalex Seals Are Used							
A	Straight Thread	B	C	D	E	A	Straight Thread	B	C	D	E	F	G
.333	$\frac{1}{8}$ -18	$\frac{3}{8}$	$1\frac{1}{16}$	$1\frac{1}{4}$	$\frac{3}{8}$	.333	$\frac{1}{8}$ -18	$\frac{3}{8}$	$1\frac{1}{16}$	$1\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$3\frac{1}{2}$
.375						.375							
.496						.496							
.540	$\frac{1}{4}$ -16	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$\frac{7}{16}$	.540	$\frac{1}{4}$ -14	$1\frac{1}{2}$	$1\frac{1}{4}$	$1\frac{1}{2}$	$\frac{7}{16}$	$\frac{3}{4}$	$3\frac{1}{4}$
.550						.550							

* When mycalex seals are added to standard Calrod units, deduct 1 in. from the listed "A" dimension in Fig. 1 and Fig. 3.

G-E CALROD IMMERSION HEATERS

G-E immersion heaters offer the most economical method of heating liquids in tanks, kettles, metal barrels, etc. They are of substantial construction and high efficiency, utilizing the well-known G-E Calrod sheath wire.

On pages 9 to 14 are mentioned a few of the commoner applications, and for each is listed a variety of sizes and ratings of units with the sheath material and heat density usually considered proper for the application.

FOR WATER

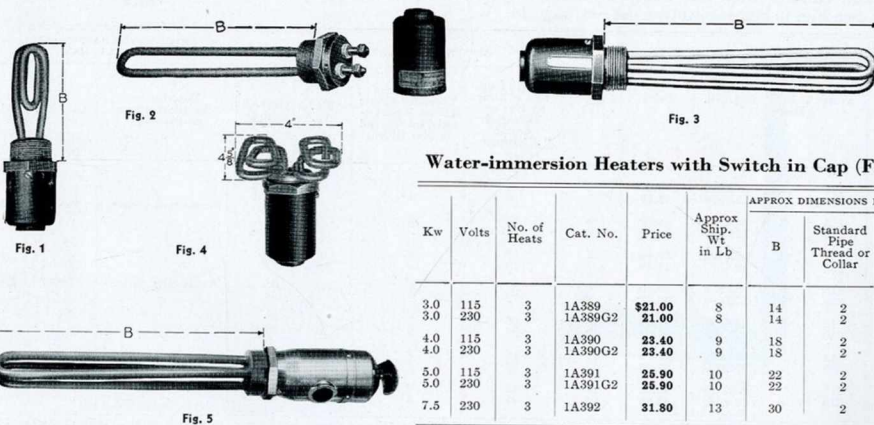
For heating water, a copper-sheathed unit of high heat density heaters are shown in Fig. 1 to 5. For application details, see page 14.

Kw	Volts	No. of Heats	Cat. No.	Price	Approx. Ship. Wt. in Lb	APPROX DIMENSIONS IN INCHES				SWITCHES FOR HAND CONTROL 250 VOLTS MAX (FURNISHED SEPARATELY)		
						Length from End of Unit to Nut on Threaded Collar "B" Dimen	Diameter of Threaded Collar (Diam is Standard Pipe Thread of Size Given)	Fig. No.	Over-all Length	Description (See Illustrations on Page 39)	Cat. No.	Price
0.6	115	1	15X820	\$7.90	2	5	1 1/4	1	8 1/2	Single-heat snap switch	60451	\$1.00
0.6	230	1	15X821	7.90	2	5	1 1/4	1	8 1/2			
0.75	115	1	15X822	8.40	2	8	1 1/4	2	11 1/2	Single-heat snap switch	60451	\$1.00
0.75	230	1	15X823	8.40	2	8	1 1/4	2	11 1/2			
1.0	115	1	15X824	9.30	2	10	1 1/4	2	13 1/2	Single-heat snap switch	60451	\$1.00
1.0	230	1	15X825	9.30	2	10	1 1/4	2	13 1/2			
1.2	115	3	15X826	11.70	3	8	1 1/4	3	11 1/2	3-heat snap switch	29X924	1.50
1.2	230	3	15X827	11.70	3	8	1 1/4	3	11 1/2			
2.0	115	3	15X828	13.60	3 1/2	10	1 1/4	3	13 1/2	3-heat snap switch	29X924	1.50
2.0	230	3	15X829	13.60	3 1/2	10	1 1/4	3	13 1/2			
2.0	115	3	*15X830	16.00	3 1/2	1 1/2	† 1 1/2	4	4 1/2	3-heat snap switch	278607	2.40
2.0	230	3	*15X831	16.00	3 1/2	1 1/2	† 1 1/2	4	4 1/2			
3.0	115	3	15X832	16.00	6	14	2	3	18	3-heat snap switch	278610	4.50
3.0	† 230	3	15X833	16.00	6	14	2	3	18			
4.0	115	3	15X834	18.40	7	18	2	3	22	3-heat snap switch	278610	4.50
4.0	† 230	3	15X835	18.40	7	18	2	3	22			
5.0	115	3	15X836	20.90	8	22	2	3	26	3-heat snap switch	278610	4.50
5.0	† 230	3	15X837	20.90	8	22	2	3	26			
7.5	† 230	3	50X295	26.80	11	30	2	3	34	.....	.....	.....
10.0	† 230	3	14X426	33.00	14	42	2	3	46	.....	.....	.....

* These heaters differ from the others in that they are installed from within the container instead of being screwed in from the outside. Therefore, they are provided with a shoulder on the header and with the necessary gasket and tightening nut. See Fig. 4.

† These heaters, for operation on a 230-volt circuit, can be operated single-heat on a 440-volt circuit by running the two elements in series. Switches listed above should not be used for circuits of over 250 volts.

‡ Straight thread, not pipe thread.



Water-immersion Heaters with Switch in Cap (Fig. 5)

Kw	Volts	No. of Heats	Cat. No.	Price	Approx. Ship. Wt. in Lb	APPROX DIMENSIONS IN INCHES		
						B	Standard Pipe Thread or Collar	Over-all Length
3.0	115	3	1A389	\$21.00	8	14	2	20 1/2
3.0	230	3	1A389G2	21.00	8	14	2	20 1/2
4.0	115	3	1A390	23.40	9	18	2	24 1/2
4.0	230	3	1A390G2	23.40	9	18	2	24 1/2
5.0	115	3	1A391	25.90	10	22	2	28 1/2
5.0	230	3	1A391G2	25.90	10	22	2	28 1/2
7.5	230	3	1A392	31.80	13	30	2	36 1/2

For control equipment, see pages 39 to 47.



E CALROD IMMERSION HEATERS

FOR WATER—SELF-PROTECTING TYPE

General Electric has developed this unique line of water immersion heaters for service in devices where the unit may accidentally be exposed at times. These units, as their name implies, will operate partly or totally uncovered for a limited period without injury. They depend, for their operation, upon the high temperature coefficient of resistance of a special alloy which is used as the heating element.

The units are similar in appearance to Fig. 2 and 3.

The sheath is made of nickel silver.

The following specific example illustrates the characteristics of this style of unit. (Other sizes approximately proportional.)

Nominal rating.....	3500 watts
Momentary inrush (calculated).....	5600 watts
Rating in water, 25 C.....	4300 watts
Rating in water, 100 C.....	3470 watts
Rating entirely uncovered.....	1575 watts

Kw	Volts	No. of Heats	Cat. No.	Price	Approx Shp. Wt. in Lb	APPROX DIMENSIONS IN INCHES				SWITCHES FOR HAND CONTROL 250 VOLTS MAX		
						Length from End of Unit to Nut on Threaded Collar "B" Dimen	Diameter of Threaded Collar (Diam is Standard Pipe Thread of Size Given)	Fig. No. (See Page 9)	Over-all Length	Description (See Illustrations on Page 39)	Cat. No.	Price
0.75	115	1	1A384	\$12.00	3	10	1 1/4	2	13 1/2	Single-heat snap switch	60451	\$1.00
1.5	115	3	1A385	17.00	3 1/2	10	1 1/4	3	13 1/2	3-heat snap switch	278607	2.40
1.5	230	1	1A385G2	17.00	3 1/2	10	1 1/4	3	13 1/2	Single-heat snap switch	60451	1.00
2.5	115	3	1A386	20.80	6	14	2	3	18	3-heat snap switch	278610	4.50
2.5	230	3	1A386G2	20.80	6	14	2	3	18			
3.5	115	3	1A387	24.00	7	18	2	3	22	3-heat snap switch	278610	4.50
3.5	230	3	1A387G2	24.00	7	18	2	3	22			
4.5	115	3	1A388	27.20	8	22	2	3	26	3-heat snap switch	278610	4.50
4.5	230	3	1A388G2	27.20	8	22	2	3	26			

† These heaters, for operation on a 230-volt circuit, can be operated single-heat on a 440-volt circuit by running the two elements in series. Switches listed above should not be used for circuits of over 250 volts.

FOR NONCIRCULATING OILS

For heating liquids such as oil and paraffin, a heater having the same general construction as Fig. 3 on page 9 is used. However, a much lower watts density is used because of possible damage to the liquids and to the heaters through carbonization, etc. Steel is used as the sheath and header material.

All G-E oil immersion heaters are equipped with an ingenious glass seal at the terminals to protect the G-E Calrod heating element against accidental contact with oil—another reason why G-E heaters stand up longer. See Fig. 6. See application details, page 14.

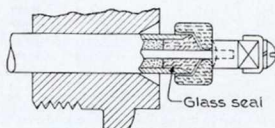


Fig. 6

Kw	Volts	No. of Heats	Cat. No.	Price	Approx Shp. Wt. in Lb	APPROX DIMENSIONS IN INCHES				SWITCHES FOR HAND CONTROL 250 VOLTS MAX		
						Length from End of Unit to Nut on Threaded Collar "B" Dimen	Diameter of Threaded Collar (Diam is Standard Pipe Thread of Size Given)	Fig. No.	Over-all Length	Description (See Illustrations on Page 39)	Cat. No.	Price
1.0	115	3	33X825	\$13.60	5	10	1 1/4	3	13 1/2	3-heat snap switch	29X924	\$1.50
1.0	230	3	33X826	13.60	5	10	1 1/4	3	13 1/2			
1.5	115	3	32X820	16.00	6	14	2	3	18	3-heat snap switch	278607	2.40
1.5	230	3	32X821	16.00	6	14	2	3	18			
2.0	115	3	32X822	18.40	7	18	2	3	22	3-heat snap switch	278607	2.40
2.0	230	3	32X823	18.40	7	18	2	3	22			
2.5	115	3	15X838	20.70	8	22	2	3	26	3-heat snap switch	278607	2.40
2.5	230	3	15X839	20.70	8	22	2	3	26			
3.0	115	3	32X824	23.00	10	26	2	3	30	3-heat snap switch	278610	4.50
3.0	230	3	32X825	23.00	10	26	2	3	30			
4.0	115	3	32X826	27.70	12	36	2	3	40	3-snap heat switch	278610	4.50
4.0	230	3	32X827	27.70	12	36	2	3	40			
5.0	115	3	32X828	32.30	14	42	2	3	46	3-snap heat switch	278610	4.50
5.0	230	3	32X829	32.30	14	42	2	3	46			

† These heaters for operation on a 230-volt circuit can be operated single-heat on a 440-volt circuit by running the two elements in series. Switches listed above should not be used on circuits of over 250 volts.

For control equipment, see pages 39 to 47.

G-E CALROD IMMERSION HEATERS



FOR CIRCULATING OILS

In circulating-oil systems, if the velocity of oil flow is sufficient to prevent excessive temperature rise on the heater, and carbonization of oil on the sheath, it is possible to employ higher watts density than where a similar heater is installed in still oil. Hence, for this application, the heater is approximately equal to the

G-E water immersion heater in watts density, but retains all of the construction details of G-E oil immersion heaters—including the highly effective glass-sealed terminals. The appearance of the unit is the same as Fig. 3 (see page 9). Application details, page 14.

Watts	† Volts	No. of Heats	Cat. No.	Price	Approx. Ship. Wt. in Lb	APPROX DIMENSIONS IN INCHES (SEE FIG. 3, PAGE 9)		
						Length from End of Unit to Nut on Threaded Collar, "B" Dimen	Diameter of Threaded Collar (Diam is Standard Pipe Thread of Size Given)	Over-all Length
5000	230	3	64X54	\$20.70	8	22	2	26
6000	230	3	63X531	23.00	10	26	2	30
8000	230	3	64X55	27.70	12	36	2	40

† These heaters can be operated single-heat on a 440-volt circuit by running the two elements in series.

FOR OIL TEMPERING BATHS

The standard Calrod oil-tempering-bath units created by General Electric for use with its own oil-tempering-bath equipments have proved popular with plant engineers who build oil baths and similar equipments to their own specifications. These units have a very

low watts density; approximately half that of heaters for noncirculating oils (page 10). They are provided with a compound-filled sealing cup at the terminals. There are two sizes, as follows.

Watts	† Volts	No. of Heats	Cat. No.	Price	Approx. Ship. Wt. in Lb	DIMENSIONS IN INCHES (FIG. 7)					
						A	B	C	D	E	F
2000	115	1	34X436	\$35	30	11 3/8	3	16	3 1/8	6 1/16	5
2000	230	1	34X437	35	30	11 3/8	3	16	3 3/8	6 1/16	5
4000	115	1	34X438	47	40	15 3/8	3 9/16	22	3 3/16	7 1/16	10
4000	230	1	34X439	47	40	15 3/8	3 9/16	22	3 3/16	7 1/16	10

† Can be operated in series on 440 volts.

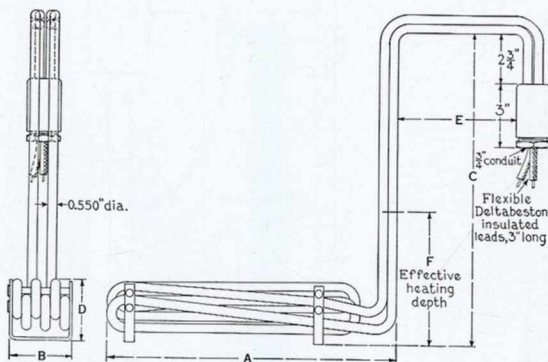


Fig. 7
Dimension outline of G-E oil-tempering-bath units

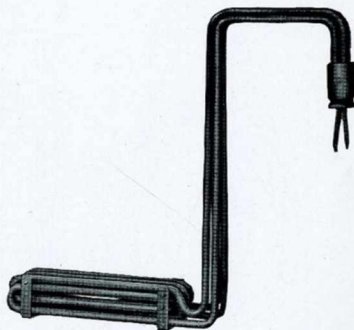


Fig. 8
G-E oil-tempering-bath unit
Cat. No. 34X438 or 34X439

For control equipment, see pages 39 to 47.

G-E CALROD IMMERSION HEATERS

FOR ALKALINE BATHS

The G-E oil immersion heaters listed on pages 10 and 11 are suitable for alkaline cleaning solutions, using such alkalies as sodium carbonate, sodium cyanide, etc. Other steel-sheathed

G-E Calrod immersion heaters for this service are listed below. The terminals are enclosed in a compound-filled sealing cup.

Watts	† Volts	No. of Heats	Cat. No.	Price	APPROX DIMENSIONS IN INCHES			
					See Fig.	B	C	E
5000	230	1	63X412	\$25	10	26	15	3¾
2000	230	1	63X532	20	11	22 ⁷ / ₁₆	10¾	4¼
4000	230	1	63X533	23	11	33 ⁷ / ₁₆	22¾	4¼
6000	230	1	63X534	30	11	43 ⁵ / ₁₆	34¾	4¾

† These heaters can be operated in series on 440 volts.

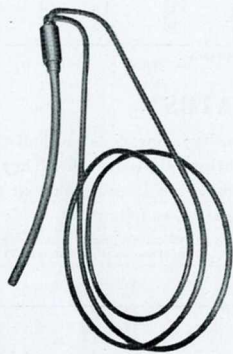


Fig. 9
Cat. No. 63X412 unit

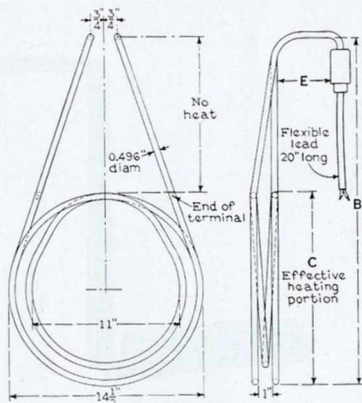


Fig. 10
Cat. No. 63X412 unit

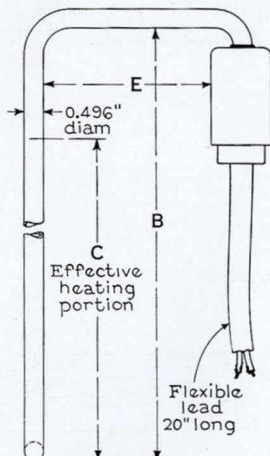
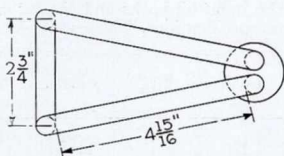


Fig. 11
Cat. No. 63X532, 63X533 and 63X534 units

For control equipment, see pages 39 to 47.

G-E CALROD IMMERSION HEATERS



FOR NICKEL- AND COPPER-PLATING SOLUTIONS

Fig. 12 and 13 illustrate a G-E Calrod heater encased in a lead pipe one quarter of an inch thick. That's why this heater is recommended for electroplating baths that will not attack lead—such as nickel- and copper-plating solutions.

The terminals are protected against the entrance of moisture or fumes by a compound-filled sealing cup.

Watts	† Volts	Cat. No.	Price
5000	230	63X410	\$30

† These are single-heat units. They can be operated in series on 440 volts.

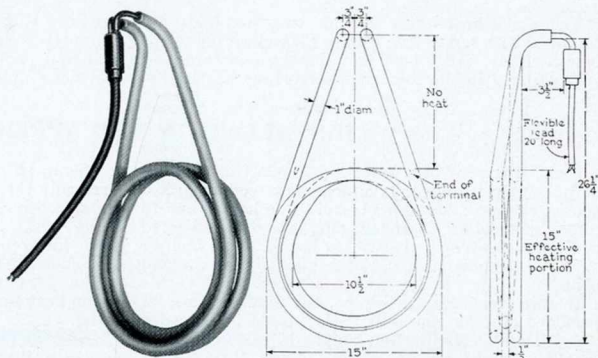


Fig. 12
Cat. No. 63X410 unit

Fig. 13

FOR MILD SULPHURIC-ACID SOLUTIONS AND CHROME-PLATING BATHS

Here is a group of G-E Calrod heaters cast into lead of a minimum wall thickness of one half inch. These heaters have been designed for pickling baths having a sulphuric-acid content up to 10 per cent concentration (and no other acids), and for chrome-plating baths.

The effective heating depth of the unit is indicated by "C" in Fig. 15. When installed, this portion of the unit must be entirely immersed and kept immersed during operation. Entrance of moisture or fumes into the terminals is prevented by the compound-filled sealing cup.

Ask your power company or your local G-E representative about the excellent facilities that are available for quickly and inexpensively releading these units.

Watts	Volts †	Cat. No.	Price	DIMENSIONS IN INCHES		Weight of Lead in Lb	Shipping Weight in Lb	Active Area in Sq In.
				A	C			
2000	230	62X552	\$40.00	23	12	45	60	172
4000	230	62X553	45.00	34	24	68	85	325
6000	230	62X554	60.00	46	36	90	115	478

† These are single-heat units. They can be operated in series on 440 volts.

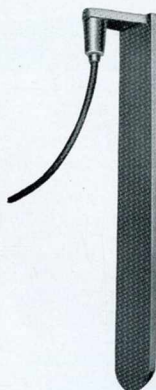


Fig. 14
Cat. No. 62X553 unit

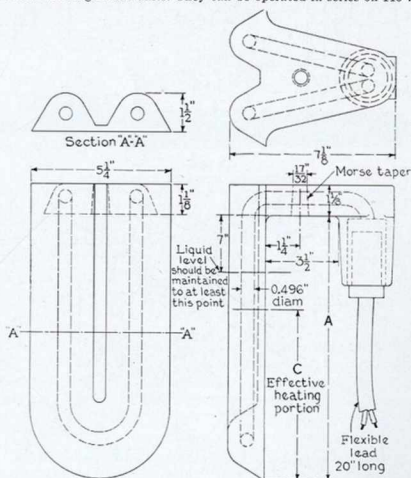


Fig. 15

For control equipment, see pages 39 to 47.



G-E CALROD IMMERSION HEATERS

OPERATION

The single-heat units having two terminals are equipped with screws and clamps for connecting to the power supply. The 3-heat units having four terminals are equipped in the same manner. These heaters are

provided with a steel cap, which serves to protect the terminals from injury. The 3-heat units dissipate one-half and one-quarter, respectively, of the maximum wattage on medium and low heats.

INSTALLATION AND APPLICATION

The "screw-in" immersion-type electric heating unit is easily installed. It is necessary only to drill a hole in the tank, kettle, or barrel to be heated and to thread the hole for a standard pipe thread, as indicated in the tables. Where the wall is not $\frac{3}{4}$ of an inch or more in thickness, it should be reinforced with a metal plate.

If units are installed in pipe, the minimum size of standard pipe for the units with the $1\frac{1}{4}$ -in. threaded collar should be $1\frac{1}{2}$ inches. Units with the 2-in. collar should not be installed in pipe of less than $2\frac{1}{2}$ -in. diameter.

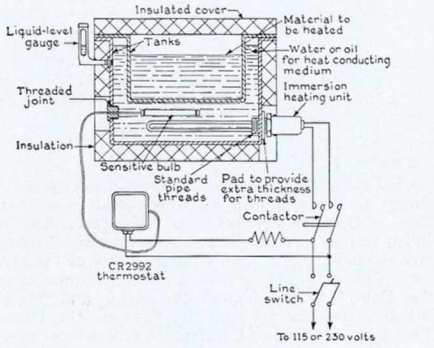
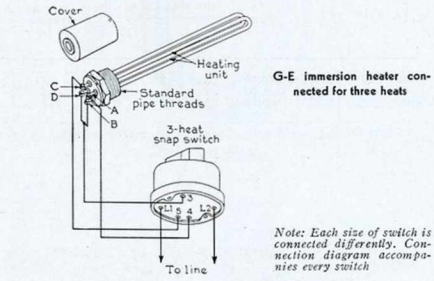
Care should be taken to keep immersion units clean. A free circulation of liquid around the heaters should be provided at all times. Immersion heaters should be inspected regularly, and any accumulations of carbon or foreign material should be removed.

"Screw-in" heaters should be installed either vertically through the bottom of the tank, or through the side. See that they are covered with at least 2 inches of liquid. Do not install this type of heater vertically from the top of a tank, because of the possibility of unit exposure with variation in liquid level and, because in the case of water heating, there is a tendency for the rising heat to cause steam pockets which overheat the units.

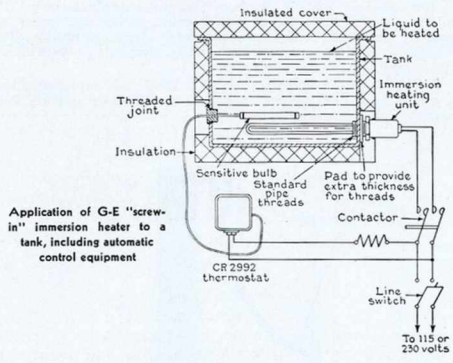
After the units have been firmly screwed in and connected to the power supply, they are ready to operate.

The "over-the-side" type of electric immersion heater (as illustrated in Fig. 7 to 15 inclusive) is also very easily installed, since it readily slips over the edge of a tank, with the terminals hanging down on the outside walls.

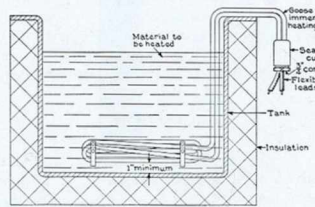
During operation, all immersion units must have their active heating portions entirely immersed, to prevent overheating, a condition which would cause the units to burn out in a short time.



Application of G-E immersion heater in heating heavy viscous liquids and other materials which carbonize readily



Application of G-E "screw-in" immersion heater to a tank, including automatic control equipment



Application of a G-E "over-the-side" immersion heater to a tank

G-E CALROD INSERTION HEATERS

FOR METALLIC PLATENS, DIE BLOCKS, HOLLOW BOLTS, ETC.

G-E Calrod insertion heaters may really be considered as a long form of the cartridge-style heating unit, since they consist of a heating unit within a closed-end tube. The illustration below shows the general outline of construction. A Calrod unit with nickel-silver sheath, and formed to bring both terminals at one end, is placed within a closed-end, chrome-steel tubing having a diameter of 0.781 inches. Thus, the units are designed for insertion in holes $\frac{7}{8}$ of an inch in diameter which have been provided in the platen or block to be heated.

These heaters are especially effective in the heating of large, hollow holding bolts (such as used in high-pressure steam-shell joints) to permit greater stressing and to prevent steam leakage.

Maximum Allowable Sheath Temperature—1000 F

Watts	Volts	Cat. No.	Price	Approx. Shp. Wt. in Lb.	DIMENSIONS IN INCHES (See Fig. 1)	
					A	B
1000	115	6A114G4	\$23.50	5	17½	15
1000	230	6A114G5	23.50	5	17½	15
1250	115	6A116G4	25.20	7	21½	19
1250	230	6A116G5	25.20	7	21½	19
1750	115	6A118G6	27.70	10	27½	25
1750	230	6A118G7	27.70	10	27½	25
2500	115	6A122G3	31.00	12	35½	33
2500	230	6A122G4	31.00	12	35½	33
2750	115	6A127G4	33.50	15	39½	37
2750	230	6A127G5	33.50	15	39½	37
3000	115	6A129G3	37.00	17	43½	41
3000	230	6A129G4	37.00	17	43½	41

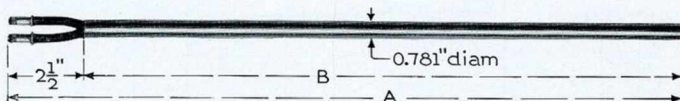


Fig. 1

G-E Calrod insertion heater for platens, die blocks, hollow bolts, etc.

G-E AIR-HEATING AND CLAMP-ON UNITS

Watts	Volts	No. of Heats	AIR-HEATING UNIT		CLAMP-ON UNIT		Approx. Shp. Wt. in Lb.	APPROX DIMENSIONS IN INCHES			
			Cat. No.	Price	Cat. No.	Price		Over-all Length	Length of Heating Surface	Width of Heating Surface	
										Air-heating Unit	Clamp-on Unit
* 350	115	1	.....	.....	28X702	\$3.30	2	18½	14¾	.....	1¾
500	115	1	30X603	\$3.50	30X607	3.70	2	23¾	20	2	1¾
500	230	1	30X604	3.50	30X608	3.70	2	23¾	20	2	1¾

* This unit can be made for 115 volts only.



Fig. 2
Air-heating unit



Fig. 3
Clamp-on unit

APPLICATION

There is a great variety of applications for these units and, while it is impossible to define all of them, the general application is for air heating and drying. A few of their uses are: for cabs, valve houses, pump houses, and telephone switchboards, around process machines, small drying ovens, etc.

The clamp-on has a variety of uses, such as heating small compound tanks, factory warming tables, tanks, parts or surfaces of machines, glue tables, water baths, etc.

DESCRIPTION

Air-heating Unit

The two steel strips for the air-heating unit have a half-round central groove running the length of the strips. The latter are welded together clamping the

Calrod firmly in the tubular space formed by the grooves. The heat generated in the Calrod is conducted to and radiated from the entire surface of the unit thus formed.

Clamp-on Unit

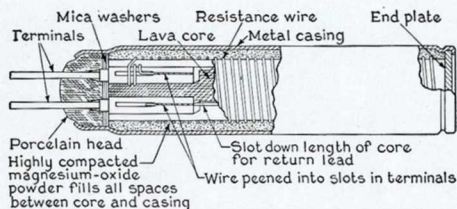
One steel strip for the clamp-on unit is bent up along either edge to form a channel about $\frac{1}{4}$ inch deep, the face being left perfectly flat. The other strip, of a width to just fit in the channel, has a central rounded groove whose depth equals the diameter of the sheath wire. This strip, when welded in the channel, clamps the Calrod firmly against the latter and helps to conduct the heat to the flat face of the channel. Terminals are offset $\frac{3}{8}$ inch giving clearance for connections.

G-E CARTRIDGE UNITS

Recognizing the need for an efficient, self-contained unit for localized heating, the General Electric Company has perfected the cartridge-type electric heating unit. It consists of an insulator core on which is wound the resistance element of nickel-chromium alloy. This element is connected to two terminals, which are embedded in one end of the core. Magnesium-oxide powder is used as the insulating material between the heating element and the casing, or sheath. After assembly, the unit is reduced in diameter by swaging, forming a compact and solid mass of high density, which is not affected by vibration.

These units are eminently suited for heating process machinery and afford the most convenient means of

heating many devices, such as gluepots, compound pots, and soldering irons.



Construction of a G-E cartridge unit

Brass Sheath—Maximum Allowable Sheath Temperature, 750 F

Diam in In.	Length of Metal Casing in In.	Terminals See Fig. No.	Watts	Volts	Symbol	Price	Diam in In.	Length of Metal Casing in In.	Terminals See Fig. No.	Watts	Volts	Symbol	Price	Diam in In.	Length of Metal Casing in In.	Terminals See Fig. No.	Watts	Volts	Symbol	Price		
3/8	1 1/2	2	30	230	2A63	\$2.00	3/8	5 1/2	2	285	115	185-H	\$3.75	1 1/2	6	3	450	115	187-H	\$4.55		
	1 1/2	2	30	230	2A64	2.00		5 1/2	2	285	230	185-X	3.75		6	3	450	230	187-X	4.55		
	2 3/8	2	75	115	2A65	2.25		2 3/8	2	200	115	151-H	2.85		6	1	660	115	*181-H	6.00		
	2 3/8	2	75	230	2A66	2.25		2 3/8	2	200	230	151-X	2.85		6	1	660	230	*181-X	6.00		
	3	2	90	115	2A67	2.50		6	2	350	115	186-H	4.20		6 1/2	3	800	440	6A84	6.20		
	3	2	90	230	2A68	2.50		6	2	350	230	186-X	4.20		6 1/2	3	1200	440	6A85	7.40		
1/2	2 3/8	2	75	115	141-H	2.35	1/2	2 1/2	2	275	115	145-H	3.20	1.25	5	3	300	115	163-H	4.65		
	2 3/8	2	75	230	141-X	2.35		2 1/2	2	275	230	145-X	3.20		5	3	300	230	163-X	4.65		
	2 3/8	2	100	115	142-H	2.35		4 3/8	3	200	115	6A80	4.10		5	3	600	115	156-H	4.65		
	2 3/8	2	100	230	142-X	2.35		4 3/8	3	200	230	6A81	4.10		5	3	600	230	156-X	4.65		
	3	2	120	115	184-H	2.55		4 3/8	3	400	115	6A82	4.10		8 1/2	3	650	115	164-H	6.00		
	3	2	120	230	184-X	2.55		4 3/8	3	400	230	6A83	4.10		8 1/2	3	650	230	164-X	6.00		
3/4	2 3/8	2	90	115	188-H	2.60	3/4	4 3/8	1	300	115	*179-H	5.60	1.293	8 1/2	3	1000	115	170-H	6.00		
	2 3/8	2	90	230	188-X	2.60		4 3/8	1	300	230	*179-X	5.60		8 1/2	3	1000	230	170-X	6.00		
	2 3/8	2	150	115	143-H	2.60		4 3/8	1	460	115	*180-H	5.60		8 1/2	3	1200	115	152-H	6.00		
	2 3/8	2	150	230	143-X	2.60		4 3/8	1	460	230	*180-X	5.60		8 1/2	3	1200	230	152-X	6.00		
	4	2	150	115	182-H	3.20																
	4	2	150	230	182-X	3.20																

* Single unit with double winding to give three heats. Watts are "high heat". Shipping weights of cartridge units vary from 1/2 to 2 lb depending on size.

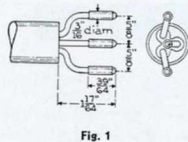


Fig. 1

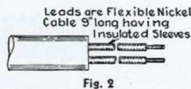


Fig. 2

Note: For flexible terminal leads longer than 9 in. (standard), add \$0.10 to the price for each additional foot or fraction thereof.

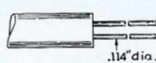


Fig. 3

Symbol	Length of Solid Leads in In.
152	2 7/16
156	3/8
163	3 1/16
164	7 5/16
170	7 5/16
187	7 5/16
6A80	7 3/16
6A81	7 5/16
6A82	7 5/16
6A83	7 5/16
6A84	7 5/16
6A85	7 5/16

Nickel-silver Sheath—Maximum Allowable Sheath Temperature, 1000 F

Nickel-silver-sheath cartridge units in the same physical sizes and ratings as above (except units 3/8 in. in diameter) can be supplied for installation requiring units whose maximum sheath temperature will not exceed 1000 F. Prices on request.

Chrome-steel Sheath—Maximum Allowable Sheath Temperature, 1200 F

Chrome-steel-sheath cartridge units in the same physical sizes and ratings as above (except units 3/8 in. in diameter) and, in some cases, with wattage ratings as much as 50 per cent higher, can be supplied for installations requiring units whose maximum sheath temperature will not exceed 1200 F. Prices on request.

Special Features

- Cartridge units with end (opposite terminal) sealed by brazing are supplied at the following additions to the price:
- Cartridges 1.25 in. in diameter and under..... add \$0.15
- Cartridges 1.293 in. in diameter..... add \$0.25

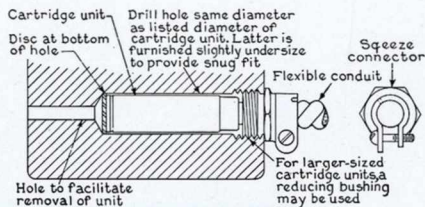
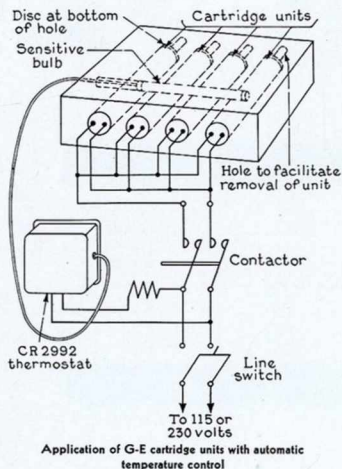
For control equipment, see pages 39 to 47.

G-E CARTRIDGE UNITS

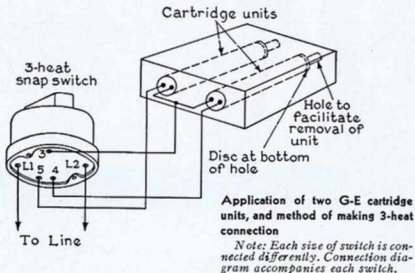
INSTALLATION AND APPLICATION

When installing a G-E cartridge-type heating unit, it is necessary only to provide a hole, in the part to be heated, of a diameter equal to the listed diameter of the cartridge unit to be inserted, which is slightly undersize. Wherever possible, it is advisable to extend the hole entirely through the part, so that the unit can be driven out readily if the necessity for removing

it ever arises. This is because a cartridge-type unit has the desirable feature of expanding when in use until it fits very tightly in its hole. This is advantageous from the standpoint of efficient thermal conductivity, but makes the unit difficult to remove unless a means is provided for driving it out, in which case it can be removed easily.



Method of installing G-E cartridge unit on metal block to be heated
(This method can be varied to suit conditions and size of units.)



G-E Lubricating Paint, Formula A-58

This is a paint consisting of a volatile liquid, supporting powdered graphite in suspension. When applied on the surface of a unit, it provides a seal of graphite between unit and socket surfaces. This retards the formation of scale and unit growth, and, by lubricating the surfaces when the unit is removed, assists greatly in this operation.

Trial units have been easily removed after months of operation.

The paint is applied with a small paint brush, or may be sprayed on, using ordinary care to obtain a smooth, even surface of a thickness approximately equal to the gap between unit and socket surfaces.

Once it is applied and dried in place, it should not be necessary to treat the unit again unless the device is

removed from its socket or the coating is damaged before the unit is inserted.

The coating is unaffected by temperature, except that the binder is driven off by the higher temperatures. Thus a treated unit will lose its coating if heated outside of the unit socket. For this reason, it is better for the user to coat his own units just before installation, rather than to have the coating applied at the time the unit is manufactured.

The coating is *not* an electric insulator, and care must be taken not to get any on the porcelain heads of cartridge units or other insulators.

Order as follows: G-E Lubricating Paint, Formula A-58. Price, \$0.60 per half pint.

G - E STRIP HEATERS

The G-E strip heater serves the double purpose of air heater and clamp-on heater. As such, it is readily adaptable to hundreds of varied uses throughout modern industry. A few of the common applications are for:

Process machinery	Pipe lines
Drying ovens	Incubators
Matrix scorchers	Valve and pump houses
Warming tables	Telephone switchboards
Glue tables	Crane cabs
Water baths	Roll heating
Drying cabinets	Packaging machinery
	Compound tanks

Nickel-chromium resistance coil is stretched the length of the heater several times, providing even distribution of heat over the entire surface of the unit.

Resistance coil is insulated from sheath by magnesium-oxide powder. After assembly, unit is compressed into a compact mass by a 385-ton press.

Compression die forms ridges on the terminal side of the heater, adding strength and rigidity to the unit.

Chrome-steel terminal studs and nuts insulated from sheath by mica washers and provided with fittings for connecting lead wires.

Mounting slots are provided in both ends of the heater.

Back surface is flat.

Terminals project from same side.



Front view of a G-E strip heater (parallel terminals at one end)



Back view of a G-E strip heater

G-E strip heaters are built to handle the most difficult heating jobs. They afford the following features:

*Uniform heat distribution
 Construction that withstands vibration
 Compressed insulation gives long life
 Ridged construction gives unusual strength
 Uniformity in every unit
 Ease of installation
 Moderate cost*

G-E strip heaters are available in two classes. The first is a steel-sheath heater for operation at sheath temperatures up to 750 F. The other is a porcelain-enamelled steel-sheath heater for operation at sheath temperatures up to 1200 F. Standard sizes of both are listed on page 19.

G-E STRIP HEATERS



STEEL SHEATH MAX. ALLOWABLE SHEATH TEMP. 750 F				PORCELAIN-ENAMELED STEEL SHEATH MAX. ALLOWABLE SHEATH TEMP 1200 F				*DIMENSIONS IN INCHES (See Fig. 1, 2, and 3)				
Cat. No.	Watts	† Volts	Price	Cat. No.	Watts	† Volts	Price	Approx Strip Wt in Lb	B	C	D	E
PARALLEL TERMINALS AT ONE END (Fig. 1)												
63X527	1000	230	\$3.25	2A249	1500	230	\$4.10	3	35½	32	34¾	....
63X526	750	230	2.75	2A248	1000	230	3.55	3	30½	26½	29½	....
51X340	500	115	2.25	2A247	750	115	2.95	2	23½	20	22¾	....
51X341	500	230	2.25	2A247G2	750	230	2.95	2	23½	20	22¾	....
2A150	500	275	2.25	2A220	500	115	2.95	2	23½	20	22¾	....
.....	.....	.....	.....	2A220G2	500	230	2.95	2	23½	20	22¾	....
51X338	350	115	2.10	2A246	500	115	2.70	2	17¾	14¾	16¾	....
51X339	350	230	2.10	2A246G2	500	230	2.70	2	17¾	14¾	16¾	....
51X336	250	115	1.90	2A245	350	115	2.40	2	11¾	8¾	11	....
51X337	250	230	1.90	2A245G2	350	230	2.40	2	11¾	8¾	11	....
51X334	150	115	1.80	2A244	200	115	2.20	1	7	3½	6¼	....
51X335	150	230	1.80	2A244G2	200	230	2.20	1	7	3½	6¼	....

OFFSET TERMINALS AT ONE END (Fig. 2)												
2A155	1000	230	\$3.25	2A235	1500	230	\$4.10	3	35½	31½	34¾	....
.....	.....	.....	.....	2A260	1000	230	4.10	3	35½	31½	34¾	....
2A154	750	230	2.75	2A234	1000	230	3.55	3	30½	26½	29½	....
.....	.....	.....	.....	2A259	750	230	3.55	3	30½	26½	29½	....
2A153	500	115	2.25	2A233	750	115	2.95	2	23½	19½	22¾	....
2A153G2	500	230	2.25	2A233G2	750	230	2.95	2	23½	19½	22¾	....
.....	.....	.....	.....	2A238	500	115	2.95	2	23½	19½	22¾	....
.....	.....	.....	.....	2A238G2	500	230	2.95	2	23½	19½	22¾	....
2A152	350	115	2.10	2A232	500	115	2.70	2	17¾	13¾	16¾	....
2A152G2	350	230	2.10	2A232G2	500	230	2.70	2	17¾	13¾	16¾	....
.....	.....	.....	.....	2A257	350	115	2.70	2	17¾	13¾	16¾	....
.....	.....	.....	.....	2A257G2	350	230	2.70	2	17¾	13¾	16¾	....

TERMINALS AT BOTH ENDS (Fig. 3)												
51X348	500	115	\$2.25	2A253	750	115	\$2.95	2	23½	19	22¾	20¾
51X349	500	230	2.25	2A253G2	750	230	2.95	2	23½	19	22¾	20¾
2A125	500	250	2.25	2A262G2	500	230	2.95	2	23½	19	22¾	20¾
51X346	350	115	2.10	2A252	500	115	2.70	2	17¾	13¾	16¾	14¾
51X347	350	230	2.10	2A252G2	500	230	2.70	2	17¾	13¾	16¾	14¾
51X344	250	115	1.90	2A251	350	115	2.40	2	11¾	7¾	11	9
51X345	250	230	1.90	2A251G2	350	230	2.40	2	11¾	7¾	11	9
51X342	150	115	1.80	2A250	200	115	2.20	1	7	2¾	6¼	4¼

† These heaters can be connected in series for use on 440- or 550-volt circuits. For these higher voltages, secondary insulation is required. For secondary insulation, see page 20.
 * Dimensions shown in Fig. 1, 2, and 3 apply to steel-sheath heaters. The porcelain-enameled heaters have a width of 1 1/16 in., thickness 1 1/2 in., height over terminals 1 1/2 in., height under terminals 1/2 in. Use 3/16 in. bolt max.

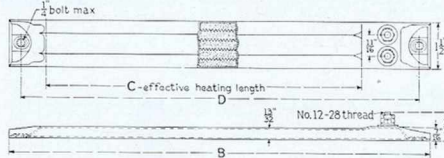


Fig. 1

Dimensions of G-E strip heater with parallel terminals at one end

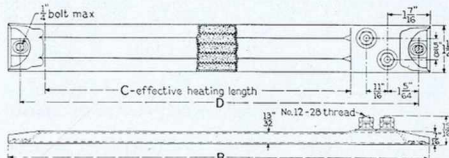


Fig. 2

Dimensions of G-E strip heater with offset terminals at one end

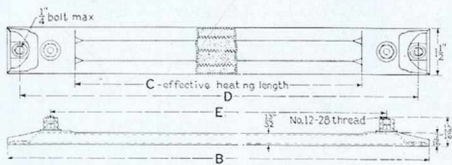


Fig. 3

Dimensions of G-E strip heater with terminals on both ends

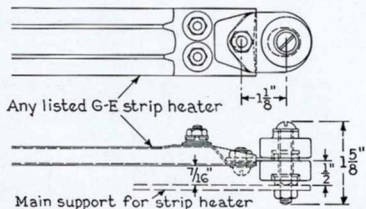
For control equipment, see pages 39 to 47.

G-E STRIP HEATERS

INSTALLATION AND APPLICATION

Secondary Insulation

G-E secondary insulation for G-E strip heaters is shown in the accompanying sketch. Sufficient secondary insulation for one heater (2 sets, 1 set for each end) is covered by Cat. No. 3939673G1. Price is \$0.40.



Connection Wires

For connections to or between strip heaters, three sizes of flexible, heat-resisting cable are available, as follows:

- 10 B & S standard strand (65/0.0126) Deltabeston motion-picture-machine cable.
- 12 B & S standard strand (66/0.010) Deltabeston motion-picture-machine cable.
- 14 B & S standard strand (41/0.010) Deltabeston motion-picture-machine cable.

The conductor of this cable is nickel, and, as indicated by the stranding mentioned above, it is flexible. The cable is insulated with $\frac{3}{32}$ in. of Deltabeston

(treated asbestos, plus a closely woven asbestos braid, which is thoroughly impregnated with a flame- and moisture-proof compound). This braid is securely cemented to the inner insulation, thereby preventing abrasion and assuring easy stripping for connections.

The following prices apply:

- 10 B & S, \$0.09 per ft
- 12 B & S, \$0.08 per ft
- 14 B & S, \$0.07 per ft

The diameter of the bare cable and the over-all diameter of the insulated cable are as follows:

Specifications

B & S Size	Diameter of Bare Cable	Diameter Over-all	Maximum Amp
10	.120 in.	.270 in.	20
12	.097 in.	.250 in.	15
14	.077 in.	.230 in.	10

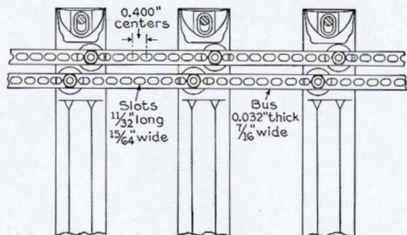
These wires may be used at temperatures as high as the strip heaters will stand in an oven.

Bus Bars

For parallel connection of a large group of strip heaters, special bus bars are available. These bus bars are punched with holes designed to go over the terminal studs of the heater and thus provide positive permanent connection.

The frequent spacing and the shape of the holes and the ease of bending the bus provide for an unlimited choice of heating-unit spacings.

As many as three buses can be put on each terminal stud for the higher current-capacity requirements.

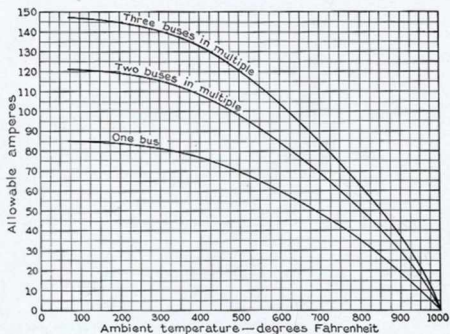


A typical application of bus bars to offset-terminal strip heaters

The current capacity of these bus bars under various conditions is shown by the accompanying curves.

Bus Bar—12 ft long, Cat. No. 2A188.

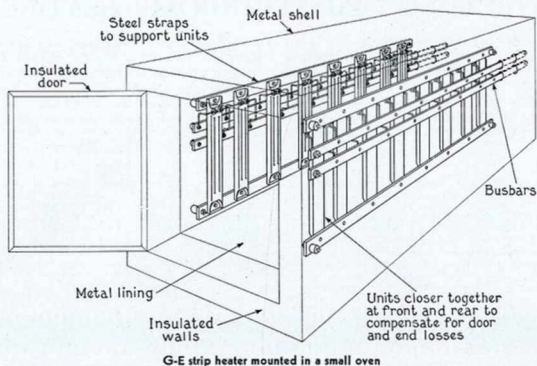
Price \$1.00 each



Current capacity of Cat. No. 2A188 bus bars

G-E STRIP HEATERS

INSTALLATION AND APPLICATION



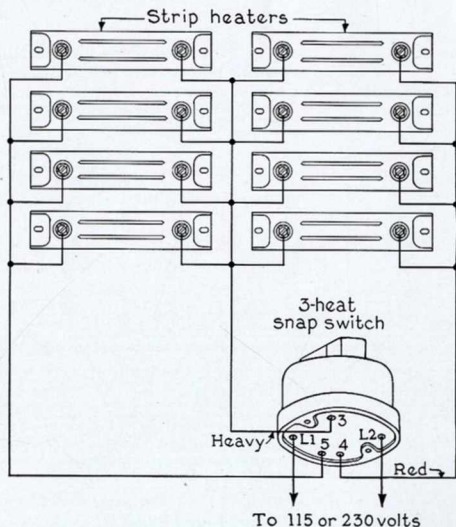
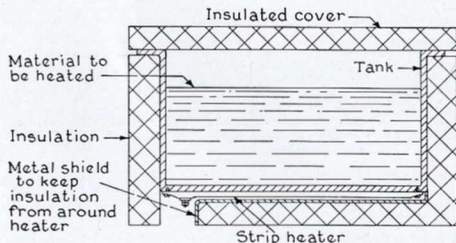
*Maximum allowable oven temperatures when
G-E strip heaters are used.*

Strip heaters rated 720 F—maximum oven temperature, 400 F
Strip heaters rated 1200 F—maximum oven temperature, 800 F

G-E Strip Heaters—Easy to Install

The three illustrations shown here are evidence of the ease with which G-E strip heaters can be installed quickly and inexpensively. For the convenience of the user, General Electric offers the accessory items shown on page 20—all designed to facilitate installation.

It should also be noted that, in general, there are three styles of terminal arrangements for G-E strip heaters. See listing on page 19. For example, it is possible to obtain from our stock a 500-watt strip heater, 23½ in. long, maximum sheath temperature 750 F, with any one of the three terminal arrangements shown in the figures at the bottom of page 19.



Arrangement of G-E strip heaters with 3-heat manual control. While wire connections are shown, the G-E bus bars (see page 20) can frequently be used to better advantage

Note: Each size of switch is connected differently. Connection diagram accompanies every switch



G-E FIN CALROD HEATING UNITS

WITH BAKED ALUMINUM FINISH

FOR FORCED-CONVECTION AIR HEATING

Relatively large heat capacity at conservatively low heat density is the outstanding feature of G-E fin Calrod heating units. This makes them especially suited to air-blast heating applications that require sturdy, compact, and durable heaters—applications such as air ducts with forced air draft, blower-type electric unit heaters (such as those described on pages 26 to 29), and industrial processes requiring heated air blasts.

G-E fin Calrod heating units are of the standard G-E Calrod construction, with a steel sheath to which is electric-furnace brazed an edgewise-wound steel strip. The completed assembly is then given a baked aluminum finish resistant to rust and oxidation. The latter is $\frac{3}{8}$ in. wide by $\frac{1}{8}$ in. thick and is so applied that there are four complete turns per inch of Calrod length, thus multiplying the radiating surface of the finished heater to many times that of the Calrod itself.

G-E Calrod unit with steel sheath. See page 4 for details of construction.

Steel fin, $\frac{1}{8}$ in. thick, edgewise wound about the Calrod unit. This gives great strength and increases radiating surface to many times that of the Calrod sheath, affording large heat capacity at conservatively low heat density.

The fin is electric-furnace brazed to the Calrod unit. This results in a permanently tight construction and permits quick and efficient heat transfer to the outer surfaces. The completed assembly is then given a baked aluminum finish resistant to rust and oxidation.

Strong nut-type terminal for electric connections. Sealed terminals also available. See page 8.



Fig. 1

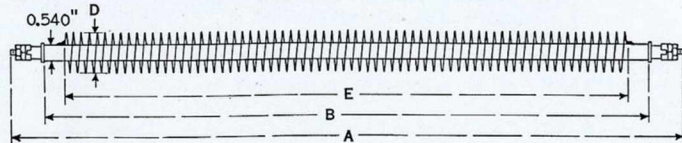


Fig. 2

Standard Sizes and Ratings of G-E Fin Calrod Heating Units

*Based on intake air temperature 70 F maximum and minimum face velocity of 400 feet per minute

For 230 Volts Operation (or 2 in Series on 440 Volts)

Maximum Allowable Sheath Temperature—1000 F

DIMENSIONS IN INCHES (See Fig. 2)				Effective Heating Length Dimension E	* Watts	Cat. No.	† Price	Approx. Shipp. Wt. in Lb
ΔA	ΔB	D						
24	22	1 1/4	20	2000	7A110	\$6.80	4	
34	32	1 1/4	30	3000	7A111	9.50	6	
44	42	1 1/4	40	4000	7A112	12.20	8	
54	52	1 1/4	50	5000	7A113	15.00	10	
64	62	1 1/4	60	6000	7A114	17.80	12	
74	72	1 1/4	70	7000	7A115	20.60	14	
84	82	1 1/4	80	8000	7A116	23.40	16	
94	92	1 1/4	90	9000	7A117	26.20	18	
104	102	1 1/4	100	10000	7A118	30.60	20	

ΔA and B dimensions as great as 16 inches longer than listed, can be furnished without extra cost. Note in particular, however, that the E dimension remains unchanged in all cases.

* Unless specified otherwise, A and B dimensions will be furnished as indicated in the table above.

† Wattages indicated are maximum allowable where intake-air temperature does not exceed 70 F. Lower wattage ratings are necessary where intake-air temperature exceeds 70 F. Thus, in the case of heaters installed several rows deep in an air duct, for example, where the intake air is 70 F and the air temperature becomes increasingly higher as it passes each row of heaters, the first row of heaters would have the wattages indicated in the table, but the second row would have wattage ratings approximately 90 per cent, and the third row approximately 80 per cent of that of the first row. Wherever possible, install heaters in a single row to provide maximum allowable wattage for each heater and to obviate the necessity of installing several different ratings of heaters. Where the air temperature approaching any row of heaters exceeds 70 F, write us for definite recommendations.

‡ Prices include standard terminal connections as shown in Fig. 1. Glass-sealed terminals or mycalex-sealed terminals can be supplied at the additional prices shown on page 8. Bushings also can be supplied at the prices shown at the top of page 8. In this case, the A and B dimensions (Fig. 2 above) will be increased 2 inches.

Forming G-E Fin Calrod Heating Units

The units can be bent at the factory on a minimum radius of one inch. Orders should be accompanied by a sketch showing the formation desired, with permissible limits of variation.

Price \$0.50 per bend, per unit—plus \$3.00 per bend, lot set-up charge.

For control equipment, see pages 39 to 47.

G-E FIN CALROD HEATING UNITS



FOR FORCED-CONVECTION AIR HEATING INSTALLATION AND APPLICATION

In addition to the useful information on air heating given on pages 53 and 55, the curve below will be found helpful as it enables you to determine the temperature

of outgoing air, and is a guide for determination of duct size, and blower capacity.

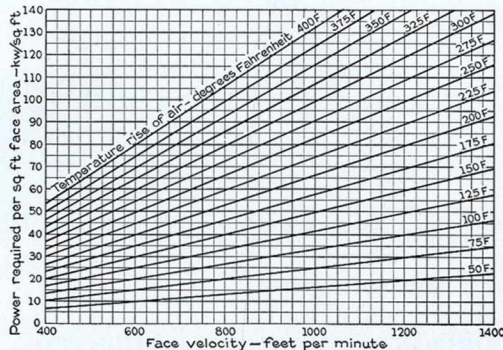


Fig. 3

Example of use of curve:

Assume 60 kw to be installed in a duct of 4 sq ft. face area (cross section). Assume blower capacity of 2000 cu ft per min of 70 F air. Problem—to determine outgoing air temperature.

- $\frac{2000 \text{ (ft)}^3/\text{min}}{4 \text{ (ft)}^2} = 500 \text{ ft/min face velocity.}$
- $\frac{60 \text{ kw}}{4 \text{ (ft)}^2} = 15 \text{ kw/sq ft of face area.}$
- Read vertically at 500 ft/min to where line intersects horizontal 15 kw/sq ft.
- This intersection is on sloping line 90 F—temperature rise.
- Outgoing air temperature = 160 F (70F + 90 F.)

Note: If by above method of calculation, your proposed application results in an objectionably high outgoing air temperature, this value can be decreased by increasing the blower capacity.

SUGGESTED ARRANGEMENT OF FIN CALROD UNITS IN AIR DUCTS

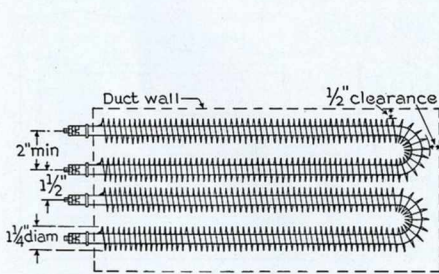


Fig. 4

Typical cross section of air duct, showing suggested arrangement of fin Calrod units in hairpin formation (see page 22 for additional price for bending unit)

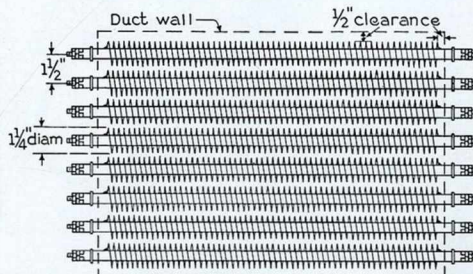


Fig. 5

Typical cross section of air duct, showing suggested arrangement of fin Calrod units in straight lengths

G-E UNIT HEATERS

NATURAL-CONVECTION TYPE

(Forced-convection Type Listed on Pages 26 to 29)

These convenient, easily installed air heaters are just the thing for heating those out-of-the-way places that are a perplexing problem in cold weather. Here is a list of common applications which are suggestive of many others.

- | | | |
|------------------|----------------------|-------------------|
| Substations | Electric locomotives | Scale rooms |
| Valve houses | Blower rooms | Watchmen's houses |
| Pump houses | Repair shops | Elevators |
| Warehouses | Service stations | Drying rooms |
| Crane cabs | Laboratories | Waiting stations |
| Airplane hangars | Garages | Ticket booths |

G-E unit heaters serve all of these applications well, and others, too, because of the following important features:

- Free air circulation provides maximum heat.
- Easily installed—simply mount on wall or floor and connect to power line.
- Light but strong—easily moved from one job to another.
- Always ready—heat available at the turn of the switch.
- The 3-heat switch provides simple regulation of temperature and economy of operation.
- No soot, dirt, or dust—no odors or obnoxious gases.

HORIZONTAL TYPE WALL-MOUNTED

G-E horizontal-type, wall-mounted unit heaters consist of a number of G-E strip heaters mounted in a perforated, pressed-steel case, with heat-resisting painted finish. They are designed for mounting directly on walls and, therefore, are equipped with ingenious heat baffles to prevent overheating and scorching of wall surfaces.

Watts	With 3-ft Armored Cable and 3-heat Snap Switch (See Fig. 1)					Without Armored Cable and Switch				Approx. Ship. Wt. in Lb	DIMENSIONS IN INCHES (See Fig. 2)					
	CAT. NO.		Price	CAT. NO.		CAT. NO.			Price		A	B	C	D	E	F
	115 Volts	230 Volts		440 Volts	Price	115 Volts	230 Volts	440 Volts								
1000	2A133	2A133G2	\$20.00	2A195	\$24.00	2A134	2A134G2	2A156	\$17.00	22	9 1/2	7 3/4	10 3/4	11 1/4	25 3/4	23 3/4
2000	2A135	2A135G2	27.00	2A164	31.00	2A136	2A136G2	2A157	23.00	32	12 3/4	10 1/2	13 3/4	14	25 3/4	23 3/4
3000	.....	2A137	34.00	2A165	38.00	.....	2A138	2A158	29.00	40	16	14 1/4	16 3/4	17 3/4	25 3/4	23 3/4
4500	.....	2A139	45.00	2A166	49.00	.....	2A140	2A159	39.00	50	16	14 3/4	16 3/4	17 3/4	32 3/4	30 3/4

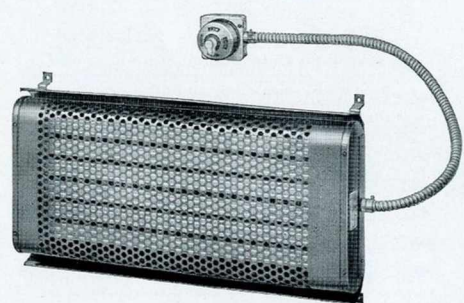


Fig. 1

NOTE: The heater is designed for mounting on the wall with the main axis horizontal, and can be mounted with the cable emerging from either the right or left end

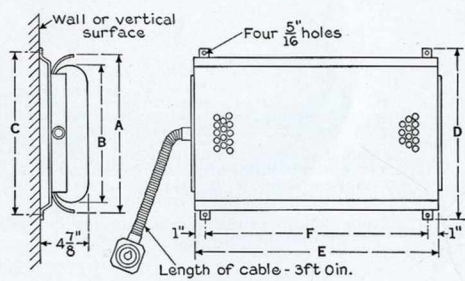


Fig. 2

G-E UNIT HEATERS

NATURAL-CONVECTION TYPE

(Forced-convection Type Listed on Pages 26 to 29)

HORIZONTAL TYPE, FLOOR-MOUNTED

These convenient, portable air heaters consist of a number of G-E strip heaters mounted in a perforated, pressed-steel case, with heat-resisting painted finish.

Each heater is equipped with a 3-heat snap switch mounted on one end, and 10 ft of rubber-covered heater cord, as shown in Fig. 3.

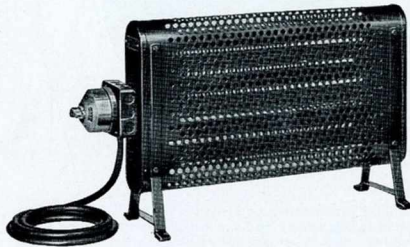


Fig. 3

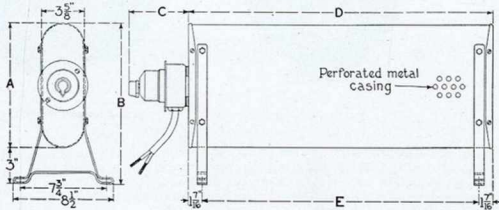


Fig. 4

Watts	CAT. NO.		Price	CAT. NO.		Approx. Ship. Wt. in Lb.	DIMENSIONS IN INCHES (See Fig. 4)				
	115 Volts	230 Volts		440 Volts	Price		A	B	C	D	E
1000	54X146	54X147	\$20.00	2A196	\$24.00	25	7 3/4	10 3/4	4 1/2	25 3/4	22 3/4
2000	2A194	54X149	27.00	2A112	31.00	33	10 7/16	13 7/16	5	25 3/8	22 3/4
3000	.....	54X151	34.00	2A113	38.00	40	14 1/4	17 1/4	5 1/2	25 3/4	22 3/4
4500	.....	2A168	45.00	2A114	49.00	50	14 3/4	17 3/4	5 3/4	32 1/4	29 3/4

CONTROL EQUIPMENT FOR NATURAL-CONVECTION UNIT HEATERS

The three-heat snap switch has four positions: high, medium, low, and "off," on which the heater will dissipate respectively full, one half, one quarter, and zero of its nominal watts rating. This gives the operator a flexible manual control of the temperature of the area.

Automatic temperature control is often desirable because it relieves the operator of this responsibility, assures even temperatures, and saves power by preventing needlessly high temperatures.

Automatic temperature control can be used with a heater without a snap switch. Many purchasers desire both, since a thermostat will control the degree of heating while the three-heat snap switch will control the rate of heating and prevent sudden temperature changes.

Automatic control devices for natural-convection unit heaters of various ratings are shown in the table below. Recommendations for automatic control of 440-volt heaters will be made on request.

Heater Cat. No.	Thermostat (See "A" on Page 29)	†Magnetic Switch Cat. No. (See "C" on Page 29)	Heater Cat. No.	Thermostat (See "A" on Page 29)	†Magnetic Switch Cat. No. (See "C" on Page 29)
2A133 54X146	* CR7865-Z1A PLUS adapter plate	} 498S126C2	2A135G2 54X149	} * CR7865-Z1A PLUS adapter plate	} 498S126C3
2A135 2A194			2A137 54X151			4986311A3
2A133G2 54X147		} 498S126C3	2A139 2A168		4386917G103

* (a) A 16-20-volt thermostat circuit can be provided where desired by the inclusion of a transformer relay panel. See "B" on page 29 for prices and description. In this case, the adapter plate can be omitted. Also, since the relay itself can carry the small heater loads, it is possible to omit the magnetic switch, except Cat. No. 4386917G102 and Cat. No. 4386917G103, for the 2-kw, 115-volt and 4.5-kw, 230-volt heaters respectively.
 (b) Thermostat, Cat. No. 4980291G18, can be substituted for all of the above control equipment. That is, it will handle the heater load direct in all cases. For description, see "D" on page 29.
 † The magnetic switches listed are for 60 cycles. For 50-cycle devices, specify frequency, and order at the same price.

G-E UNIT HEATERS

FORCED-CONVECTION TYPE

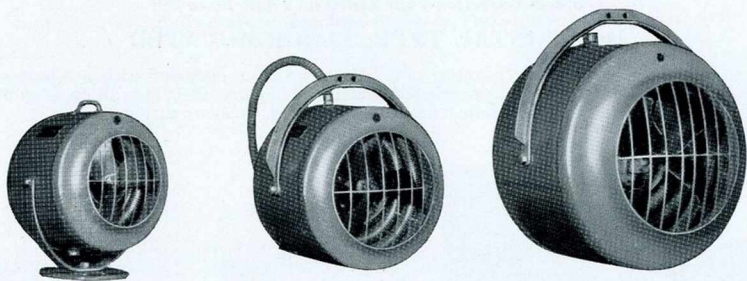


Fig. 1
G-E forced-convection unit air heaters

General Electric with its broad experience and large success in the field of industrial air conditioning, should be expected to have an excellent electrically heated unit heater of the forced-convection type. General Electric has such a unit heater—in the opinion of the many heating engineers who have seen it and applied it. They like the efficient design that quietly draws air over the compact arrangement of heating units and directs it exactly where desired. They approve the elimination of inactive corners, so prevalent in many of the rectangular models, and they praise the scientific arrangement of heating unit, motor, and fan—an arrangement that takes heat from the units with maximum efficiency, eliminates hot spots in the units themselves, yet permits the motor to remain cool. These are features that they know will provide a long life of uninterrupted service while giving the user quick, clean heat when and where he wants it.

G-E unit heaters of the forced-convection type are available in two styles. One is a portable model, primarily for floor mounting, but which can readily be arranged for suspension mounting, as explained later. The other style embraces heaters that are larger physically and higher in heat rating—designed only for suspension mounting from wall or ceiling.

The Heating Unit

G-E Calrod, of course. But, this time, a G-E fin Calrod unit of the type described on page 22. This is the famous G-E Calrod with the addition of strong radiating fins that multiply the radiating surface of the Calrod itself manifold. And, these fins are electric-furnace brazed on the Calrod to provide maximum heat-transfer efficiency. The resulting unit is one that is low in heat density and mechanically strong—a unit that will have long life.



Fig. 2
G-E fin Calrod heating unit used in G-E forced-convection unit heaters

The Fan

G-E aphonic pressure-type fan with matching outlet orifice. The type of fan so widely and successfully employed by our Air Conditioning and Commercial Refrigeration Department. Adopted because it provides efficient and quiet operation.

The Motor

A G-E totally enclosed motor with sleeve bearings—a long-established standard motor of our Motor Division. The motor is protected against direct radiation from the heating units by an ingenious baffle. Cool air is drawn over the motor frame at all times through the space between the motor and the baffle.

Automatic Protection Against Overheating

G-E unit heaters, of the forced-convection type, are automatically protected from excessive overheating by thermostatic cutouts. Thus, in the case of accident, such as obstruction of the inlet or outlet openings, or the remote possibility of fan failure, the resultant temperature rise causes the thermostatic device to operate, which, in turn, causes the removal of power from the heater.

The heaters rated under 10 kilowatts have a convenient reset button located on the outside of the case. On the heaters rated 10 kilowatts and over, remote push-button control is used, and the push button provides the necessary reset feature.

The Housing

It's strong and sturdy. But what will appeal to you more is the ingenious arrangement that permits the heater to be directed upward or downward as much as 30 degrees from the horizontal, to serve exactly the required area. Note too, the absence of louvers that such an arrangement permits, thereby allowing free flow of air.

The portable style can quickly be arranged for suspension mounting. Just unbolt the foot pedestal, unbolt the supporting arm, and readjust the latter so that it will be 180 degrees from its standard location. Thus, the supporting arm is in position to be adapted to either a wall- or ceiling-mounting bracket.

Wide Utility—May Also Be Used as Fan Only

The two smaller sizes of G-E forced-convection heaters are so designed that they can readily be used only as fans during hot weather.

To operate the motor and fan independently of the heating unit, the 2-, 3-, and 4-kw heaters are provided with a tumbler switch mounted on the casing. On the 5- and 7.5-kw heaters, the fan-motor leads are brought out so that, if desired, the fan can be connected to a manual switch, which is purchased and mounted separately.

G-E UNIT HEATERS

FORCED-CONVECTION TYPE

Portable Style

Primarily for Floor Mounting but Easily Adaptable for Wall or Ceiling Mounting

Kw	CAT. NO.		Price	Ship. Wt in Lb	Dimen- sions See Fig.	Approximate Conditions under Normal Operation					
	* Single-phase, 50/60 Cycles, A-c					Btu. per Hour	Equivalent Direct Radiation at 240 Btu per Sq Ft	Avg Velocity of Air Ft per Min	Volume of Air, Cu Ft per Min at Outlet Temperature	TEMP DEG F	
	115 Volts	* 230 Volts								Inlet	Outlet
2	2A174G31	2A174G30	\$42.00	40	3	6,824	28.4	710	200	70	105
3	2A175G23	2A175G30	48.00	43	3	10,236	42.7	730	206	70	120
4	.....	2A176G30	54.00	46	3	13,648	56.9	750	212	70	135

* Standard 230-volt heaters operated on 208 volts, 50/60 cycles, a-c, will dissipate approximately 82 per cent of listed kw. Special unit heaters can be supplied for connection, of both fan motor and heating elements, to circuits listed as follows: 50/60 cycles, 115 volts, single-phase, a-c (special 4-kw heater), 25 cycles, 115 or 230 volts, single-phase, a-c, 25, 50, or 60 cycles, 208 or 440 volts, single-phase, a-c. Direct current—115 volts, 2 and 3 kw; 230 volts, 2, 3, and 4 kw. PRICE—add \$10 to standard heater.

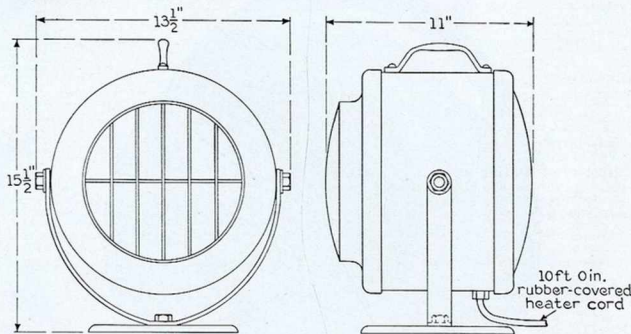


Fig. 3

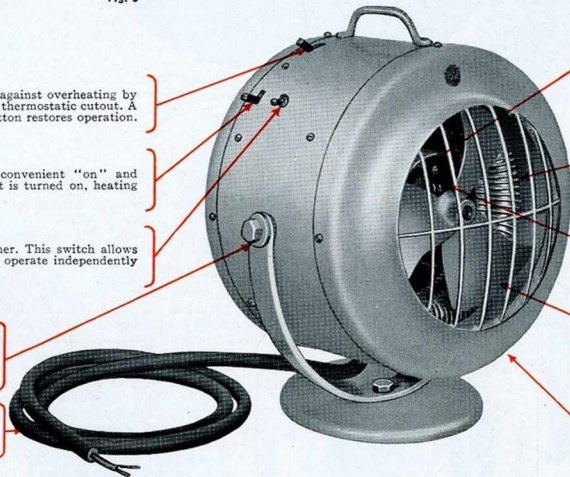
Automatic protection against overheating by means of an ingenious thermostatic cutout. A touch of this reset button restores operation.

Easy to operate. A convenient "on" and "off" switch. When it is turned on, heating begins instantly.

A fan for warm weather. This switch allows the motor and fan to operate independently of the heating unit.

Heat where you want it. This arrangement permits directing the heater upward or downward.

Each heater is supplied with 10 feet of heavy-duty two-conductor rubber-covered heater cord.



G-E heaters are built for long life. One of the many contributing features is this effective baffle between the heating unit and motor—affording cool operation of the motor.

The famous G-E fin Calrod heating unit. High heat capacity at low heat density. A strong unit for a long useful life.

G-E totally enclosed motor with sleeve bearings affords dependable operation.

G-E aphonic pressure-type fan with matching outlet orifice. Draws cold air quietly over the heater and noiselessly expels the heated air.

No inactive corners or dangerous hot spots. This circular design, with its scientific arrangement of heating unit, motor, and fan, operates with maximum efficiency and safety.

Fig. 4

For control equipment, see page 29.



G-E UNIT HEATERS

FORCED-CONVECTION TYPE

Suspension Style—For Wall or Ceiling Mounting

Kw	CAT. NO.		Δ Price	Ship. Wt in Lb	Approximate Conditions under Normal Operation				TEMP DEG F		DIMENSIONS IN INCHES (See Fig. 6)							
	* 230 Volts Single-phase 50/60 Cycles A-c	* 230 Volts Three-phase 50/60 Cycles A-c			Btu per Hour	Equivalent Direct Radiation at 240 Btu per Sq Ft	Avg Velocity of Air, Ft per Min	Volume of Air, Cu Ft per Min at Outlet Temperature	Inlet	Outlet	A	B	C	D	E	F	G	H
5	2A177G27	\$75	80	17,060	71.1	894	536	70	115	1 3/4	3/4	10 3/16	17 3/4	3/16	15	13 3/4	
7.5	2A178G27	.....	\$85	90	25,590	106.4	916	550	70	130							
10	2A201	125	140	34,120	142	1725	1540	70	100	2	1	14 3/8	25 3/8	3/4	22	19 3/4	
12.5	.....	2A202	135	150	42,650	178	1753	1363	70	106							
15	.....	2A203	145	160	51,180	213	1782	1590	70	112							

Δ Price includes 4 ft of armored connecting cable as shown in Fig. 6.

* Standard 230-volt heaters operated on 208 volts, 50/60 cycle, a-c, will dissipate approximately 82 per cent of listed kw.

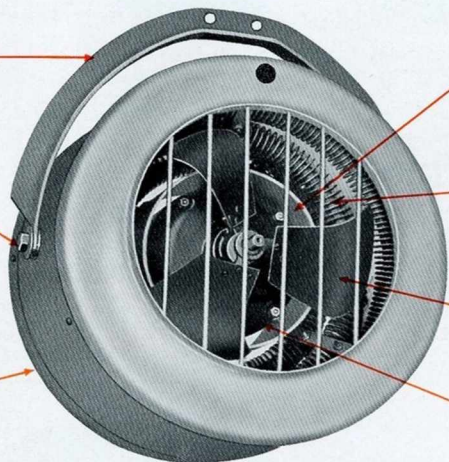
Special unit heaters can be supplied for connection of both fan motor and heating element, to circuits listed below. (The 5- and 7.5-kw heaters will be single-phase only; the 10-, 12.5-, and 15-kw heaters will be three-phase only) 25 cycles, a-c, 230 volts; 25, 50, or 60 cycles, a-c, 208 or 440 volts; direct current, 230 or 250 volts.

Price—add \$10 to standard heater.

Strong suspension yoke for mounting from wall or ceiling brackets.

Heat where you want it. This arrangement permits directing the heater upward or downward.

No inactive corners or dangerous hot spots. This circular design, with its scientific arrangement of heating unit, motor, and fan, operates with maximum efficiency and safety.



G-E heaters are built for long life. One of the many contributing features is this effective baffle between the heating unit and motor—affording cool operation of the motor.

The famous G-E fin Calrod heating unit. High heat capacity at low heat density. A strong unit for a long useful life.

G-E aphonic pressure-type fan with matching outlet orifice. Draws cold air quietly over the heater and noiselessly expels the heated air.

G-E totally enclosed motor with sleeve bearings affords dependable operation.

Fig. 5

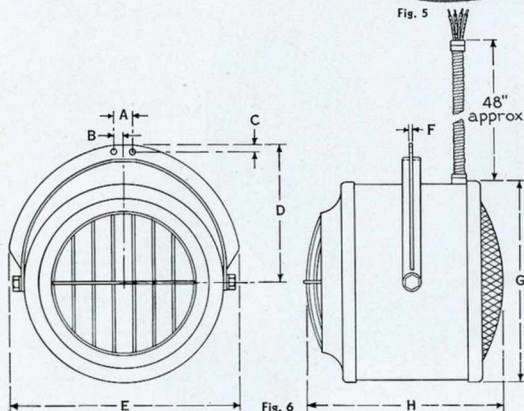


Fig. 6

Control Equipment

There is a choice between manual and automatic control. If the heaters are connected to automatic control equipment, this equipment also permits manual starting and stopping.

The devices for manual control are easy to reach and positive in operation. The devices for automatic control combine these advantages with the elimination of personal attention. In addition, automatic temperature control assures even temperatures and saves power by eliminating needlessly high temperatures. Each device is enclosed and permits wall mounting and conduit connection. The thermostat should be mounted in the area where heat is desired. The other devices may be mounted wherever is most convenient for wiring, etc. Complete connection diagrams for the heaters and control equipment are supplied with each heater.

The suggested control equipment is for one heater. If a number of heaters are to be installed in one area, it is possible that a single larger control equipment would be less expensive than individual control.

For control equipment, see above and page 29.

G-E UNIT HEATERS



FORCED-CONVECTION TYPE—CONTROL EQUIPMENT (CONT.)

Heater Cat. No.	FOR MANUAL CONTROL	* FOR AUTOMATIC CONTROL Choose Between Alternatives 1, 2, and 3						Fan (Only) Control	
		ALTERNATIVE NO. 1			ALTERNATIVE NO. 2		ALTERNATIVE NO. 3		
		Thermostat (See "A" Below)	Transformer Relay Panel (See "B" Below)	Cat. No. Magnetic Switch (See "C" Below)	Thermostat (See "A" Below)	Cat. No. Magnetic Switch (See "C" Below)	Cat. No. Thermostat (See "D" Below)		Cat. No. Magnetic Switch (See "C" Below)
2A174G31 2A174G30 2A175G23 2A175G30 2A176G30	Tumbler switch included on heater housing	CR7865- Z1A	CR7865-C1A2	4386917G102	CR7865-Z1A plus adapter plate	4386917G102	49802S1G18	None	Tumbler switch included on heater housing
2A177G27 2A178G27	Trumbull Cat. No. 20221. Price \$3.60 Trumbull Cat. No. 20222. Price \$6.00		CR7865-C1A5	4386918G102		4988126C3		4386918G102	
			None	4386917G103	4386917G103	4386917G103	4386918G102	None	
			4386917G103	4386917G103	4386917G103	4386917G103	4386918G103	4386917G103	Trumbull Cat. No. 2328 Price \$1.60

* The transformer relay panels and magnetic switches listed are for 60 cycles. For 50-cycle devices, specify frequency and order at same price.

Heater Cat. No.	Control Equipment Required					
	† FOR MANUAL CONTROL			† FOR AUTOMATIC CONTROL		
	Cat. No. Magnetic Switch (See "C" Below)	Push-button Station	Cat. No. Magnetic Switch (See "C" Below)	Relay	Push-button Station	* Thermostat (See "A" Below)
2A201	4383134G103	CR2940-BS79J Price \$2.00	4383134G103	CR2811-C1T Cat. 2283728G3 Price \$6.00	CR2940-BS79J Price \$2.00	CR7865-Z1A plus adapter plate
2A202						
2A203						

* (a) Thermostat, Cat. No. 49802S1G18, can be substituted for thermostat "A." For description see "D" below.
 (b) A 16-20-volt thermostat circuit can be provided, where desired, by the inclusion of a CR7865C1A5 transformer relay panel.
 For description, see "B" below. In this case, the thermostat adapter plate can be omitted.
 † The magnetic switches, relays, and transformer relay panels listed are for 60 cycles. For 50-cycle devices, specify frequency and order at the same price.



Fig. 7
Thermostat

A. Thermostat CR7865-Z1A—Price \$8.00
 These thermostats are designed for wall mounting. When on 16-20-volt circuit, they can be mounted without conduit box and with inexpensive wiring. (See "B.") By using an adapter plate, they can be mounted on a standard conduit box for use on 115- or 230-volt circuits.
 Adapter plate only: Cat. No. 94X699, Price \$0.50

These are 2-wire snap-action thermostats. They have an adjustment range of 55-90 F, and a differential of 1½ F min. They have an attractive gold finish and include a thermometer.

B. Transformer Relay Panel
 CR7865-C1A2, Price \$7.00
 CR7865-C1A5, Price \$2.00

The panels incorporate a transformer with primary voltages of 115 and 230 volts respectively; 60 cycles, single-phase. The secondary is 16-20 volts. The purpose of this low voltage is to permit the use of the most simple and inexpensive wiring without conduit to the wall-mounted thermostat, with the relay coil in series. The relay tips handle the small heaters direct and handle the magnetic switches which, in turn, handle the large heaters.



Fig. 8
Transformer
relay panel

C. The magnetic switches are CR-2811, enclosed wall-mounted type.

MAGNETIC SWITCH

Cat. No.	Price	Cat. No.	Price
4386917G102	\$12	4988311A3	\$9
4386917G103	12	4988126C3	7
4386918G102	23	4383134G103	25
4386918G103	23	4988126C2	7

Fig. 9
Magnetic switch



Fig. 11
Relay



Fig. 12
Push-button station



Fig. 13
Trumbull
Cat. No. 20221
Cat. No. 20222



Fig. 14
Trumbull
Cat. No. 2328

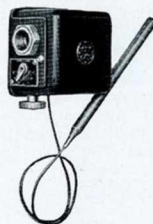


Fig. 10
Thermostat
Cat. No. 49802S1G18

D. Thermostat Cat. No. 49802S1G18 is similar to those on page 43. The adjustable temperature range is from 30 to 120 F. The differential is =3 F. Price, \$9.00.

G-E ELECTRIC-OVEN HEATERS

Air Heaters for Wall or Floor Mounting

Kw (Average)	* Volts	Cat. No.	† Price	Approx Ship. Wt in Lb	APPROX DIMENSIONS IN INCHES		
					Length	Height	Width
FOR INDUSTRIAL OVENS OPERATING UP TO 750 F							
1.8	110	3884885G1	\$11.30	28	19 1/2	12	2 1/2
2.55	110	3884886G1	12.30	28	19 1/2	12	2 1/2
3.8	110	1908371G1	14.75	35	26 5/16	12	2 1/2
5.0	220	3884887G1	16.50	40	33 1/2	12	2 1/2
2.5	110	1908370G1	17.90	45	36 1/2	12	2 1/2
FOR INDUSTRIAL OVENS OPERATING FROM 750 TO 1150 F							
1.8	110	3884885G2	\$22.00	28	19 1/2	12	2 1/2
2.55	110	3884886G2	23.00	28	19 1/2	12	2 1/2
3.8	110	1908371G13	26.25	35	26 5/16	12	2 1/2
5.0	220	3884887G2	28.00	40	33 1/2	12	2 1/2

* Heaters may be connected in series on voltages as high as 550 v.
 † For floor mounting, standard floor supports (or feet) are required. See Fig. 2. Add **\$1.40** per heater.

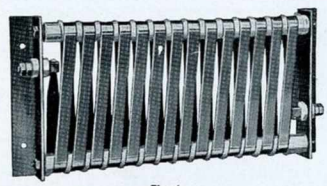


Fig. 1
Form G heater to be mounted on feet for floor mounting or on straps for wall mounting

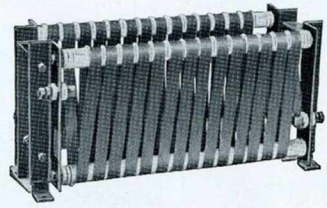


Fig. 2
Two Form G heaters mounted together on floor supports

Cat. No. 3884885G1, 3884886G1, 1908371G1, and 3884887G1

These heaters have been designed for japanning, enameling, core baking, and drying. The electrical rating of each is specified on the table. The ribbon is of nickel-chrome alloy in one piece, the temperature of which will not exceed 800 F, in a oven at 450 F.

Cat. No. 1908370G1

This heater has been designed for use in large japanning and enameling ovens where a low-gradient heater is required. This heater costs somewhat more than other heaters and should be used only where low gradient is necessary.

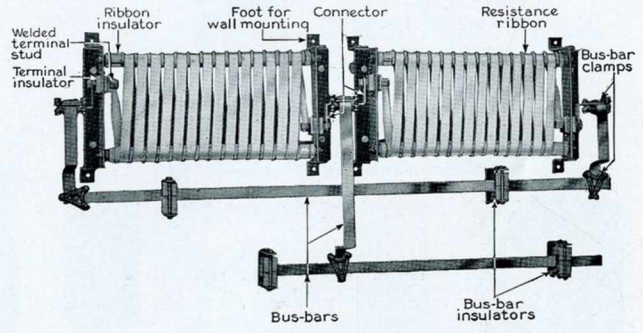
The heater is rated 2.5 kw, at 110 volts, and can be connected in series for higher voltages.

The ribbon is of nickel-chromium alloy in one piece, the temperature of which will not exceed 600 F in an oven at 450 F.

Cat. No. 3884885G2, 3884886G2, 1908371G13, and 3884887G2

These heaters have been designed for ovens or furnaces for work requiring temperatures from 750 to 1150 F, such as annealing aluminum or glass, rough-annealing brass, etc., and for other heating operations which fall within these temperature limits.

Appearance of G-E air heaters set up for wall mounting



These heaters, while designed primarily for oven work, can be used to advantage in heating large kettles, melting pots, and tanks, and for air heating.

G-E METAL-MELTING POTS



FOR SOFT METALS

Maximum Operating Temperature, 950 F

These pots are designed for melting lead, babbitt, tin, solder, type metal, and similar alloys or metals, except spelter or zinc, at temperatures not exceeding 950 F. Each pot consists of a durable, sheet-steel cylindrical casing, in which is situated a cast-iron crucible of the dimensions specified in the table. The

space between the casing and the crucible is efficiently insulated with a compact heat insulator. The heating units, which are of the G-E Calrod cast-in immersion type, are suspended from the rim of the pot and extend directly into the metal to be melted—affording maximum efficiency and speed in heating.

50/50 Solder	CAPACITY IN LB (Approx)			Volts	Cat. No.	* Price	Approx Ship. Wt in Lb	WATTAGE			Approx Dimensions in Inches				SINGLE HEATING UNITS (See dimensions below)			
	Lead	Babbitt	Tin					High	Medium	Low	INSIDE		OUTSIDE		Rating in Watts	Cat. No. of Unit	Price	Approx Ship. Wt in Lb
											Diam	Depth	Diam	Depth				
28	35	†	25	230	28S1146G3	\$32.50	50	750	.....	.....	6	4	9	10	750	4X994	\$18.25	12
28	35	†	25	115	28S1146G2	32.50	50	750	.....	.....	6	4	9	10	750	4X993	18.25	12
28	35	33	25	230	28S1146G5	32.50	50	1000	.....	.....	6	4	9	10	1000	4X996	19.75	12
28	35	33	25	115	28S1146G4	32.50	50	1000	.....	.....	6	4	9	10	1000	4X995	19.75	12
100	135	125	90	230	2666404G1	95.00	130	2500	1500	1000	8	6	14	14	1000 1500	297549 297551	19.75 22.50	14 14
100	135	125	90	115	2666404G2	95.00	130	2500	1500	1000	8	6	14	14	1000 1500	297548 297550	19.75 22.50	14 14
330	425	390	270	230	2666407G1	136.00	250	5000	3000	2000	12	9	18 3/4	20 1/2	2000 3000	297553 297555	25.25 31.00	30 30
330	425	390	270	115	2666407G2	136.00	250	5000	3000	2000	12	9	18 3/4	20 1/2	2000 3000	297552 297554	25.25 31.00	30 30

Larger sizes, up to 3000-lb capacity, are also standard and are available for quick delivery. See publication GEA-164.

* Price covers pot with heating unit installed. Control equipment not included. For control equipment, see page 48.

† When this size of pot is wanted for melting babbitt, it is necessary to use either Cat. No. 28S1146G4 or Cat. No. 28S1146G5.



Fig. 1
Metal-melting pot,
Cat. No. 2881146G2,
2881146G3, 2881146G4,
or 2881146G5



Fig. 3
Metal-melting pot,
Cat. No. 2666404G1,
2666404G2, 2666407G1,
or 2666407G2

Cat. No. of Unit	DIMENSIONS IN INCHES (FIG. 2)					Volume in Cu. In.
	A	B	C	D	E	
4X994	5 1/2	4 1/2	2 1/2	1 1/2	2 1/2	26
4X993						
4X996						
4X995						

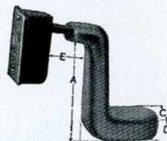


Fig. 2
Type of cast-in immersion unit used with metal-melting pots illustrated by Fig. 1

Cat. No. of Unit	DIMENSIONS IN INCHES (FIG. 4)					Volume in Cu. In.
	A	B	C	D	E	
297551 297549 297550 297548	8 1/4	7 1/16	1 3/4	2	3 3/4	36
297555 297553 297554 297552	11 1/2	11	2 3/8	2 3/4	4 1/4	96

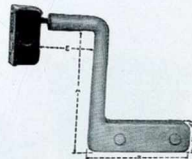


Fig. 4
Type of cast-in immersion unit used with metal-melting pots illustrated by Fig. 3

For control equipment, see page 48.

G-E METAL-MELTING POTS

FOR SOFT METALS

Small Portable Pot for Solder and Lead—Maximum Operating Temperature, 750 F

CAPACITY IN LB (APPROX)		Volts	Cat. No.	* Price	Approx Ship. Wt in Lb	Watts	Approx Dimen in Inches				SINGLE HEATING UNIT		
50/50 Solder	Lead						INSIDE		OUTSIDE		Cat. No.	Price	Approx Ship Wt in Lb
							Diam	Depth	Diam	Depth			
12	16	115	3887185G2	\$18.50	18	550	4¼	3¾	9	6¼	48X260	\$7.50	3
12	16	230	3887185G3	18.50	18	550	4¼	3¾	9	6½	48X261	7.50	3

* Price covers melting pot with unit, 6 ft of cable, and connecting plug.



Cat. No. 48X260 and 48X261 heating unit

Cat. No. 3887185G2 and 3887185G3 melting pots are similar in construction to the melting pots listed on page 31. The heating unit is of G-E Calrod construction utilizing heavy-wall steel tubing, and provided with a terminal cup.

Each pot is equipped with a bail and 6 ft of cord, with suitable attaching plug, affording ready portability.



Cat. No. 3887185G2 and 3887185G3 metal-melting pot

G-E PORTABLE TINNING POT

Maximum Operating Temperature, 500 F

Watts	Volts	† Cat. No.	Price	Approx Ship. Wt in Lb	Approx Dimen in Inches				Renewal Parts	
					INSIDE		OUTSIDE		Price	Price
					Diam	Depth	Diam	Depth		
150	115	3648750G1	\$10.00	6	2½	1	5	4½	\$2.60	\$0.90

† Cat. No. includes pot, cord, and plug as shown below.

△ Order as Symbol 143-H.

§ Consists of 4 ft of heavy Deltabeston heater cord and Cat. No. GE1582 plug.



Cat. No. 3648750G1 portable tinning pot

Application

The portable tinning pot, Cat. No. 3648750G1, is a convenient device for small tinning and soldering operations. It is of good mechanical design and efficiently heat-insulated, being built on the same principle as the larger melting pots.

Description

The heating unit is of the G-E cartridge type and dissipates 150 watts. It is placed in a boss cast on the bottom of the crucible, and is readily removable. The crucible and base are made of cast iron, and the jacket is made of sheet steel. The cord is heavy Deltabeston heater cord, and the plug is of the armored type.

This pot is particularly designed for solder and tin, having a maximum operating temperature of 500 F. Only about 15 minutes is required to reduce the full contents of the pot to working temperature.

G-E CALROD CAST-IN IMMERSION UNITS

FOR METAL-MELTING POTS

Operating at Temperatures up to 950 F

For the application of electric heat to existing metal-melting pots, there is available not only the group of G-E Calrod cast-in immersion units as used with standard G-E melting pots (see page 31), but also a wide variety of other shapes and sizes. Some of these

are described in the table below.

G-E Calrod cast-in immersion heaters are eminently suited for melting lead, solder, babbitt, tin, type metal, and similar alloys, except spelter or zinc.

Watts	Volts	Cat. No.	* Price	Approx Shp. Wt in Lb	Fig. No.	APPROX DIMENSIONS IN INCHES					Volume in Cu In.
						A	B	C	D	E (Should be specified when ordering)	
5000	115	15X736	\$42.00	40	1	12 1/4	16	2 3/8	3	4 min to 9 max	135
5000	† 230	15X737	42.00								
5000	115	297560	42.00	55	1	19 3/4	16	2 3/8	4	5 3/4 min to 8 max	180
5000	† 230	297561	42.00								
5000	† 230	64X61	42.00	45	1	24 5/8	16	1 3/8	3 3/8	5 3/4 min to 9 max	145
5000	† 230	15X596	42.00	32	1	7 3/8	22	1 3/8	3 3/8	4 1/2 min to 8 1/2 max	104
5000	† 230	64X62	42.00	55	1	10 3/4	26	4	2 3/8	4 1/2 min to 8 1/2 max	180
2000	115	39X79	25.25	15	3	4 3/8	7	2 3/8	1 1/2	4 1/4 min to 5 max	40
2000	230	39X80	25.25								
1500	115	39X65	22.50	13	2	2	8 1/2	3 3/4	2	.....	27
1500	230	39X66	22.50								
2200	115	39X67	26.50	17	2	2	12 1/2	3 3/4	2	.....	41
2200	230	39X68	26.50								
3000	115	39X69	31.00	22	2	2	18	3 3/4	2	.....	57
3000	230	39X70	31.00								
4000	440	3A177	38.00	35	2	2 1/16	24	Δ	3	.....	121
5000	† 230	29X741	42.00	32	4	13 3/4	7	.....	10 3/8	4 3/4 min to 9 max	100
5000	† 230	29X742	42.00	35	5	18 1/2	7	.....	10 3/8	4 3/4 min to 9 max	110
10000	† 230	29X743	70.00	60	6	19	9	.....	11	4 3/4 min to 9 max	192

* Price covers unit with terminal box as illustrated in Fig. 1 to 6. Where units are used in the presence of acid fumes, excessive oil, or moisture, the sealed terminal box illustrated by Fig. 7 should be specified. Price, \$5.00 additional.

† These units can be operated in series on 440 volts.

Δ This unit has a square mounting flange—3 1/4 in. square. The four bolt holes are on a 4 1/4-in. circle and are 9/16 in. in diameter.

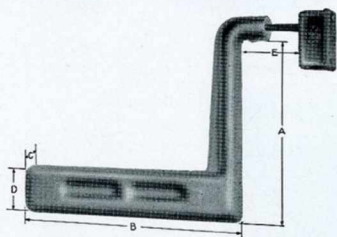


Fig. 1

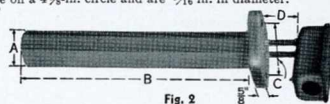


Fig. 2

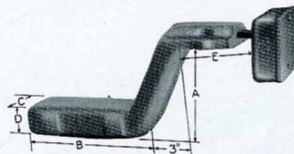


Fig. 3

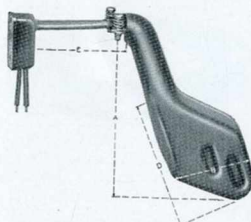


Fig. 4

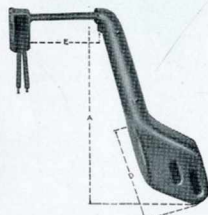


Fig. 5

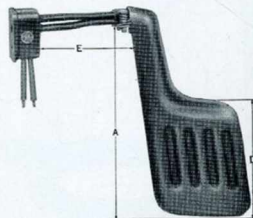


Fig. 6

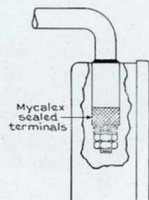


Fig. 7

For control equipment, see pages 39 to 47.

G-E GLUEPOTS

NONAUTOMATIC STYLE (Automatic style, see page 35)

G-E gluepots of the nonautomatic style are manufactured in two distinct types, distinguished by their method of heating the glue. The jacketless type has no water jacket and heats the glue by direct thermal contact with the walls of the pot. It is designed for continuous operation and serves admirably as a tem-

perature-holding pot in cases where glue is supplied from some central cooker. The water-jacketed type has an interposed heating medium, water, and is particularly adapted for quick, intermittent service. G-E cartridge units are used in both types.

Jacketless (Single Heat)

Capacity in Quarts	Volts	Watts	Fig. No.	* Cat. No.	Price	Approx Ship. Wt in Lb	OUTSIDE DIMENSIONS IN IN.	
							Height	Diameter
1	115	70	1	269853	\$16.00	4 $\frac{3}{4}$	6 $\frac{1}{16}$	6
1	230	70	1	269855	16.00	4 $\frac{3}{4}$	6 $\frac{1}{16}$	6
2	115	90	1	259989	18.00	5 $\frac{1}{2}$	7 $\frac{1}{4}$	7
2	230	90	1	259991	18.00	5 $\frac{1}{2}$	7 $\frac{1}{4}$	7
4	115	140	1	259994	21.00	7 $\frac{3}{8}$	9 $\frac{1}{8}$	8 $\frac{5}{16}$
4	230	140	1	259996	21.00	7 $\frac{3}{8}$	9 $\frac{1}{8}$	8 $\frac{5}{16}$

Water-jacketed (Three Heats)

Capacity in Quarts	Volts	WATTS			Fig. No.	‡ Cat. No.	PRICE		Approx Ship. Wt in Lb	OUTSIDE DIMEN IN IN.		Average Time Required to Heat from 70 to 145 F on High Heat in Minutes	Average Constant Temperature in Pot at Low Heat in Deg F
		Low Heat	Medium Heat	High Heat			Complete	Less Cover		Height	Diam		
1	115	75	150	300	2	280486	\$18.00	\$16.75	25	6 $\frac{1}{4}$	7 $\frac{1}{4}$	45	145
1	230	75	150	300	2	280487	18.00	16.75	25	6 $\frac{1}{4}$	7 $\frac{1}{4}$	45	145
2	115	115	230	460	2	280488	20.00	18.75	28	8 $\frac{1}{4}$	8 $\frac{1}{4}$	40	145
2	230	115	230	460	2	280489	20.00	18.75	28	8 $\frac{1}{4}$	8 $\frac{1}{4}$	40	145
4	115	165	330	660	2	280490	24.00	22.75	40	8 $\frac{1}{2}$	11	60	145
4	230	165	330	660	2	280491	24.00	22.75	40	8 $\frac{1}{2}$	11	60	145

* Each pot is provided with contact plug, 8 ft of cable, and socket attaching plug.
‡ Each pot is provided with contact plug, 8 ft of cable, and a 3-heat plug on the cable.



Fig. 1
Jacketless gluepot



Fig. 2
Water-jacketed gluepot

G-E GLUEPOTS

AUTOMATIC STYLE

If you have a job that requires unusually careful regulation of glue temperature and the quick production of workable glue, these G-E automatic gluepots will meet your requirements.

Capacity in Quarts	Watts	Volts A-c or D-c	* Cat. No.	PRICE		OUTSIDE DIMEN IN IN.		Approx Ship Wt in Lb
				Complete	Less Cover	Height	Diam of Casing	
1	150	115	6A126	\$18.00	\$16.75	5 1/4	7 1/4	7
1	150	230	6A126G2	18.00	16.75	5 3/4	7 3/4	7
2	250	115	6A111	20.00	18.75	7 1/4	7 1/4	8
2	250	230	6A111G2	20.00	18.75	7 3/4	7 3/4	8
4	350	115	6A139	24.00	22.75	9	8 3/4	10
4	350	230	6A139G2	24.00	22.75	9	8 3/4	10

* Each pot is equipped with contact plug, 8 ft. of rubber-covered cord, and socket attaching plug.



Fig. 1
G-E automatic gluepot

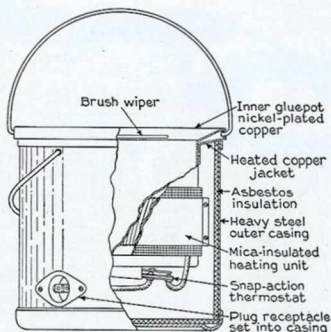


Fig. 2
Construction details of G-E automatic gluepot

Description

The G-E automatic gluepot has been developed to combine the advantages of rapid melting and heating, and accurate holding temperatures. It is designed and constructed to embody the best practice in automatic gluepots, plus advantages not to be found in other pots. The pot is unusually rapid in heating, as indicated in the accompanying curve. The final temperature is factory set and is accurately maintained at 140-150 F—the temperature required for best results.

The pot is made up of a removable copper container for holding the glue, a heated copper jacket in contact with the glue container, and a heavy steel protecting casing. Heat insulation is placed between the heated jacket and the outer casing, so that heat losses are low. The heating unit surrounds the jacket and is completely mica-insulated. It is easily replaceable if such procedure should ever be necessary. A sensitive snap-acting thermostat is so mounted on the jacket that it will receive maximum influence from the glue, rather than from the heated jacket. The snap action results in long contact life, since arcing is practically prevented by the rapid motion of the contacts.

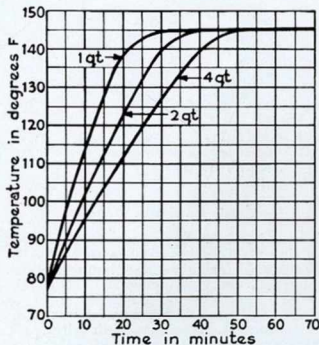


Fig. 3

G-E SOLDERING IRONS

General Electric soldering irons, for various industrial applications, are the result of twenty years' experience as a builder and as a user. The irons listed here have been created primarily for the severe and exacting soldering operations of the large and varied production in General Electric factories. Thus, they are offered to prospective users, with an established background of experience and fine performance—the kind of performance that makes for continuous, high-quality results.

There are two types of G-E soldering irons, the Type I and the Type CI. Type I embraces six physical sizes of irons—irons that are built to withstand the rigors of daily industrial service. Type CI includes three physical sizes, comparable with the smallest three sizes of Type I, but slightly lighter in

weight. They are designed particularly for those operators who like a soldering iron that is light to the "feel"—as good soldering irons should be.

Both types employ the long-lasting G-E cartridge unit of swaged construction and insulated with densely compact magnesium oxide—a unit that is quickly replaceable in those rare cases of unit failure. Both employ a renewable, colorized copper tip, which prevents undue oxidation and thereby gives a longer life. Each iron of both types has six feet of tough rubber cord and a molded-on rubber plug—an assembly that is easy to use and "stands up" against rough handling.

The lubricating paint, A-58, listed on page 17, greatly facilitates the easy removal of soldering-iron tips.

TYPE I

† Diam of Tip in In.	Watts	Type No.	Cat. No.	Volts	Price	WEIGHT	
						Net in Oz Excl Stand	Ship. in Lb
FOR LIGHT DUTY							
1/16	100	I-80	43X700	115	\$4.95	17	1 1/2
1/16	100	I-80	43X701	230	4.95	17	1 1/2
1/8	75	I-75	291880	115	5.25	17	1 1/2
1/8	75	I-75	291882	230	5.25	17	1 1/2
FOR INTERMITTENT DUTY							
3/8	100	I-76	291883	115	\$5.80	18	1 1/2
3/8	100	I-76	291885	230	5.80	18	1 1/2
1	150	I-77	291886	115	6.45	27	2 1/4
1	150	I-77	291888	230	6.45	27	2 1/4
FOR HEAVY DUTY							
1	225	I-78	291889	115	*\$9.70	27	4 1/2
1	225	I-78	291891	230	* 9.70	27	4 1/2
1 1/4	350	I-79	291892	115	*11.70	38	5 1/4
1 1/4	350	I-79	291894	230	*11.70	38	5 1/4

* Price includes radiating stand as shown in illustration.
† Chisel-type tips are employed on all sizes. Pyramid-type tips may be substituted at \$0.25 extra per iron.

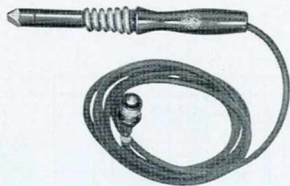


Fig. 1
Typical light- or intermittent-duty soldering iron, Type I-75, I-76, or I-77

Type CI

Type CI soldering irons are made in three sizes as shown in the tabulation on page 37. They are primarily designed for light or medium work, such as is handled daily in many industrial plants. They are especially suited, because of their light weight and speed in heating, for work on telephone equipment, radio sets, light wires, electric instruments, switchboards, and other kinds of light manufacturing.

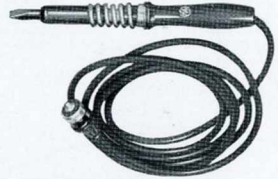


Fig. 2
Typical light-duty soldering iron, Type I-80

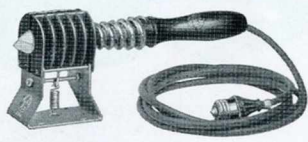


Fig. 3
Typical heavy-duty soldering iron, Type I-78 or I-79, with radiating stand. (These irons should be placed in radiating stand as shown when connected but not in use. Such precaution will promote longer life of heating unit and tip.)

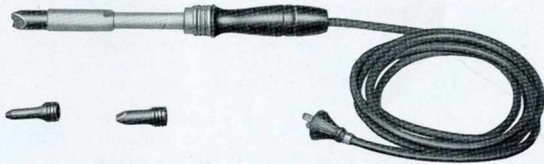


Fig. 4
Type CI soldering iron. Complete iron shown is Cat. 6A108 with 3/8-in. tip. Other irons are the same except for tip sizes and electrical ratings.

G-E SOLDERING IRONS

Type CI Soldering Irons

* Diam of Tip in In.	Watts	Type No.	Cat. No.	Volts	Price	WEIGHT IN OZ	
						Net	Ship.
5/8	80	CI-80	6A106	115	\$4.30	17	22
	80	CI-80	6A106G2	230	4.30	17	22
1/2	90	CI-75	6A107	115	4.30	18	23
	90	CI-75	6A107G2	230	4.30	18	23
3/8	110	CI-76	6A108	115	4.30	19	24
	110	CI-76	6A108G2	230	4.30	19	24

Soldering Irons for Extra-heavy Duty

Diam of Tip in In.	Watts	Cat. No.	Volts	Price	Net Wt in Lb
1 1/4	650	68X535	115	\$25.00	6
1 3/8	650	3A101	230	25.00	6
2	1250	6A113	115	45.00	8 1/2
	1250	6A113G2	230	45.00	8 1/2

* All tips and tip holders have the same thread size, thereby permitting interchangeability of tips on all three sizes of Type CI irons. However, the CI irons are stocked with chisel-type tips of the sizes indicated in the table. Any of the other sizes of chisel-type tips listed or any similar-size tips of the pyramid type may be substituted at \$0.25 extra per iron.

For Extra-heavy Duty

These electric soldering irons are especially designed to meet the difficult requirements of heavy, continuous soldering. Equipped with a G-E Calrod unit which is cast directly into the copper heating head, they are unusually quick heating and efficient. The tip is of calorized copper, chisel-type, and is brazed to the copper heating head, thereby providing efficient heat transfer. To renew the tip, unbraz it from the heating head and braze (silver solder) on a new one.

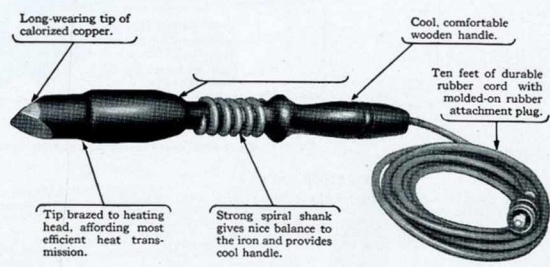


Fig. 5
 Typical extra-heavy-duty G-E soldering iron

G-E SOLDERING IRONS

RENEWAL PARTS

Complete Irons	HEATING UNITS		† TIPS		CORD AND PLUG		RADIATING OR SUPPORTING STAND		HANDLE SUPPORT		HANDLE		INSULATING BEADS		LEAD CLAMPING SCREW		LEAD CONNECTION INSULATOR		
	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price	
291880	174-X1	\$2.35	561352	\$0.90	5222300P2	\$0.60	2575987P2	\$0.20	2576902P2	\$0.70	2575968P2	\$0.35	5215157P4	\$0.05	5215157P4	\$0.05	5215157P4	\$0.05	5215157P4
291882	174-X1	2.35	561352	.90		.60	2575987P2	.20	2576902P2	.70	2575968P2	.35	.03	5215157P4	.05	.05	.05	.05	.05
291883	175-X1	2.85	561353	.90		.60	2575987P2	.20	2576902P2	.70	2575968P2	.35	.03	5215157P4	.05	.05	.05	.05	.05
291885	175-X1	2.85	561353	.90		.60	2575987P2	.20	2576902P2	.70	2575968P2	.35	.03	5215157P4	.05	.05	.05	.05	.05
291886	176-X1	3.20	561354	1.20		.60	2575987P2	.20	2576901P2	.75	2576911P2	.45	.03	5215157P2	.05	.05	.05	.05	.05
291888	176-X1	3.20	561354	1.20		.60	2575987P2	.20	2576901P2	.75	2576911P2	.45	.03	5215157P2	.05	.05	.05	.05	.05
291889	177-X1	3.20	5280786	1.00		.60	2576903G1	3.00	2576901P2	.75	2576911P2	.45	.03	5215157P2	.05	.05	.05	.05	.05
291891	177-X1	3.20	5280786	1.00		.60	2576903G1	3.00	2576901P2	.75	2576911P2	.45	.03	5215157P2	.05	.05	.05	.05	.05
291892	178-X1	3.50	561359	1.50		.60	2576904G1	3.80	2576901P3	.95	2576911P2	.45	.03	5215157P2	.05	.05	.05	.05	.05
291894	178-X1	3.50	561359	1.50		.60	2576904G1	3.80	2576901P3	.95	2576911P2	.45	.03	5215157P2	.05	.05	.05	.05	.05
43X700	183-X1	2.35	3920240	.30		.60	2575987P2	.20	3902158P21	.70	3902157P21	.35	.03	5215157P4	.05	.05	.05	.05	.05
43X701	183-X1	2.35	3920240	.30		.60	2575987P2	.20	3902158P21	.70	3902157P21	.35	.03	5215157P4	.05	.05	.05	.05	.05
6A106	3A73	2.50	5215147	.30		.60	2575987P2	.20	5204181G1	.95	5222391	.35	.10	5215157P1	.05	.05	.05	.05	.05
6A106G2	3A74	2.50	5215147	.30		.60	2575987P2	.20	5204181G1	.95	5222391	.35	.10	5215157P1	.05	.05	.05	.05	.05
6A107	3A75	2.50	5215148	.30		.60	2575987P2	.20	5204181G1	.95	5222391	.35	.10	5215157P1	.05	.05	.05	.05	.05
6A107G2	3A76	2.50	5215148	.30		.60	2575987P2	.20	5204181G1	.95	5222391	.35	.10	5215157P1	.05	.05	.05	.05	.05
6A108	3A77	2.50	5215149	.30		.60	2575987P2	.20	5204181G1	.95	5222391	.35	.10	5215157P1	.05	.05	.05	.05	.05
6A108G2	3A78	2.50	5215149	.30		.60	2575987P2	.20	5204181G1	.95	5222391	.35	.10	5215157P1	.05	.05	.05	.05	.05
68X535	3A173	14.50	3952837	2.70		.90	None	.....	2576901P3	.95	5222308P1	.45	.03	5215157P3	.05	.05	.05	.05	.05
3A101	3A179G2	14.50	3952837	2.70		.90	None	.....	2576901P3	.95	5222308P1	.45	.03	5215157P3	.05	.05	.05	.05	.05
6A113	3A179	23.00	5236601	4.00		.90	None	.....	5239713P21	1.20	5239710P21	.60	.03	5215157P3	.05	.05	.05	.05	.05
6A113G2	3A179G2	23.00	5236601	4.00		.90	None	.....	5239713P21	1.20	5239710P21	.60	.03	5215157P3	.05	.05	.05	.05	.05

* This iron also has a heating-unit-head insulator, which covers the leads immediately adjacent to the head. This insulator is Cat. No. 3974435. Price \$0.25.
 † G-B lubricating paint A-58, listed on page 17, greatly facilitates the easy removal of soldering-iron tips.
 ‡ Symbol No.; not Cat. No.

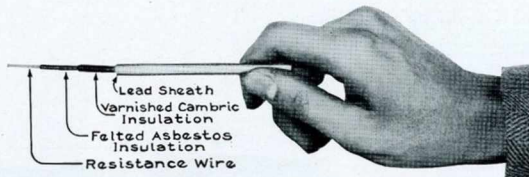
G-E HEATING CABLE

The introduction of G-E heating cable opened a new and larger field for industrial electric heating. This flexible, lead-covered cable can be bent and formed readily to fit almost any low-temperature heating job. It should be used on those jobs requiring a heater sheath temperature of 165 F or less. Its gentle heating effect can be extended along a line or spread evenly over a wide area. And yet the cable is so pliable that it can easily be concentrated in certain areas.

To be sure, soil heating is one of the widest applications of heating cable as well as one of the oldest, but ingenious operators have been alert to the low-cost possibilities of this new electric heating medium and have put it to work on a great

diversification of application. Here are some jobs that are now being done successfully on a wide scale. These will undoubtedly suggest many others:

Soil heating	Lily ponds
Protecting pipes and valves from freezing	Kennel floors
Brooders	Floor heating
Poultry water warming	Protecting sprinkler systems
Warming testing rooms	Melting ice from eaves and downspouts
Warming valves and pipe lines of viscous material	Miscellaneous air heating
Acid baths (acids that will not attack lead)	Freeing ice from sidewalks, and other surfaces



Construction details of G-E heating cable—size is No. 19 Awg

APPLICATION DATA

The tabulation below shows the lengths of cable recommended for the more common voltages, and the resultant wattages. Never use shorter lengths on these voltages because such practice will increase the wattage and operating temperature and shorten the cable life. Longer lengths can be used, in which case the total watts will decrease according to the following equation:

$$\text{Total Watts} = \frac{(\text{Volts})^2}{\text{Ft Length} \times 0.5}$$

No. 19 Awg Length in Feet	Volts	Total Watts
60	110	400
120	220	800
240	440	1600

Never apply in a location where sheath temperature will exceed 165 F. When used in the lengths indicated in the table, in free air the sheath temperature will be approximately 95 F above air ambient temperature. It is usually safe to mount on boards as well. In soil of average moisture content, the sheath temperature will be approximately 60 F above the soil temperature.

Bend on a minimum diameter of 2 in.

Vertical suspension can be made of lengths up to 120 ft.

When making connections to G-E heating cable, strip the lead sheath back about one inch further than the insulation to provide adequate creepage distance between the conductor and the sheath. Make a waterproof connection by covering the splice with alternate layers of tape and varnish or shellac.

When applying heating cable to long sections, such as to a pipe line, it is advisable to bend the selected length of cable back on itself and then apply doubly. Thus, the two ends will be together to facilitate connections and the inductive heating effect will be lessened.

SPECIFICATIONS

Resistor: No. 19 Awg, nickel-chromium alloy of finest grade, .036 in. diameter; resistance .5015 ohms per linear ft.

Insulation: (a) felted asbestos .031 in. thick

(b) two separate wraps of black varnished cambric, each wrap .008 in. thick and each wrap lapped.

Sheath: Lead .047 in. thick.

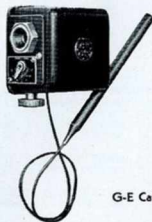
Finished Diameter: .240 in.

Shipping Weight per 1000 Ft: 180 lb.

PRICES

Quantity in Ft	Price
1 to 599	\$6.25 per C ft—f.o.b. factory
600 to 1999	6.00 per C ft—freight allowed
2000 to 4999	5.75 per C ft—freight allowed

A HANDY THERMOSTAT FOR AUTOMATIC CONTROL



The G-E Cat. No. 4980281G18 thermostat—range 30 to 120 F—comes in handy for many low-temperature heating jobs. It will handle 25 amperes, 115 or 230 volts, a-c. Price, \$9.00.

The sensitive bulb is 6 5/8 in. long by 7/8 in. in diam. The capillary tube is 18 in. long.

G-E Cat. No. 4980281G18 thermostat



Heating cable applied to pipe line carrying molasses



Heating cable installed in a greenhouse bench

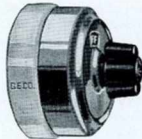


Heating cable installed in moist-room used in testing samples of concrete

G-E CONTROL EQUIPMENT

MANUAL

Snap Switches



Single-heat snap switch

For reliable manual control, General Electric offers the strong, dependable snap switches shown. There are two styles—single- and 3-heat. A complete connection diagram, similar to those below, accompanies each switch.

Three-heat switches can be used to advantage only when using two units, or when a unit has two heating elements. Three-heat switches will do what their name implies—give three different wattages by changing the connections between the power circuit and the two units or two heating elements, merely by a turn of a button. The following indicates the results:

Where W_1 = Wattage of X
 W_2 = Wattage of Y

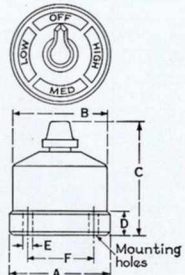
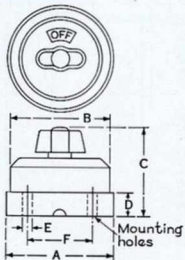
Position of Switch	Switch Connects	Resultant Wattage
High	X and Y in parallel	$(W_1 + W_2)$
Medium	X or Y (only one)*	W_1 or W_2 *
Low	X and Y in series	$\frac{W_1 \times W_2}{W_1 + W_2}$

* Medium-heat position connects the heater wired as follows:

Snap Switch Cat. No.	Between Points
29X924	4 and 5
278607	4 and 3
278610	4 and 3

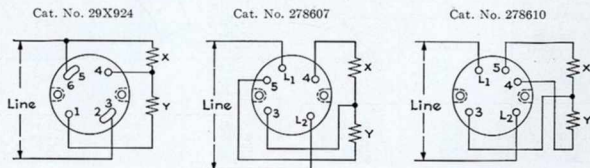


3-heat snap switch



Circuits	Fig. No.	Cat. No.	Amp	Volts	DIMENSIONS IN INCHES						Price
					A	B	C	D	E	F	
Single-heat	1	60451	10	250	2 $\frac{3}{4}$ ₂	2 $\frac{9}{32}$	1 $\frac{1}{2}$ ₁₆	$\frac{9}{16}$	$\frac{3}{16}$	1 $\frac{1}{2}$	\$1.00
Three-heat	2	29X924	7 $\frac{1}{2}$ 15	250 125	2 $\frac{3}{4}$	2 $\frac{3}{8}$	2 $\frac{1}{4}$ ₁₆	$\frac{1}{2}$	$\frac{5}{32}$	1 $\frac{3}{8}$	1.60
Three-heat	2	278607	10 30	250 125	2 $\frac{1}{2}$ ₁₆	2 $\frac{1}{16}$	3 $\frac{1}{4}$ ₁₆	$\frac{3}{8}$	$\frac{3}{16}$	2 $\frac{1}{16}$	2.40
Three-heat	2	278610	30 50	250 125	3 $\frac{3}{4}$	3 $\frac{1}{2}$ ₃₂	3 $\frac{1}{2}$ ₃₂	1 $\frac{1}{2}$ ₃₂	$\frac{1}{4}$	2 $\frac{3}{4}$	4.60

CONNECTION DIAGRAMS FOR THREE-HEAT SWITCHES





G - E CONTROL EQUIPMENT

AUTOMATIC

While manual control is sufficient in some cases, the use of automatic temperature-control equipment is regarded with much favor for most installations, because:

1. Uniformity of temperature is provided.
2. Ample heat is supplied without waste of power.
3. No attendance is required.

G-E automatic temperature-control equipment gives

all of this, and more. It is built to last and will perform consistently day after day. It is simple in arrangement, consisting only of a thermostat, an enclosed-type magnetic switch, and a fusible line-disconnection switch. In cases where the thermostat can carry the current direct, the magnetic switch is not required.

A convenient table is given below, from which may be chosen suitable G-E automatic temperature-control equipment for practically every condition.

Conditions to be Met				Control to be Used						
Heater Circuit, Amperes*	HEATER CIRCUIT (60 Cycles Where A-c)		Control Circuit, Volts (Single-phase 60 Cycles Where A-c)	Thermostat, Price and Specifications	MAGNETIC SWITCH		Fusible Line-disconnection Switch	Wiring Diagram, See Fig.		
	Volts	Phase			Cat. No.	Price				
0-25	115 a-c	1	115 a-c	See pages 42 to 47	none		See table below	1		
0-22	115 a-c	1	115 a-c		3885954G102	\$13.00		2		
25-45	115 a-c	1	115 a-c		4383134G102	25.00		2		
22-45	115 a-c	3	115 a-c		4383134G103	25.00		2		
45-70	115 a-c	1 or 3	115 a-c		4383280G102	43.00		2		
70-135	115 a-c	1 or 3	115 a-c		4383590G2	102.00		2		
0-25	230 a-c	1	230 a-c		none			See table below	1	
0-22	230 a-c	1	230 a-c		3885954G103	13.00			2	
25-45	230 a-c	1	230 a-c		4383134G103	25.00			2	
22-45	230 a-c	3	230 a-c		4383134G103	25.00			2	
45-70	230 a-c	1 or 3	230 a-c		4383280G103	43.00			2	
70-135	230 a-c	1 or 3	230 a-c		4383590G3	102.00			2	
0-22	440 a-c	1 or 3	115 a-c Δ		† 4981364G102	13.00			See table below	3
22-45	440 a-c	1 or 3	115 a-c Δ		† 2241537G102	25.00				3
45-70	440 a-c	1 or 3	115 a-c Δ		† 4383311G102	43.00				3
70-135	440 a-c	1 or 3	115 a-c Δ	† 4981365G2	102.00	3				
0-22	115 d-c	d-c	115 d-c	3656232G2	40.00	Included on Magnetic Switch	4			
22-36	115 d-c	d-c	115 d-c	4981942G2	47.00	See table below	5			
36-90	115 d-c	d-c	115 d-c	5361972G2	68.00		5			
90-135	115 d-c	d-c	115 d-c	4985707G2	94.00		5			
0-22	230 d-c	d-c	230 d-c	3656232G3	40.00	Included on Magnetic Switch	4			
22-36	230 d-c	d-c	230 d-c	4981942G3	47.00	See table below	5			
36-90	230 d-c	d-c	230 d-c	5361972G3	68.00		5			
90-135	230 d-c	d-c	230 d-c	4985707G3	94.00		5			

* To determine amperes: Single-phase, a-c or d-c—amperes = $\frac{\text{Watts}}{\text{Volts}}$ Three-phase, a-c—amperes = $\frac{\text{Watts}}{\text{Volts} \times 1.73}$

(NOTE: In cases of unbalanced loads, amperes should be the maximum on any phase.)

† For control switch, use Trumbull Cat. No. 2228—price, \$1.60. The line-disconnection switch acts also as the control switch in all other cases, since the line and control voltage is the same.

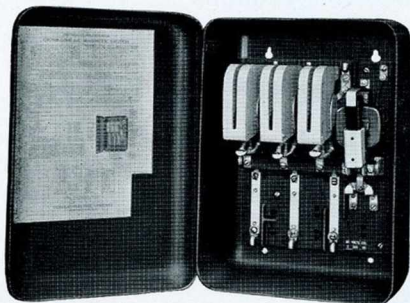
Δ All 440-volt a-c magnetic switches listed above have 115-volt a-c control circuits. If a suitable 115-volt a-c circuit is not available, an air-cooled Type M transformer, 440/110 volts, should be used. The ratings of transformers required for the control circuit of one magnetic switch are as listed below.

Fusible Line-disconnection Switch

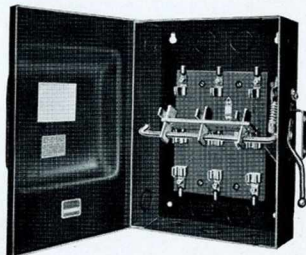
Magnetic Switch (440 Volts, A-c)	Kva Rating of Transformer for 110-volt Control Circuit	Transformer Cat. No. 440/110 Volts, 60 Cycles	Price	FUSIBLE LINE-DISCONNECTING SWITCH				
				Heater Circuit, Amperes	Volts	Phase	Trumbull Cat. No. Price	
				0-25	115 to 230	1	40221	\$4.00
				25-50	115 to 230	1	40222	6.90
				50-80	115 to 230	1	40223	12.00
				80-160	115 to 230	1	40224	16.50
				0-25	115 to 230	3	40321	5.10
				25-50	115 to 230	3	40322	7.50
				50-80	115 to 230	3	40323	15.00
				80-160	115 to 230	3	40324	21.90
				0-25	440	1 or 3	40361	8.10
				25-50	440	1 or 3	40362	10.20
				50-80	440	1 or 3	40363	21.00
				80-160	440	1 or 3	40364	31.40

G-E CONTROL EQUIPMENT

AUTOMATIC



Typical magnetic switch, showing 3-pole a-c contactor



Typical fusible line-disconnection switch

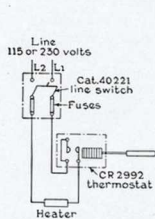


Fig. 1

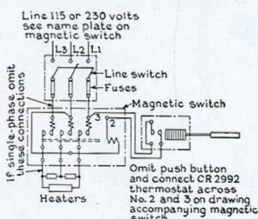


Fig. 2

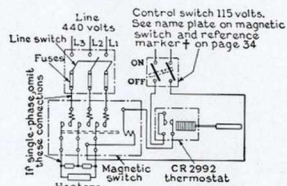


Fig. 3

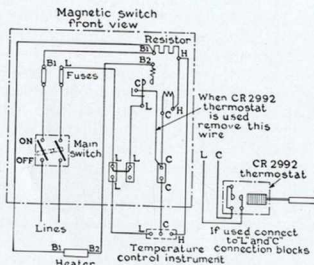


Fig. 4

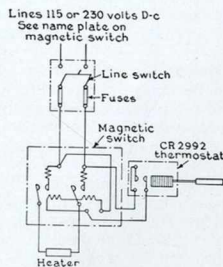


Fig. 5

G-E CONTROL EQUIPMENT

AUTOMATIC

Thermostat, with Temperature-setting Indicator

For Use with Industrial Heating Units

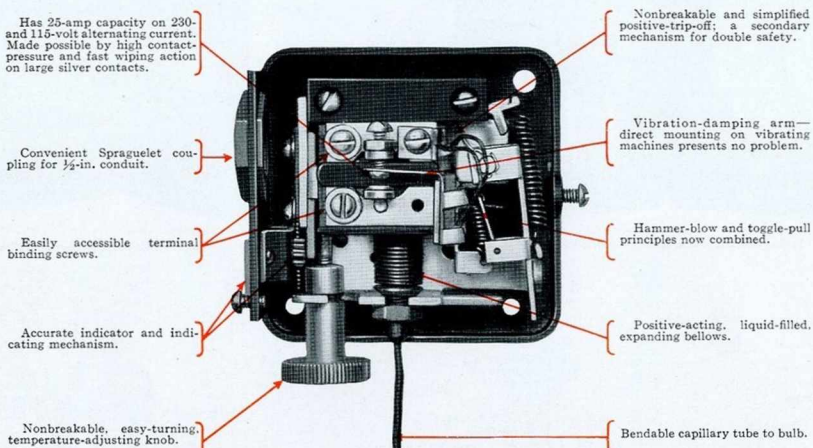


Fig. 1

DESCRIPTION AND OPERATION

CR2992 thermostats are designed for use primarily with small electric heating units on tough industrial applications. The design was developed by engineers thoroughly familiar with the entire problem of heating and heating units.

When the CR2992 thermostat is adopted for the control of a heat source, the user can expect to protect constantly the machine, the workers, and the plant; to reduce his servicing costs; and practically to eliminate tie-ups.

On a process machine, this CR2992 thermostat, which can be expected to hold day-in, day-out, predetermined temperatures, will minimize the numbers of rejects and speed up production; which means increased profits and better shipping schedules.

On any application, users of the CR2992 thermostat are assured of its standing up and performing in the face of rough handling and rough service, and are assured of unusually long wear because of the strong, accurately machined mechanism and hard, oilless bearings. Manufacturers who have once used the CR2992 thermostat stand by it.

The thermostat will give trouble-free operation because of the conservative rating on double, heavy shunts; large silver contacts under strong contact-pressure; and large, accessible connection screws. The thermostats have Underwriters' approval.

Attention is called to the feature that the contact pressure, always strong, is strongest just before throw-over to either "On" or "Off" position, and *abruptly* passes through zero on throw-over. This eliminates the fluttering action that burns contacts. Instead, it gives an extremely positive action with a clean break of the circuit. This qualifies as the most reliable principle of operation by actually increasing the contact pressure as the circuit is about to be opened (impossible with most other mechanisms).

The CR2992 thermostat can be depended upon to produce superior-quality and most uniform results, because it uses the irresistible, uniform, liquid-expansion principle having the same differential at all points of the adjustable range. The same principle of operation and general design has been used since the very beginning, years ago.

With automatic control, heat can be turned on and the machine can be left with safety and assurance that temperature rise will stop at the proper point. Manual control requires constant attention to prevent over-temperatures with resultant damage and possible fires. The positive, sensitive operation of the CR2992 thermostat will materially reduce the fire hazard, eliminate the labor of attention, reduce rejects, and save power.

Because of its high electrical capacity, the CR2992 thermostat frequently can be used to control the load

G-E CONTROL EQUIPMENT



AUTOMATIC Thermostat, with Temperature-setting Indicator For Use with Industrial Heating Units

directly, saving the cost of a magnetic switch and its wiring.

With the CR2992 thermostat, connection can be made to the remote switching mechanism out in the cool zone, yet the small sensitive bulb can be inserted right into the spot to be controlled. Thermostats with the switching mechanism near the sensitive element must be wired with high-temperature leads and frequently take up valuable space or give erratic control because they are too large to get the sensitive element at the right spot. The CR2992 thermostat can be mounted at any angle.

All bellows assemblies are interchangeable on all mechanisms and can be easily removed without injury.

All steel parts are cadmium plated to resist corrosion, and every part is easily removed and replaced at low cost in case of mechanical injury.

On account of their frequent application to the protection of costly machines and to the control of processes involving valuable material, these devices are

provided with a secondary contact-opening mechanism not operating by snap action but by direct action of the bellows on a lever. This, or course, comes into play only in an emergency, and is added insurance seldom found on devices of this nature and price.

The bellows assembly consists of the bellows, capillary tube, and bulb. The bulb is the sensitive element which determines the temperature range and differential.

On temperature rise, the irresistible expansion of liquid within the bellows assembly operates the mechanism in one direction, while with temperature fall, a heavy spring moves the mechanism in the other direction. The latter action is permitted because of the contraction of the liquid.

The thermostats with normally closed contacts open the electric circuits when the temperature of the medium being controlled rises to the point at which the thermostat is set. When the temperature falls, the contacts will reclose. If thermostats with normally open contacts are used, the action is reversed.

TEMPERATURE RANGE * OR POSSIBLE SETTING IN DEG F		† Differential Max. Deg F Between Opening and Closing of Contacts Regardless of Setting	Length of Bulb in In. Dimen. "F" (Fig. 2)	Diameter of Bulb in In. (See Dimen. "C" (Fig. 2))	CR2992-R1 (Normally Closed Contacts)				Price	Approx Ship. Wt in Lb
Min.	Max.				CAT. NO. DETERMINED BY LENGTH OF CAPILLARY TUBE. SEE DIMENSION "D," FIG. 2.					
				D. . 8 in.						
65	135	φ 4.5	7 1/2	1/2	4980281G16	4980281G111	4980281G62	4980281G34	\$12	3
120	190	φ 4.5	7 1/2	1/2	4980281G112	4980281G113	4980281G114	4980281G115	12	3
170	240	φ 4.5	7 1/2	1/2	4980281G116	4980281G117	4980281G118	4980281G119	12	3
220	290	φ 4.5	7 1/2	1/2	4980281G120	4980281G121	4980281G122	4980281G123	12	3
270	370	φ 6.5	7 1/2	3/4	4980281G124	4980281G125	4980281G126	4980281G127	12	3
350	450	φ 6.5	7 1/2	3/4	4980281G128	4980281G129	4980281G130	4980281G131	12	3
450	550	φ 6.5	7 1/2	3/4	4980281G132	4980281G133	4980281G134	4980281G135	14	3
500	600	φ 6.5	7 1/2	3/4	4980281G136	4980281G137	4980281G138	4980281G139	14	3
30	120	φ 6.5	6 3/8	7/16	4980281G90	4980281G49	4980281G54	4980281G38	12	3
70	175	φ 6.5	6 3/8	7/16	4980281G91	4980281G92	4980281G93	4980281G94	12	3
145	250	φ 6.5	6 3/8	7/16	4980281G95	4980281G96	4980281G97	4980281G98	12	3
225	330	φ 6.5	6 3/8	7/16	4980281G99	4980281G100	4980281G101	4980281G102	12	3
320	470	φ 9.5	6 3/8	7/16	4980281G103	4980281G104	4980281G105	4980281G106	12	3
450	600	φ 9.5	6 3/8	7/16	4980281G107	4980281G108	4980281G109	4980281G110	14	3
85	245	φ 10	4 1/2	7/16	4980281G80	4980281G4	4980281G30	4980281G19	12	3
145	305	φ 10	4 1/2	7/16	4980281G81	4980281G2	4980281G50	4980281G57	12	3
250	480	φ 15	4 1/2	7/16	4980281G82	4980281G83	4980281G84	4980281G85	12	3
370	600	φ 15	4 1/2	7/16	4980281G86	4980281G87	4980281G88	4980281G89	14	3
500	600	¶ 16	4 3/16	3/8	.....	4980281G158	4980281G159	.....	17	3
575	675	¶ 16	3 3/8	5/8	.....	4980281G160	4980281G161	.....	17	3
650	750	¶ 16	3 3/8	5/8	.....	4980281G162	4980281G163	.....	17	3
500	750	¶ 20	3	1/2	.....	4980281G156	4980281G157	.....	17	3

* For allowable temperature overtravel above setting, see "Thermal Characteristics," page 46.
† To guide use of differential data, see "Thermal Characteristics" page 45.

φ These differentials can be obtained with the bulb immersed in an oil, or equivalent, heat-transferring medium changing not more than 2 F per minute. In these temperature ranges, when below 310 F, both bulb and capillary tube are copper. Above 310 F, nickel alloy or brass may be used. In no case are the bulbs suitable for direct immersion in molten metal. See ¶.

¶ These differentials can be obtained with the bulb immersed in molten metal or in an equivalent heat-transferring medium, changing not more than 3 F per minute. The bulb and capillary tube of thermostats indicated by ¶ have heavy steel walls and are suited to direct immersion in molten lead and type metals as well as to miscellaneous applications, such as hot plates, etc. For molten babbit, tin, or solder, the bulb and capillary tube must be protected by a cast-iron well, to be furnished by purchaser. Pouring lead into the well is suggested as a means of improving the conductivity of heat to the bulb. A drilled, cast-iron sash weight might be used as the well.

CURRENT RATINGS

These thermostats can be used on circuits up to \$230 volts for making, breaking, and carrying current loads as follows:

Alternating Current, 115 or 230 volts; \$25 amp. inductive or noninductive. Direct Current, see table below.

\$ Volts D-c	\$ AMPERES		Condenser Capacity, Micro-farads	\$ Volts D-c	\$ AMPERES		Condenser Capacity, Micro-farads
	Non-inductive	Inductive			Non-inductive	Inductive	
32	0-20	0-5	None	230	0-0.25	0.10	None
	0-0.5	0-0.25	None				
	0.5-1.5	.....	1/2				
115	1.5-3	.....	1/2	230	0.25-0.7	.....	1/2
	.....	.....	3/4				
	3-5	.....	1				
.....	.....	.....	.....	.....	1.5-2.5	.....	1

§ For higher-voltage circuits and larger current capacities, use thermostats in connection with G-E magnetic switches or with G-E automatic control panels. These are listed on page 40.

△ These condensers should be procured locally by the customer. They should be connected across the tips of the thermostat.

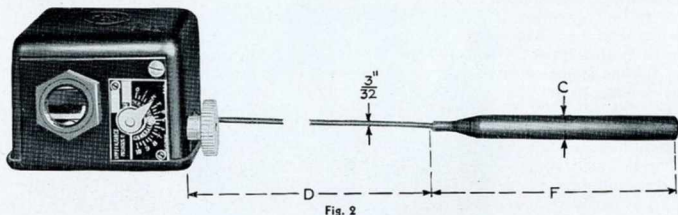
G-E CONTROL EQUIPMENT

AUTOMATIC Thermostat, with Temperature-setting Indicator

For Use with Industrial Heating Units

ORDERING DIRECTIONS

In ordering a listed device, specify CR2992-R1 thermostat by catalog number ONLY. Giving other information, such as temperature range, etc., for standard listed devices is unnecessary and may delay shipment.



APPLICATION

The possible applications of these thermostats are innumerable. For controlling liquids, the sensitive element, or bulb, can be directly immersed, provided the liquid will not attack the bulb or the capillary tube connecting the bulb to the bellows. In nearly every machine, there is room to put the bulb next to the material to be controlled. Where explosive gas atmosphere makes objectionable the operation of contacts in open air, it is suggested that the entire mechanism be immersed in a VERY THIN oil, such as G-E No. 10-C, but with the bulb at or in the medium of which the temperature is to be controlled. To meet Underwriters' Specifications, all live parts should be immersed at least 10 in. beneath the surface of the oil.

The bulb and capillary tube will not be injured by any pressure up to 400 lb per square inch from gas or liquid.

Where it is desired to control an electric load slightly higher than the capacity of the thermostat, a saving

can be effected by using a small magnetic switch just sufficient to carry the excess load that the thermostat will not handle. The magnetic-switch coil should be in parallel with part of the load across the thermostat. This arrangement can not be used except where the heating load can be divided.

Some suggested applications are:

Wax pots on shoe machinery	Vulcanizers
Boilers and driers on laundry machinery	Oil-burner equipments
Pressing and cleaning machinery	Embossing machinery
Gluepots and driers on paper-box machinery	Glue cookers
Doughnut-cooking machines	Water heaters
Match-making machines	Many process machines
Valve heating	Soil heating (See publication GEA-1644)
Starting cooling or heating pumps	Oil or water reservoirs
Stills and sterilizers	Bearing-temperature control
	All types of liquid-temperature control

Dimensions

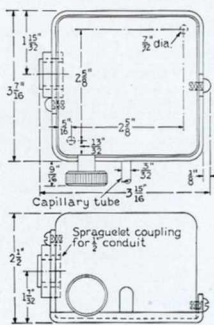


Fig. 3

Renewal Parts

The bellows assembly is sometimes ruined by mechanical injury or by exposure to injuriously high temperatures. It is not possible to assemble the three parts—bellows, bulb, and capillary tube—to each other in the field; therefore, when a replacement bellows assembly is needed, it should be ordered as a unit. Order as follows: "Bellows assembly for thermostat Cat. No. (insert complete Cat. No. from nameplate on mechanism)."

Bellows assemblies for

Cat. No. 4980281G86 to 4980281G89, incl	} Price \$6.50
4980281G107 to 4980281G110, incl	
4980281G132 to 4980281G139, incl	
Cat. No. 4980281G156 to 4980281G163, incl	} Price \$9.50
All other listed thermostats.		Price $4.50

G-E CONTROL EQUIPMENT

AUTOMATIC

Thermostat, with Temperature-setting Indicator

For Use with Industrial Heating Units

THERMAL CHARACTERISTICS

Control with a Differential

The term "differential," as applied to these devices, means the difference in degrees Fahrenheit between the temperature at which the contacts open and the temperature at which they close. These temperatures are measured in the immediate vicinity of the bulb.

Inasmuch as the opening or closing of the contacts is accomplished by the expansion or contraction of the liquid inside the bulb, the differential for a device with a given temperature range will vary proportionately as the rate of heat conduction to and from the liquid in the bulb. This rate of heat conduction, and, hence the differential, are dependent on:

1. The thermal contact with the medium.

Naturally, the ideal thermal contact is to have the bulb completely surrounded by the medium, as in immersion or encircling metal-to-metal contact.

2. The nature of the medium being controlled.

Different substances, such as water, steel, and air, have different rates of heat absorption and dissipation.

3. The rate of temperature change in the medium.

When the change in temperature of the medium is rapid, the temperature of the bulb lags behind that of the medium, both on rise and fall, and the differential is increased.

The above three factors influencing the differential will be met in varying degree in any form of thermal

control. Good design minimizes their influence without sacrificing strong, positive action.

On a definite application, common judgment must be used in estimating the influence of the thermal contact permitted by the application, and the influence of the rate of heat absorption and dissipation of the material itself. It is not possible to discuss all materials and amount of thermal contact.

For the CR2992 thermostat, it is possible to indicate the influence of the third factor—the rate of temperature change in the medium. This influence can be read easily from the curves below. In using the curves, note particularly that the water curve is on the basis of degrees per minute; the air curve, degrees per hour. Also note that the influence of rate of temperature change may be felt on temperature rise or fall, or on both. For instance, if there is a very rapid rate of temperature change, equal on both rise and fall, the percentage increase in differential will be double that indicated by the curves. The influence of the rate of change should be calculated separately for rise and fall and added to the listed differential.

The data indicated in the air curve are on the basis of still air. For a given rate of temperature change, the lag is lessened by the presence of air currents.

The data indicated in the water curve are approximately the same as would be met in an application where the bulb is completely encircled by the metal, with good metal-to-metal contact, as in a hot plate.

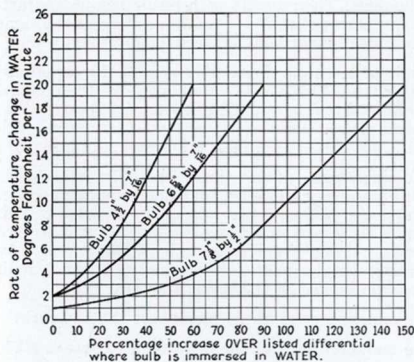


Fig. 4

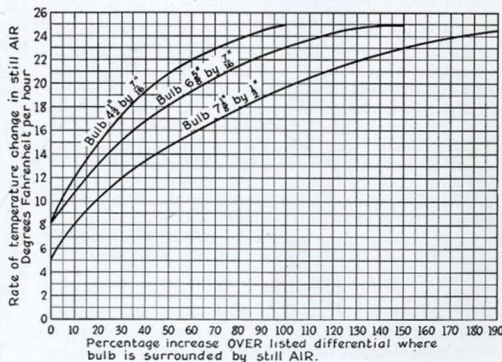


Fig. 5



G-E CONTROL EQUIPMENT

AUTOMATIC

Thermostat, with Temperature-setting Indicator

For Use with Industrial Heating Units

Allowable Overtravel

After the mechanism has tripped, the temperature rise to which the bulb can be subjected without damage depends on the setting. Exceeding this allowable rise results in overexpanding and damaging the bellows. The amount of allowable temperature rise above the setting may be expressed as a percentage of the adjustable temperature range. In other words, when set at the same relative position, say midway, in the adjustable temperature range, a thermostat having a wide range of 160 F (like 85–245 F) would have a larger allowable overrise in actual degrees than one having a narrow range of 70 F (like 120–190 F). In either case, the percentage will be the same. Furthermore, it will be noted from the curve (Fig. 6) that the closer the setting to the minimum of the nameplate range, the greater the allowable overrise. However, to adjust the device for the highest temperature which it will withstand without injury, set at the maximum of the nameplate range.

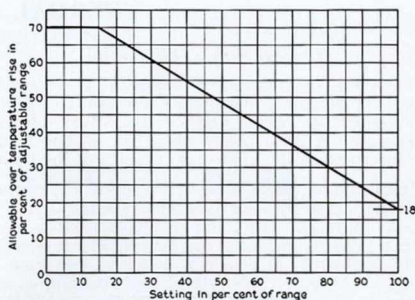


Fig. 6

LIMITS OF MODIFICATION

The thermostats listed cover a very wide selection, some form of which should meet nearly every application. They are considered standard. Thermostats, with modifications (within certain limits) in temperature range, differential, dimensions of capillary tube and bulb, sell at the price of a standard thermostat plus (on the initial order only) a charge of \$15.00. This charge is to be allocated to the quantity of similar thermostats on the initial order. At all times it is desirable, as far as possible, to hold to the standard lengths of capillary tube (8, 25, 60, or 120 in.) and to the standard sizes of bulbs ($4\frac{1}{2}$ by $\frac{7}{16}$, $6\frac{3}{8}$ by $\frac{7}{16}$, or $7\frac{1}{8}$ by $\frac{1}{2}$ in.). However, for any modification of the listed devices, the extra charge must apply.

These thermostats can not be furnished for controlling at temperatures above 750 F. A definite rule to be kept in mind is that increased bulb volume will result in narrower adjustable range (difference between minimum and maximum settings) and smaller differential. These changes are nearly proportional. The reverse is also true. Changes can be made in these characteristics, within reason. It should also be borne in mind that the same volume can be retained by increasing the bulb diameter when shortening the bulb length. However, there is a general rule that, particularly if the rate of temperature change is rapid, the greater the length with respect to the volume, the more sensitive the control will be.

The capillary tube allows bending and coiling as far as can be expected from a copper tube, and, therefore, a standard device with a long capillary tube should be used, making it unnecessary to order a special length.

The devices listed have normally closed contacts, opening on temperature rise. Devices with normally open contacts, closing on temperature rise, can be supplied in lots of 50 or more at the same price. (Lots of 49 or less, \$1.00 each additional.)

The maximum "D" dimension, as shown in Fig. 2, is 10 ft.

Special materials can be used for the capillary tube and bulb, where required, but this will not be justified unless the initial order is a lot of 50 or more. Prices will be furnished on request.

The thermostats with single-knob outside adjustment are standard. Thermostats with inside hex-nut adjustment can be supplied in lots of 50 or more at the same price. (Lots of 49 or less, \$1.00 each additional.)

Single-pole, single-throw thermostats (2 terminals) are standard. Single-pole, double-throw thermostats (3 terminals) can be supplied in lots of 100 or more at the same price. (Lots of 49 or less, \$2.00 each additional. Lots of 50 to 99, incl, \$1.00 each additional.)

The single-pole, double-throw arrangement consists of two stationary contacts, and one movable contact which snaps between the stationary contacts. This arrangement is particularly valuable when it is desired to open a heating circuit and at the same time to close a warning-signal circuit. The capacity of each circuit is the same as that of the single standard circuit.

The omission price of the black base is \$0.40 each.

The omission price of the drawn-shell cover is \$0.40 each.

G-E CONTROL EQUIPMENT

AUTOMATIC

Thermostat, with Temperature-setting Indicator

For Use with Industrial Heating Units

WHEN USED IN A CLOSED LIQUID OR GAS SYSTEM

For years it was common practice to use a dead-end tube or a plug brazed to the capillary tube in order to place the bulb inside a closed liquid or gas system at the point where temperature control was desired.

Except where the copper capillary tube and copper (nickel-alloy on higher temperatures) bulb would be injured by the liquid or gas, the disadvantage of the dead-end tube should prevent its use. This disadvantage is that the additional casing around the bulb usually results in less sensitive control.

Where a large quantity (100 or more) of thermostats is to be purchased at one time, an inexpensive plug, brazed to the capillary tube, can be supplied. Price will be furnished on request. This type of plug has been found impracticable when small quantities of thermostats are involved. The need of brazing prevents flexible warehousing, delays shipment, and is costly.

The plug assembly illustrated in Fig. 9 is of such a design that it can be installed easily and the price is such that it can be used for ordinary applications. Fig. 7 clearly illustrates its construction. It consists of a brass union, threaded at each end, with a $\frac{1}{2}$ -in. pipe thread for insertion into the tank wall, and two slotted brass disks, one on each side of a lead packing. The disks are drawn together by the squeezing nut to such an extent that the soft lead is forced into all cracks and openings and is wedged down into the capillary tube. Because of the squeezing nut, this joint will not vibrate loose; yet, even after the first tightening, up to the point where a good seal is obtained, the whole assembly can be moved to any point along the capillary tube or even completely taken off the bellows assembly, by

loosening the squeezing nut. The threaded union and squeezing nut have a hole through their centers, permitting them to be slipped over a $\frac{3}{16}$ -in. diameter bulb or any bellows. These plug assemblies will not be supplied assembled to the thermostat, but will be a separate package. This is an advantage to the purchaser, not only from a price and shipment standpoint, but also by thus allowing assembly to any point along the capillary tube and even interchange of bellows assemblies. A few easy turns of the squeezing nut make the seal, which can be broken and remade at will.

The design of these plugs is such that any pressure inside the container tends to tighten the lead packing. They are recommended for pressures up to 400 lb per square inch.

These plugs should not be used where the temperature at the lead packing exceeds 600 F, nor should they be used in a liquid or an atmosphere that will attack lead or brass.

Cat. No. 4900739G1 covers this plug, consisting of a brass union, a brass squeezing nut, two brass disks, one lead packing (in halves), plus an extra lead packing as a spare part. Cat. No. 4900739G1. Price \$1.50 each.

Fig. 7 shows an application of this plug.

If it is desired to support the thermostat mechanism on the insertion plug, as illustrated in Fig. 8, the thermostat, a plug assembly (Cat. No. 4900739G1), and a bracket assembly (Cat. No. 4964229G1) should all be ordered. This bracket assembly consists of bracket, bracket nut, two screws, and two lock washers. Order Cat. No. 4964229G1. Price \$1.50 each.

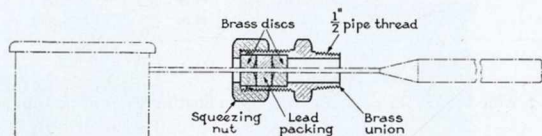


Fig. 7

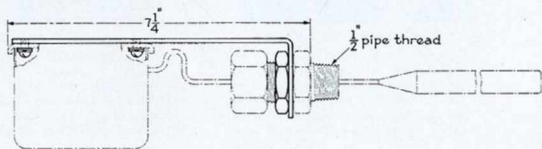


Fig. 8



Fig. 9

G-E CONTROL EQUIPMENT

FOR METAL-MELTING POTS (See page 31)

Manual Control

Cat. No. of Pot	Single-heat Control		Two-heat Control			
	Trumbull Switch Cat. No.	Price	Panel * Cat. No.	Price	WATTAGE	
					High	Low
2881146G2	2228	\$1.60	3651328	\$22.50	750	550
2881146G3	2228	1.60	3651328	22.50	750	550
2881146G4	2228	1.60	3651328	22.50	1000	750
2881146G5	2228	1.60	3651328	22.50	1000	750

* Cat. No. 3651328 consists of a 9-in. panel on which are mounted a 2-heat snap switch and resistor tubes.



Push-button switch
Cat. No. 2698009G2
20 amp, 250 volts

Cat. No. of Pot	Cat. No. of Switch	Price	No. Required for Each Pot	WATTAGE		
				High	Medium	Low
				2666404G1	2698009G2	\$8.00	1	2500	1500	1000
2666404G2	2698009G2	8.00	1	2500	1500	1000
2666407G1	2698009G2	8.00	1	5000	3000	2000
2666407G2	40221	4.00	2	5000	3000	2000



Trumbull safety switch
Cat. No. 40221
30 amp, 250 volts

Automatic Control

Control Panels

For Melting Pot Cat. No.	Control Panels					
	115 VOLTS, 60 CYCLES, SINGLE-PHASE, A-C		230 VOLTS, 60 CYCLES, SINGLE-PHASE, A-C		230 VOLTS, D-C	
	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price
2881146G3 or 2881146G5	.....	.....	4388473G3	\$37.00	3656232G3	\$40.00
2881146G2 or 2881146G4	4388473G2	\$37.00	4388473G3	37.00	3656232G3	40.00
2666404G1	.....	.....	4388473G3	37.00	3656232G3	40.00
2666404G2	4388473G2	37.00	.....	.....	.....	.....
2666407G1	.....	.....	4388473G3	37.00	3656232G3	40.00

Thermostats

General Electric can furnish a wide variety of nonindicating or indicating thermostats for use with metal-melting pots. Prices on request.

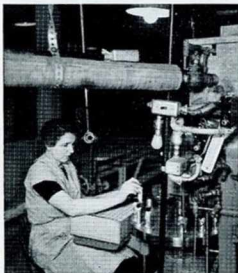
G-E HEATING UNITS AND DEVICES



ARE GIVING DEPENDABLE DAILY SERVICE

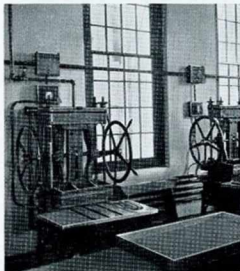
IN THESE INSTALLATIONS—

AND IN THOUSANDS OF OTHERS



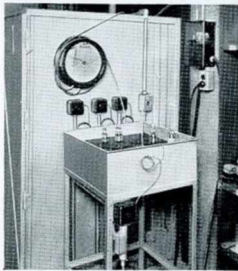
FILLING TUBES

Seven "Spots" of heat, inserted in this tube-filling machine at the Musterole Co., keep "Musterole" in a fluid state, thus enabling the machine to be operated at a constant speed.



HEATING PLATENS

These molding presses at the Molded Rubber Company, Philadelphia, are each heated by seven "Strips" of heat and the temperature is accurately controlled by "Midget" thermostats.



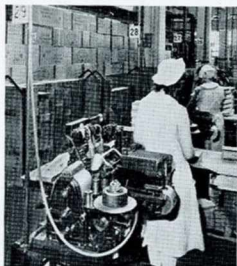
WATER BATHS

In this electrically heated water bath, the characteristics of soapsuds are tested. Electric heat did the job better and met the requirements of laboratory accuracy.



HEATING OVENS

In the Geometric Stamping Company's plant, Cleveland, eight "Strips of Heat" in this oven supply, at low cost, heat for baking emery dust onto polishing wheels. Note the simplicity of the installation.



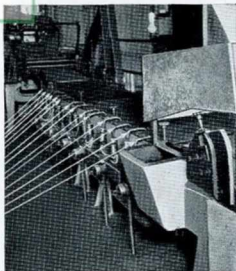
PROCESS MACHINES

If you need a precisely located, dependable spot of heat in a manufacturing process or a machine, use "Spot." Four "Spots" in this machine help wrap and seal thousands of cigars in Cellophane daily.



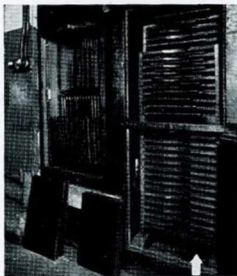
HEATING CLEANING TANKS

"Dip" heats this combined cleaning-solution and hot-water tank for the Leeds & Northrup Company, Philadelphia—a user of electric heaters for the past fifteen years.



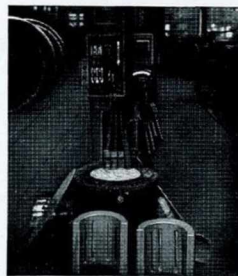
IMPREGNATING WAXES

Fourteen liquid-heating units suspended over the side of the tank supply heat to melt the paraffin in this process machine, which turns out milk-bottle caps by the thousands.



WARMING CABINETS

How best to heat these case-warming cabinets, puzzled the owner of an electrotype plant. The problem was easily solved by the insertion of two strip heaters in each cabinet.



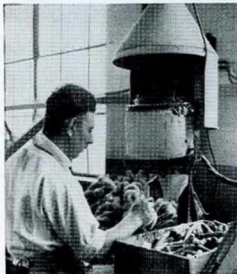
SOFT-METAL MELTING

Electric metal-melting pots, such as this one, are widely used for melting solder, tin, lead, babbit, and type metal. Full-automatic control provides accurate temperature conditions.



CAN SOLDERING

One of seven continuous can-soldering machines operated by a large Maryland can company. Each machine is equipped with three 5-kw cast-in Calrod immersion units.



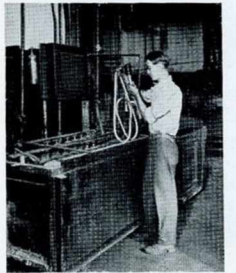
CEMENTING BRUSH HANDLES

A leading brush manufacturer has equipped all his plants with cement-melting pots heated by a bottom hot plate in which are embedded six 200-watt cartridge units.



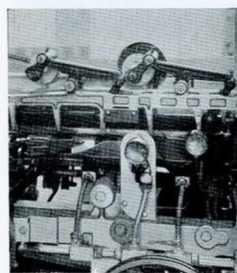
REPIGGING TYPE METAL

This Monarch Monometer type-metal furnace installed in a Brooklyn newspaper plant is used for repigging linotype slugs. The furnace is equipped with six 5-kw cast-in Calrod immersion heaters.



PLATING TANKS

A simple liquid-heating unit, easily suspended over the side, supplies all the heat necessary for this nickel-plating tank in a printing plant. This effective installation led to the eventual adoption of electric heat throughout the plant.



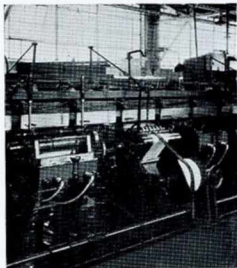
PACKAGING MACHINERY

This ingenious packaging machine used by a packer of sea foods employs five G-E "Spots" to maintain the proper temperature of sealing wax.



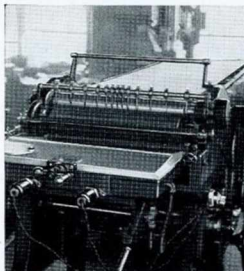
MELTING PARAFFIN

Cardboard disks used in the manufacture of fiber cans are paraffin-dipped in this ingenious machine which is equipped with two "Dip" immersion heaters.



BOOKBINDING

"The cost of maintaining the Calrod immersion units in our bookbinding machines is practically negligible," reports a Tennessee publisher, and adds, "Furthermore, we have clean, efficient heat at all times."



GLUING BOX WRAPS AND LABELS

This automatic gluing machine for box wraps, labels, etc., uses two 1000-watt immersion heaters in the water jacket surrounding the glue tank.



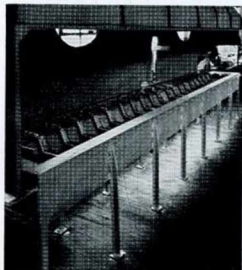
WRAPPING BREAD AND COOKIES

Here's "Strip" at work in a bakery. You'll find him in the foreground under the hot plate which is used for sealing large cakes, and also in the appliances in the center, used for sealing packages of bread and cooking.



HEATING ISOLATED ROOMS

Why go to the expense of extending steam lines to isolated offices like this? An inexpensive air heater will keep you comfortably warm all winter long.



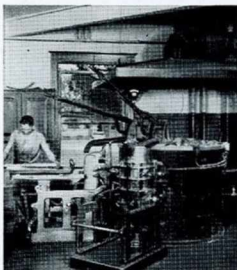
TINNING POTS

A few pieces of standard steel shapes and 20 metal-melting units. The result, an inexpensive, home-made tinning pot of huge capacity.



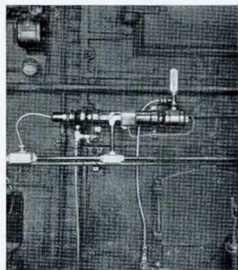
TRADE-MARKING PRODUCTS

"Spot" economically heats this machine for trade-marking tennis balls for the Dunlop Tire and Rubber Company, Buffalo.



STEREOTYPE MELTING

This is a 5-ton stereotype furnace, equipped with nine 5-kw metal-melting units.



PRE-HEATING FUEL OIL

Thermostatically controlled "Dip" heating unit keeps low-gravity fuel oil at proper temperature for efficient combustion.



MELTING GLUE

Two of 75 G-E gluepots in use in the Tennessee Furniture Corporation's plant, Chattanooga.



USEFUL INFORMATION

CALCULATING POWER REQUIREMENTS

The data following will be of assistance in determining the energy required to heat a given part or substance and maintain it at the proper temperature. It is difficult to determine the power requirements exactly, because of the number of factors involved. Hence, the unit or units chosen should be of ample capacity, because it is easier to reduce the rating than to increase it.

To determine the energy required to heat a given substance, the total of the individual requirements must be calculated and added, such as:

- Heat absorption of the substance.
- Heat absorption of the racks or trays, if used.

Heat absorption of ventilating air, if used.
Heat losses through walls, doors, exposed surfaces, etc.

The following formulas, curves, tables, and examples will prove useful in calculating these values:

The energy required to heat any substance
 $= \text{wt in lb} \times \text{specific heat} \times \text{temp rise in deg F}$
 $F = \text{energy in Btu}$

To convert Btu to kw-hr, divide by 3412.

When necessary, the heat of fusion or heat of vaporization must be added to this value, keeping the values in the same units, either Btu or kw-hr.

DATA ON SPECIFIC HEATS, ETC.

Solids

Substance	Average Specific Heat	Heat of Fusion, Btu per Lb	Melting Point, Deg F	Weight in Lb per Cu Ft
Aluminum.....	.23	138	1216	160
Antimony.....	.052	25	1166	423
Asphalt.....	.40	40	250 *	65
Beeswax.....	...	75	144	60
Bismuth.....	.031	23	520	610
Brass.....	.10	..	1700 *	525
Brickwork and Masonry.....	.220	..	...	140
Carbon.....	.204	75	1981	550
Copper.....	.10	..	..	..
Glass.....	.20	..	2200 *	165
Graphite.....	.20	..	..	130
Iron, cast.....	.13	..	2300 *	450
Iron, wrought.....	.12	..	2800 *	480
Lead, solid.....	.031	10	621	710
Lead, melted.....	.04	..	..	..
Nickel.....	.11	..	2642	550
Paper.....	.45	..	..	58
Paraffin.....	.70	63	133	56
Pitch, hard.....	...	..	300 *	83
Rubber.....	.40	..	..	95 **
Silver.....	.057	38	1761	655
Solder (50% lead—50% tin).....	.04	17	425	580
Steel.....	.12	..	2550 *	490
Sugar.....	.30	..	320	105
Sulphur.....	.203	17	230	125
Tallow.....	...	..	90 *	60
Tin, solid.....	.056	25	450	455
Tin, melted.....	.064	..	..	..
Type metal (85% lead—15% antimony).....	.040	..	500	670
Wood.....	.45 *	..	..	34—pine 50—oak
Zinc.....	.095	51	787	445

USEFUL INFORMATION

DATA ON SPECIFIC HEATS, ETC. (Cont)

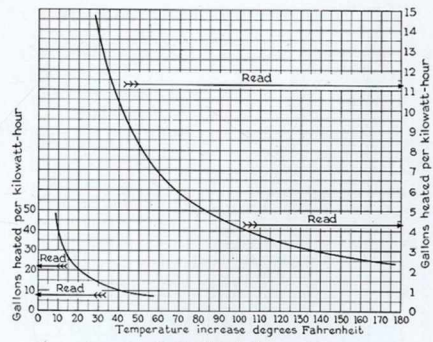
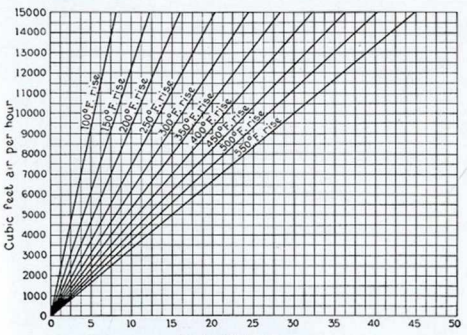
Liquids

Substance	Average Specific Heat	Heat of Vaporization, Btu per Lb	Boiling Point, Deg F	Weight in Lb per Cu Ft
Acetic acid.....	.472	153	245	66
Alcohol.....	.65	365	172	55
Benzine.....	.45	166	175	56
Ether.....	.503	160	95	46
Glue (mixed 2 parts water, 1 part dry glue).....	.895	.....	.....	69
Glycerine.....	.58	.....	554	79
Mercury.....	.0333	117	675	845
Oil, cotton-seed.....	.47	.....	.....	60
Oil, machine.....	.40	.....	.....	58
Oil, olive.....	.471	.....	570 #	58
Paraffin, melted.....	.71	.....	750 #	56
Petroleum.....	.51	.....	.....	56
Sulphur, melted.....	.234	652	601	..
Turpentine.....	.41	133	319	54
Water.....	1.0	965	212	62.5

Gases and Vapors

Substance	Average Specific Heat, Constant Pressure	Weight in Lb per Cu Ft at Approx 70 F and Atmospheric Pressure
Acetylene.....	.35	.073
Air.....	.237	.080
Alcohol.....	.433	.....
Ammonia.....	.520	.048
Carbon dioxide.....	.203	.123
Carbon monoxide.....	.243	.078
Chlorine.....	.125	.20
Hydrochloric acid.....	.195	.102
Hydrogen.....	3.41	.0056
Methane.....	.60	.0447
Nitrogen.....	.245	.078
Oxygen.....	.218	.09
Sulphur dioxide.....	.155	.179

ENERGY REQUIRED TO HEAT AIR AND WATER



USEFUL INFORMATION

HEAT LOSSES

Heat Losses Through Insulated Walls (Ovens, Pipes, etc.)

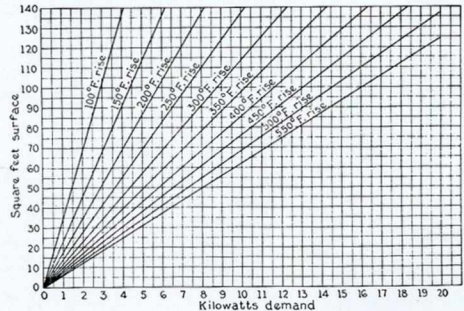


Fig. 3
These data include not only the heat loss through the insulation, but also the extra losses due to joints in insulation, through metal ties, etc., i.e., these values provide for average construction. Curve based on an insulation 1 in. thick of standard high-grade material, such as 85 per cent magnesia, Rockwool, Filinul, etc. If insulation is 2 in. thick, divide curve values by 2; if 4 in. thick, divide by 4, etc.

Heat Losses from Molten-metal Surfaces

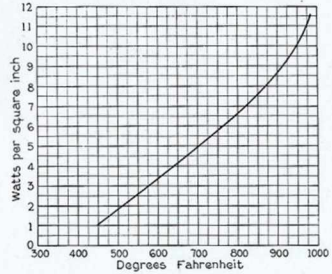


Fig. 5
Heat losses for lead, tin, type metal, babbitt, etc.

Heat Losses from Surfaces of Oil Baths

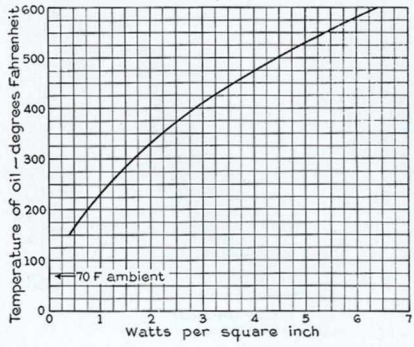


Fig. 6

Heat Losses from Vertical, Solid, Smooth Surfaces

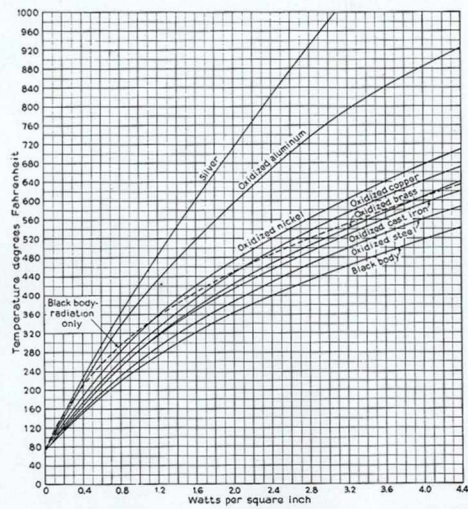


Fig. 4
Heat losses from a horizontal surface laid flat on one side are: top surface, 110 per cent of curve values; bottom surface, 55 per cent of curve values; averages of losses from top and bottom surfaces and pipe surfaces are 82½ per cent of curve values

Heat Losses from Open Hot-water Tank

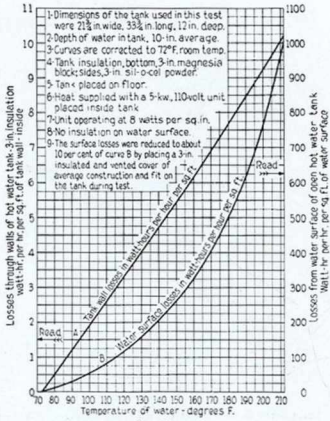


Fig. 7

- 1-Dimensions of the tank used in this test were 23 1/2 in. wide, 33 1/2 in. long, 12 in. deep
- 2-Depth of water in tank, 10 in. average
- 3-Curves are corrected to 72°F. room temp.
- 4-Tank insulation, bottom, 3 in. magnesia blocks, sides, 3 in. 80-per cent powder
- 5-Tank placed on floor
- 6-Hot: supplied with a 5-kw. 110-volt unit placed inside tank
- 7-Tank operating at 8 watts per sq. in.
- 8-No insulation on water surface
- 9-The surface losses were reduced to about 10 per cent of curve B by enclosing a 3-in. insulated and vented cover of average construction and fit on the tank during test.

USEFUL INFORMATION

EXAMPLES OF ESTIMATING POWER REQUIREMENTS

1. Lead Melting

Given a pot having a holding capacity of approximately 425 lb of lead (inside dimensions of pot, 12 in. diameter by 9 in. deep).

Required to melt 300 lb of lead per hour and heat it to 750 F; lead at 70 F when charged.

Kw-hr to melt the lead =

$$\frac{\text{wt (lb)} \times \text{specific heat} \times (t_2 - t_1)}{3412} + \frac{\text{heat of fusion (Btu)}}{3412} = \frac{300 + .031 (621 - 70) \times 10 + 300}{3412} = 2.40 \text{ kw-hr}$$

To this must be added the energy required to raise the temperature from 621 to 750 F.

$$2.40 \text{ kw-hr} + \frac{300 \times .04 (750 - 621)}{3412} = 2.85 \text{ kw-hr}$$

The heat losses from this pot are 1.56 kw-hr per hr at 750 F. The maximum losses will be taken, but the bath will be at 750 F only a small part of the time.

There will be needed 2.85 + 1.56 = 4.4 kw.

The pot should have a rating slightly higher than the actual requirements, or approximately 5 kw.

2. Oven Baking

Given: an oven having inside clearances of 2 ft wide by 3 ft deep by 3 ft high, with 2-in. insulated walls.

Required: to bake 150 lb of steel parts per charge to a temperature of 250 F.

Weight of trays used—50 lb.

Time of bake—45 minutes.

Ventilation required—4 changes per charge

Initial temperature of steel and air—70 F

Summation of the heat requirements are:

200 lb steel, heated from 70 to 250 F.

$$200 \times .12 (250 - 70) = 1.27 \text{ kw-hr}$$

4 changes of air = 4 × 2 × 3 × 3 = 72 cu ft per charge

72 × .08 lb per cu ft = 5.76 lb

$$\frac{5.76 \times 0.237 (250 - 70)}{3412} = .072 \text{ kw-hr to heat air}$$

1.27 + .072 = 1.34 kw-hr needed in 45 minutes

$$\text{Power to be installed} = \frac{1.34}{.75} = 1.80 \text{ kw} + \text{losses}$$

Losses from the walls, door cracks, etc. (Fig. 3), equal 2.9 kw-hr per hr for 53.3 sq ft (taking 0.1 of the loss for 533 ft with a 1-in. wall. For 2-in. wall, divide by 2, which gives 1.45 kw + 15% for extra door loss = 1.67 kw-hr: 1.8 + 1.67 = approx 25 per cent for controlling and contingencies = 4.5 kw.

3. Room or Building Heating

A general formula for average construction, and assuming no loss through floor.

Btu per hour = (0.02 NC + 1.13G + KA) (t - t_o)

where—

N = number of air changes per hour (usually 2 to 3 changes)

C = cubical contents of room in cu ft

G = glass surface in sq ft

A = wall surface in sq ft (exposed walls and ceiling)

t - t_o = temperature difference in deg F between inside and outside.

K = Heat transmission in Btu per hr per sq ft per deg F

(For average frame residence, K = 0.25; for 8-in. brick wall, K = 0.50; for 12-in. brick wall, K = 0.36; for 6-in. concrete, K = 0.79; for 10-in. concrete, K = 0.62.)

(The outside temperature, t_o, should be taken as 15 F higher than the lowest recorded temperature for the given locality.)

To determine the total heat required for a given heating season:

$$\text{Kw-hr} = \frac{H (t - t_a) N}{3412 (t - t_o)}$$

where—

H = calculated heat loss of building in Btu per hour (from above)

N = number of hours of heating season corresponding to average temperatures, t_a

t = inside temperature in deg F (average over 24 hours)

t_a = average outside temperature in deg F, corresponding to N.

t_o = outside temperature in deg F, see above.

For complete information on heat transmission through various wall constructions, also minimum and average temperatures for various localities; refer to the 1933 edition of the *American Society of Heating and Ventilating Engineers Guide*.

4. Water Heating

Given: a hot-water tank having inside dimensions of 2 ft wide by 3 ft long by 2 ft high, filled to within 6 in. of the top. Top of tank open, and bottom and sides insulated with 2-in. insulation.

Required: to heat this water from 50 to 150 F within two hours and from then on to heat approximately 4 gallons per hour.

The amount of water to be heated is 2 × 3 × 1½ = 9 cu ft; 9 × 7.5 gal per cu ft = 67.5 gallons of water.

From Fig. 2, it can be seen that approximately 4 gallons of water can be heated for each kw-hr.

There will be needed $\frac{67.5}{4} = 17$ kw-hr approximately, plus

the radiation losses, the losses depending on the construction, insulation, etc. Since this was to be heated in two hours, there

will be needed $\frac{17 \text{ kw-hr}}{2 \text{ hr}} = 8.5$ kw, plus losses, to be installed.

From curves in Fig. 7, losses at 150 F = 1.7 kw-hr per hr.

Four gallons of water to be heated from 50 to 150 F now requires (from Fig. 2) 1 kw-hr; or, since it is to be heated within

one hour = $\frac{1 \text{ kw-hr}}{1 \text{ hr}} = 1$ kw, plus losses.

Therefore, the installation should consist of: one 10-kw, 3-heat water-immersion unit and a CR2992 thermostat.

Checking the above by means of the formula:

$$\text{Energy} = \frac{\text{Weight} \times \text{specific heat} \times \text{temp rise deg F}}{3412}$$

$$\text{Energy} = \frac{562 \times 1 \times 100}{3412} = 16.5 \text{ kw-hr.}$$

$$\text{For a 2-hr heat-up} = \frac{16.5}{2} = 8.25 \text{ kw (approximately)}$$

Conversion Tables, Factors, Etc.

Deg Fahrenheit = (1.8 × Deg C) + 32

Deg Centigrade = .555 (Deg F - 32)

1 gal water = 8.3 lb

1 hp = 745.2 watts

1 Btu = 0.252 kg calories = 0.2930 whr

1 Btu per lb = 1.8 cal per gram

1 kw-hr = 3412 Btu

1 kw-hr will evaporate 3.5 lb of water from and at 212 F

1 kw-hr will raise 22.75 lb of water from 62 F to 212 F

1 gal = 231 cu in. = 3.785 liters = .1337 cu ft

1 cu ft = 1728 cu in. = .03704 cu yd = 7.481 gal

Wattage varies directly as ratio of voltages squared

$$\left[W_2 = W_1 \times \left(\frac{E_2}{E_1} \right)^2 \right]$$



G-E ELECTRIC FURNACES

General Electric has developed electric furnaces to meet practically all requirements in the industrial field—furnaces that have been perfected in the exacting proving grounds of G-E factories.

It was General Electric, for example, which pioneered the development of controlled-atmosphere furnaces, wherein metal parts can be heat-treated at high temperatures without oxidation or discoloration. This important advance in the art of heat-treating has completely eliminated the necessity of subsequent cleaning operations.

In metal fabrication, the G-E electric-furnace brazing process has solved many production problems and cut over-all costs. This process is being employed in the

manufacture of a wide variety of products, such as refrigerator-mechanism parts, cash-register and computing-machine parts, fin-type radiator and condenser units, automotive parts, parts for the all-metal radio tube, etc.

And General Electric's heat-sealed continuous enameling, furnaces are very widely used in the ceramic industry. A total of thirty-six of these are now in daily operation in the production of ranges, refrigerators, table tops, signs, kitchenware, etc.

These and many other applications where G-E electric furnaces have been economically and successfully used are covered by the following tabulation.

Application	Types of Furnaces	Application	Types of Furnaces
ANNEALING		COPPER BRAZING	Box Conveyor Roller-heat
Copper and Brass	Box Pusher-tray Conveyor Roller-heat Strand-annealing Bell	HEAT TREATING	Box Conveyor Lead Pots Cyanide Pots Pit Pusher Rotary-heat Roller-heat
Malleable Castings	Roller-heat Pusher-tray Elevator	Hardening	Air-draw Oil-bath Salt-bath
Steel Bar Stock and Tubes	Car-bottom Pit Elevator Roller-heat	Drawing	Pit Salt-bath
Steel and Iron Castings and Forgings	Car-bottom Pusher-tray Conveyor Roller-heat	Aluminum Alloys	Hot-dip Galvanizing
Steel Sheets and Coil Strip	Bell Rectangular Cylindrical Elevator	GALVANIZING	Box Continuous Conveyor
Steel Strip (Continuous Strip)	Roller-heat	VITREOUS ENAMELING	Atmosphere-gas Converter for Processing City Gas, Natural Gas, Butane, Propane, etc. Ammonia dissociator
		ATMOSPHERE-GAS-CONVERTER EQUIPMENT	

Helpful G-E Industrial Heating Publications

(Order from your nearest G-E sales Office.)

MIDGET HEATING UNITS AND DEVICES

Cartridge-type Heating Units	GEA-104
Calrod Units, High-temperature	GEA-2941
Can-soldering Machines, Heating Equipment for	GES-1889
Electroplating Baths, Immersion Units for	GEA-3195
Fin Calrod Heating Units	GEA-2618
Gluepots	GEA-193
Heating Units for Process Machines	GES-2131
Immersion Heaters, water and oil	GEA-214
Metal-melting Pots	GEA-164
Snow Melters for Track Switches	GEA-2719
Soil-heating Equipment	GEA-1644
Soldering Irons	GEA-2619
Soldering and Soldering Irons	GES-2099
Stereotype Furnaces, How to Select Equipment	GES-2012
Stereotype Furnaces, Heating Equipment for	GEA-532
Strip Heaters	GEA-1157
Thermostats—for Midget Heaters	GEA-1265
Unit Heaters	GEA-2592

LARGER INDUSTRIAL HEATING EQUIPMENTS

Air-draw Furnaces	GEA-1324
Atmosphere-gas Converters	GEA-2948
Bell-type Annealing Furnaces	GEA-1495
Control Panels for Industrial Heating	GEA-594
Furnace Brazing	GEA-2891
Galvanizing Tanks, Heating Equipment for	GEA-1102
Glass Annealing, Heating Equipment for	GEA-1379
Malleable-iron Annealing	GEA-3063
Ovens, Heating Equipment for	GEA-408
Porcelain-enameling Furnaces	GEA-2074
Reactrol Control	GEA-3301
Scale-free Hardening Furnaces	GEA-2790



GENERAL ELECTRIC COMPANY

GENERAL OFFICE, SCHENECTADY, N. Y.

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Akron, Ohio	335 South Main Street	Milwaukee, Wis.	940 West St. Paul Avenue
Atlanta, Ga.	187 Spring Street, Northwest	Minneapolis, Minn.	12 South Sixth Street
Baltimore, Md.	39 West Lexington Street	Nashville, Tenn.	234 Third Avenue, North
Bangor, Me.	600 Main Street	Newark, N. J.	744 Broad Street
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Birmingham, Ala.	600 North Eighteenth Street	New Orleans, La.	837 Gravier Street
Boston, Mass.	140 Federal Street	New York, N. Y.	570 Lexington Avenue
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Cleveland, Ohio	4966 Woodland Avenue	Providence, R. I.	111 Westminster Street
Columbus, Ohio	40 South Third Street	Reading, Pa.	31 North Sixth Street
Dallas, Texas	1801 North Lamar Street	Richmond, Va.	700 East Franklin Street
Davenport, Iowa	511 Pershing Avenue	Rochester, N. Y.	202 South Jefferson Street
Dayton, Ohio	25 North Main Street	St. Louis, Mo.	89 East Avenue
Denver, Colo.	450 Seventeenth Street	Salt Lake City, Utah	112 North Fourth Street
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Detroit, Mich.	700 Antoinette Street	San Francisco, Calif.	201 Villita Street
Duluth, Minn.	1 West Superior Street	Schenectady, N. Y.	235 Montgomery Street
El Paso, Texas	109 North Oregon Street	Seattle, Wash.	1 River Road
Erie, Pa.	10 East Twelfth Street	Spokane, Wash.	821 Second Avenue
Evansville, Ind.	123 Northwest Fourth Street	Springfield, Ill.	421 Riverside Avenue
Fort Wayne, Ind.	1635 Broadway	Springfield, Mass.	95 State Street
Fort Worth, Texas	408 West Seventh Street	Syracuse, N. Y.	113 South Salina Street
Grand Rapids, Mich.	148 Monroe Avenue, Northwest	Tacoma, Wash.	1019 Pacific Avenue
Hartford, Conn.	410 Asylum Street	Toledo, Ohio	420 Madison Avenue
Houston, Texas	1312 Live Oak Street	Tulsa, Okla.	409 South Boston Street
Indianapolis, Ind.	110 North Illinois Street	Utica, N. Y.	258 Genesee Street
Jackson, Mich.	212 Michigan Avenue, West	Washington, D. C.	806 Fifteenth Street, Northwest
Jacksonville, Fla.	237 West Forsyth Street	Waterbury, Conn.	72 West Liberty Street
Kansas City, Mo.	106 West Fourteenth Street	Wichita, Kan.	200 East First Street
Knoxville, Tenn.	602 South Gay Street	Worcester, Mass.	165 Commercial Street
Los Angeles, Calif.	212 North Vignes Street	Youngstown, Ohio	25 East Boardman Street
Louisville, Ky.	456 South Fourth Street		
Memphis, Tenn.	8 North Third Street		

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Hawaii: W. A. Ramsay, Ltd., Honolulu

Motor Dealers and Lamp Agencies in all large cities and towns

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Cincinnati, Ohio	215 West Third Street	Philadelphia, Pa.	429 North Seventh Street
Cleveland, Ohio	4966 Woodland Avenue	Pittsburgh, Pa.	16 Terminal Way, South Side
Dallas, Texas	1801 North Lamar Street	St. Louis, Mo.	1110 Delmar Boulevard
Detroit, Mich.	5950 Third Avenue	Salt Lake City, Utah	360 West Second South Street
Houston, Texas	1312 Live Oak Street	San Francisco, Calif.	361 Bryant Street
Kansas City, Mo.	819 East Nineteenth Street	Seattle, Wash.	1508 Fourth Avenue, South
Los Angeles, Calif.	5203 Santa Fe Avenue		

Special service divisions are also maintained at the following Works of the Company: Erie, Pa.; Ft. Wayne, Ind.; Pittsfield, Mass.; Schenectady, N. Y.; and West Lynn, Mass. (River Works and West Lynn Works).

INTERNATIONAL GENERAL ELECTRIC COMPANY, INC.

SCHENECTADY, N. Y.

Executive Offices: 570 Lexington Avenue, New York City

Cable Address: "Ingencinet New York"

PRINCIPAL FOREIGN OFFICES, ASSOCIATED COMPANIES, AND AGENTS

ARGENTINA: General Electric, S.A., Buenos Aires and Rosario	INDIA: International General Electric Company (India), Ltd., Bombay
AUSTRALIA: Australian General Electric Ltd., Sydney and Melbourne	ITALY AND COLONIES: Compagnia Generale Di Eletticitra, Milan
BELGIUM AND COLONIES: Societe d'Electricite et de Mecanique (Procedes Thomson-Houston & Carels), Brussels	JAPAN: Shikoku Engineering Works, Ltd., Tokyo; Tokyo Electric Company, Ltd., Kawasaki, Kanagawa-Ken; International General Electric Co., Inc., Tokyo
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HOLLAND: Mijnsen & Co., Amsterdam	SWITZERLAND: Troillet Freres, Geneva
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