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 $25	$25 and less than $200	$200 and less than $1000	$1000 and more
Published Price	15%	25%	35%

PAGES 24, *25, 27, 28, 30, 34, and 35.

Less than $100	$100 and less than $400	$400 and more
Published Price	10%	15%

PAGES 17, †25, 29, 31, 32, 33, 38, 40, and 48.
Published Price

* Heaters only.
† Control only.

See Reverse Side for Shipping Information

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

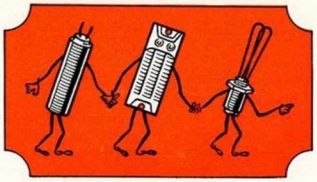
December, 1939

GED-650A
Supersedes GED-650

TABLE OF CONTENTS

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

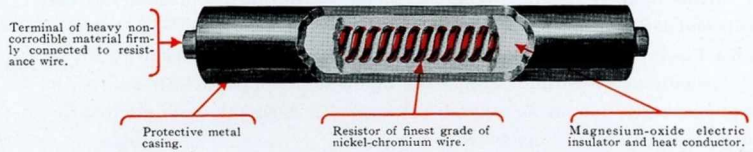
The G-E Calrod heating unit is the most outstanding development in the field of electric heating during recent years and has established an imposing record for dependability, economy, and durability.

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.

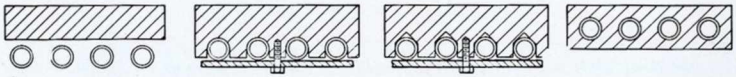
A copper sheath is used for immersion in water and similar liquids.

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.

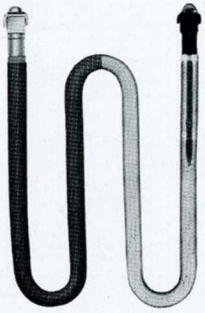
General Electric has extensive facilities for forming Calrod units into practically any desired shape consistent with bending limitations. The units can be bent on a minimum radius equal to the diameter of the sheath.

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.

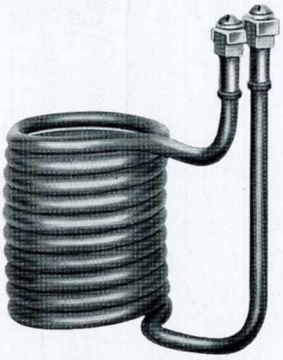
Price: *$0.15* per bend, per unit, plus
$1 per bend, lot set-up charge.

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

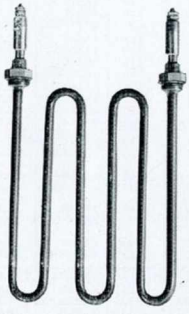
Quantity of Units Ordered	Total Price per Unit
1	**$16.90**
10	**11.50**



X-ray view of formed G-E Calrod unit

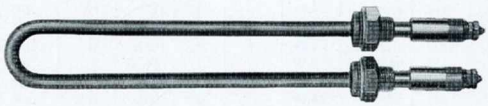


G-E Calrod unit showing possibilities of unusual formation

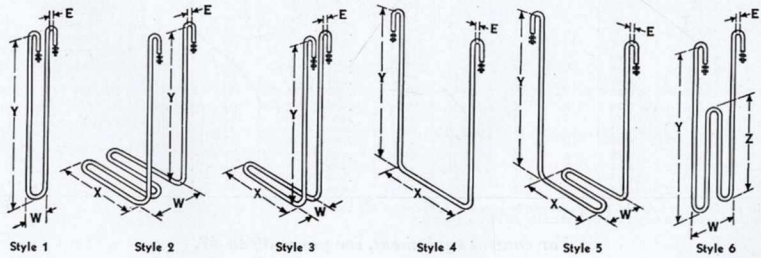


Calrod unit formed in a grid shape

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

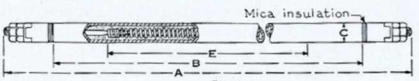


Fig. 1

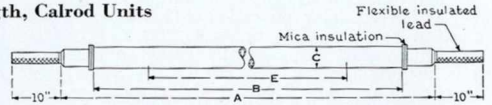


Fig. 2

Watts	* Volts	Cat. No.	Price	Approx Ship. Wt in Lb	APPROXIMATE DIMENSIONS IN INCHES: See Fig.	A	B	C	E (Effective Heating Length)	Watts per Sq In.	Sheath Material	Suggested Applications	Maximum Allowable Sheath Temperature
500	115	4A275	**$3.20**	2	1	24	22	0.333	17½	27	Steel	Contact heating of metal surfaces Casting into iron and aluminum Direct immersion in oil, alkaline baths, and other liquids not injurious to steel and not of high viscosity Soft-metal immersion (but not in metals that will attack steel, such as zinc, etc.)	750 F
500	230	4A275G2	**3.20**	2	1	24	22	.333	17½	27			
750	115	4A276	**3.60**	3	1	31	29	.333	25½	28			
750	230	4A276G2	**3.60**	3	1	31	29	.333	25½	28			
1000	115	4A277	**5.00**	3	1	43	41	.333	38	25			
1000	230	4A277G2	**5.00**	3	1	43	41	.333	38	25			
550	115	4A284	**4.70**	4	1	37	35	.375	21	22			
550	230	4A284G2	**4.70**	4	1	37	35	.375	21	22			
1000	115	4A278	**6.90**	3	1	39¾	37¾	.496	31	20			
1000	230	4A278G2	**6.90**	3	1	39¾	37¾	.496	31	20			
1500	115	4A279	**10.20**	4	1	55¼	53¼	.496	48½	20			
1500	230	4A279G2	**10.20**	4	1	55¼	53¼	.496	48½	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	75¼	73¼	.496	67	20			
2000	230	4A280G2	**13.10**	5	1	75¼	73¼	.496	67	20			
2500	115	4A281	**14.70**	5	1	87¼	85¼	.496	78½	20			
2500	230	4A281G2	**14.70**	5	1	87¼	85¼	.496	78½	20			
5000	230	4A282	**24.00**	10	1	157¼	155¼	.496	114	28			
2000	230	4A283	**25.90**	10	1	154¼	152¼	.550	108	11			
1000	115	4A285	**4.40**	4	1	34¼	32¼	.375	19½	44	Steel	Casting into iron and aluminum Direct immersion in alkaline baths and other liquids not injurious to steel *and not of high viscosity* Soft-metal immersion (but not in metals that will attack steel, such as zinc, etc.)	750 F
1000	230	4A285G2	**4.40**	4	1	34¼	32¼	.375	19½	44			
1500	115	4A286	**6.60**	4	1	49¼	47¼	.375	34	38			
1500	230	4A286G2	**6.60**	4	1	49¼	47¼	.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	97¼	95¼	.550	68	42			
5000	115	4A289G2	**17.60**	9	1	97¼	95¼	.550	68	42			
250	115	4A263	† **13.90**	6	1	126¼	124¼	.333	112	2	Nickel-silver	Contact heating of metal surfaces Air heating Pipe heating	1000 F
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	102⅝	101	.280	95	6	Calorized steel		
500	230	4A295G2	**9.60**	2	2	102⅝	101	.280	95	6			
650	115	4A296	**9.10**	2	2	94⅝	93	.280	73	10			
650	230	4A296G2	**9.10**	2	2	94⅝	93	.280	73	10			
2500	115	4A297	**20.50**	10	2	226⅝	225	.318	212	12			
1000	115	4A620	**10.40**	4	1	39¾	37¾	.600	31	17	Chrome steel	Contact heating of metal surfaces. Air heating Pipe heating	1200 F
1000	230	4A620G2	**10.40**	4	1	39¾	37¾	.600	31	17			
1500	115	4A621	**15.50**	5	1	55¼	53¼	.600	48½	17			
1500	230	4A621G2	**15.50**	5	1	55¼	53¼	.600	48½	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	75¼	73¼	.600	67	17			
2000	230	4A623G2	**20.20**	6	1	75¼	73¼	.600	67	17			
2500	115	4A624	**22.90**	6	1	87¼	85¼	.600	78½	17			
2500	230	4A624G2	**22.90**	6	1	87¼	85¼	.600	78½	17			
5000	230	4A625	**38.80**	11	1	157¼	155¼	.600	114	23			
600	115	4A298	**3.00**	2	1	19¾	17¾	.333	14	41	Copper	Water immersion	212 F
600	230	4A298G2	**3.00**	2	1	19¾	17¾	.333	14	41			
1000	115	4A299	**3.20**	2	1	23¾	21¾	.333	18	53			
1000	230	4A299G2	**3.20**	2	1	23¾	21¾	.333	18	53			
1500	115	4A300	**5.40**	3	1	31¾	29¾	.496	23½	41			
1500	230	4A300G2	**5.40**	3	1	31¾	29¾	.496	23½	41			
2000	115	4A301	**6.90**	3	1	39¾	37¾	.496	31	41			
2000	230	4A301G2	**6.90**	3	1	39¾	37¾	.496	31	41			
2500	115	4A302	**8.70**	4	1	47¼	45¼	.496	39	41			
2500	230	4A302G2	**8.70**	4	1	47¼	45¼	.496	39	41			
5000	115	4A303	**14.70**	5	1	87¼	85¼	.496	79	41			
5000	230	4A303G2	**14.70**	5	1	87¼	85¼	.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.

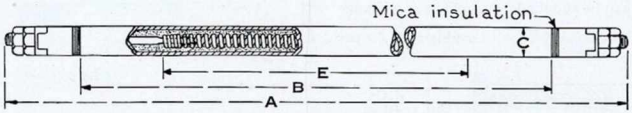


Fig. 3

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	**10.60**	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.

Mycalex 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.

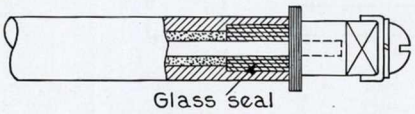


Fig. 4

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.

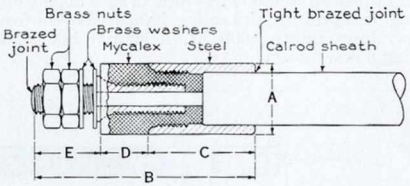


Fig. 5

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	½	1 ⅜	15/16	⅜	9/16	¼ in.–28. 9/64 in. thick
Larger than 0.400 in. diam	¾	2 9/32	1 ⅜	½	21/32	5/16 in.–24. 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.

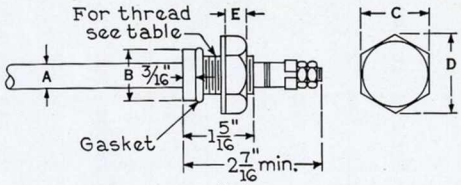


Fig. 6

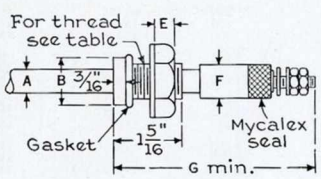


Fig. 7

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 .375	5/8–18	⅜	1 1/16	1 ¼	⅜	.333 .375	5/8–18	⅜	1 1/16	1 ¼	⅜	½	3½
.496 .540 .550	¾–16	1	1 ¼	1½	7/16	.496 .540 .550	⅝–14	1⅜	1 ¼	1½	7/16	¾	3¾

* 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, and having a threaded brass header, is used. Typical 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: 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	SWITCHES FOR HAND CONTROL 250 VOLTS MAX (FURNISHED SEPARATELY): Description (See Illustrations on Page 39)	Cat. No.	Price
0.6	115	1	15X820	**$7.90**	2	5	1¼	1	8½	Single-heat snap switch	60451	**$1.00**
0.6	230	1	15X821	**7.90**	2	5	1¼	1	8½			
0.75	115	1	15X822	**8.40**	2	8	1¼	2	11½			
0.75	230	1	15X823	**8.40**	2	8	1¼	2	11½			
1.0	115	1	15X824	**9.30**	2	10	1¼	2	13½			
1.0	230	1	15X825	**9.30**	2	10	1¼	2	13½			
1.2	115	3	15X826	**11.70**	3	8	1¼	3	11½	3-heat snap switch	29X924	**1.50**
1.2	230	3	15X827	**11.70**	3	8	1¼	3	11½			
2.0	115	3	15X828	**13.60**	3½	10	1¼	3	13½			
2.0	230	3	15X829	**13.60**	3½	10	1¼	3	13½			
2.0	115	3	* 15X830	**16.00**	3½	1⅛	‡ 1⅜	4	4½	3-heat snap switch	278607	**2.40**
2.0	230	3	* 15X831	**16.00**	3½	1⅛	‡ 1⅜	4	4½			
3.0	115	3	15X832	**16.00**	6	14	2	3	18			
3.0	† 230	3	15X833	**16.00**	6	14	2	3	18			
4.0	115	3	15X834	**18.40**	7	18	2	3	22			
4.0	† 230	3	15X835	**18.40**	7	18	2	3	22	3-heat snap switch	278610	**4.50**
5.0	115	3	15X836	**20.90**	8	22	2	3	26			
5.0	† 230	3	15X837	**20.90**	8	22	2	3	26			
7.5	† 230	3	50X595	**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.

Fig. 1

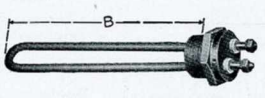


Fig. 2

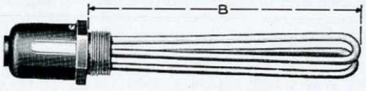


Fig. 3

Fig. 4

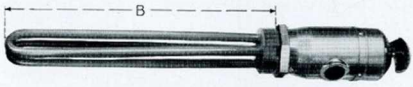


Fig. 5

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	20½
3.0	230	3	1A389G2	**21.00**	8	14	2	20½
4.0	115	3	1A390	**23.40**	9	18	2	24½
4.0	230	3	1A390G2	**23.40**	9	18	2	24½
5.0	115	3	1A391	**25.90**	10	22	2	28½
5.0	230	3	1A391G2	**25.90**	10	22	2	28½
7.5	230	3	1A392	**31.80**	13	30	2	36½

For control equipment, see pages 39 to 47.

G-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 Ship. Wt in Lb	APPROX DIMENSIONS IN INCHES: 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	SWITCHES FOR HAND CONTROL 250 VOLTS MAX: Description (See Illustrations on Page 39)	Cat. No.	Price
0.75	115	1	1A384	**$12.00**	3	10	1¼	2	13½	Single-heat snap switch	60451	**$1.00**
1.5	115	3	1A385	**17.00**	3½	10	1¼	3	13½	3-heat snap switch	278607	**2.40**
1.5	230	1	1A385G2	**17.00**	3½	10	1¼	3	13½	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			
3.5	† 230	3	1A387G2	**24.00**	7	18	2	3	22			
4.5	115	3	1A388	**27.20**	8	22	2	3	26	.....	.....	...
4.5	† 230	3	1A388G2	**27.20**	8	22	2	3	26	3-heat snap switch	278610	**4.50**

† 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.

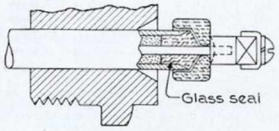


Fig. 6

Kw	Volts	No. of Heats	Cat. No.	Price	Approx Ship. Wt in Lb	APPROX DIMENSIONS IN INCHES: 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	SWITCHES FOR HAND CONTROL 250 VOLTS MAX: Description (See Illustrations on Page 39)	Cat. No.	Price
1.0	115	3	33X825	**$13.60**	5	10	1¼	3	13½	3-heat snap switch	29X924	**$1.50**
1.0	230	3	33X826	**13.60**	5	10	1¼	3	13½			
1.5	115	3	32X820	**16.00**	6	14	2	3	18			
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			
2.5	230	3	† 15X839	**20.70**	8	22	2	3	26			
3.0	115	3	32X824	**23.00**	10	26	2	3	30			
3.0	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			
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 15/16	5
2000	230	1	34X437	**35**	30	11 3/8	3	16	3 1/8	6 15/16	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.

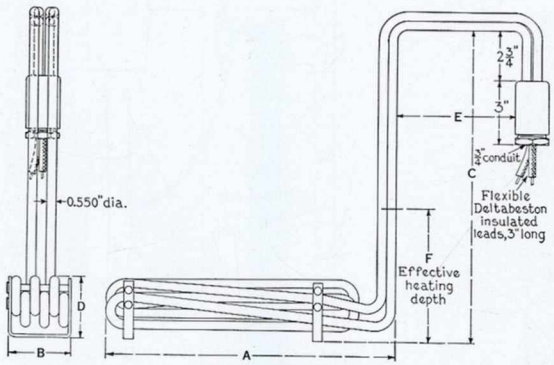


Fig. 7
Dimension outline of G-E oil-tempering-bath units

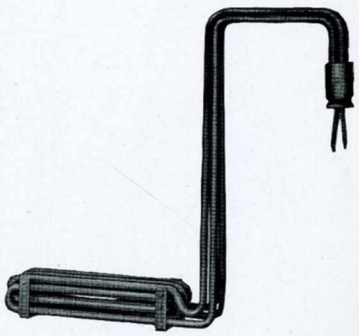


Fig. 8
G-E oil-tempering-bath unit
Cat. No. 34X438 or 34X439

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 3/16	10¾	4¼
4000	230	1	63X533	**23**	11	33 5/16	22¾	4¼
6000	230	1	63X534	**30**	11	45 5/16	34¾	4¼

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

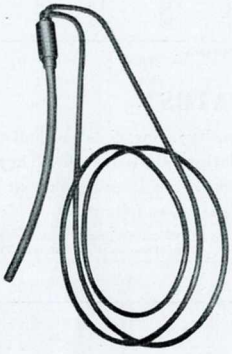
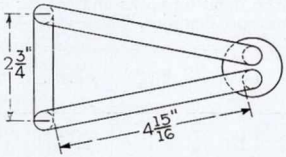


Fig. 9
Cat. No. 63X412 unit



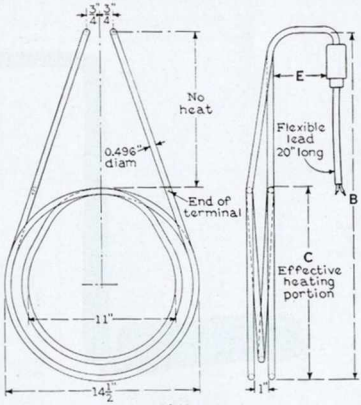


Fig. 10
Cat. No. 63X412 unit

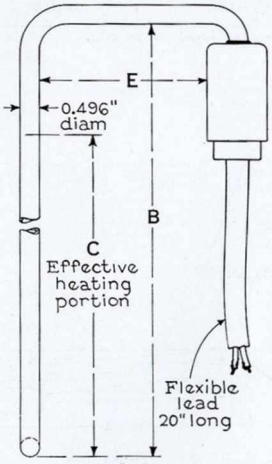


Fig. 11
Cat. No. 63X532, 63X533 and 63X534 units

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.

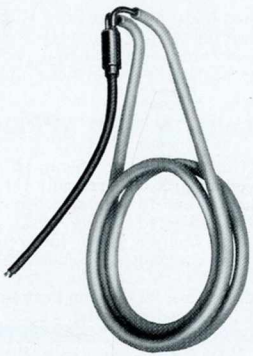


Fig. 12
Cat. No. 63X410 unit

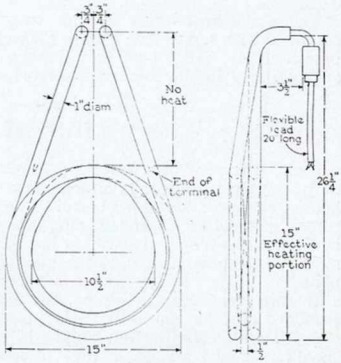


Fig. 13

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 A	DIMENSIONS IN INCHES C	Weight of Lead in Lb	Shipping Weight in Lb	Active Area in Sq In.
2000	230	62X552	**$40.00**	23	12	45	60	172
4000	230	62X553	**46.00**	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.

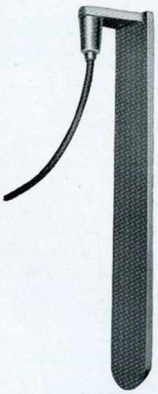


Fig. 14
Cat. No. 62X553 unit

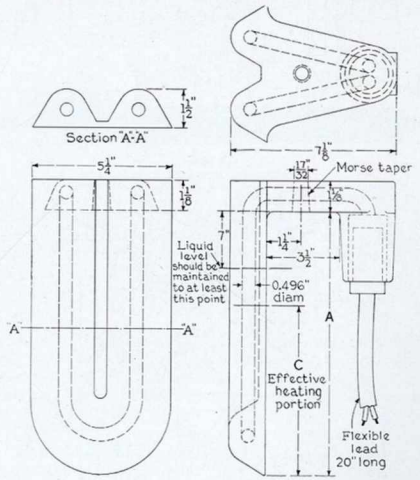


Fig. 15

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 ¾ 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 1¼-in. threaded collar should be 1½ inches. Units with the 2-in. collar should not be installed in pipe of less than 2½-in. diameter.

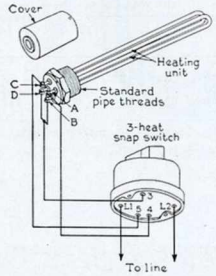
Care should be taken to keep immersion units clean. A free circulation of liquid around the heaters should be provided at all times. Immersion heaters should be inspected regularly, and any accumulations of carbon or foreign material should be removed.

"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.

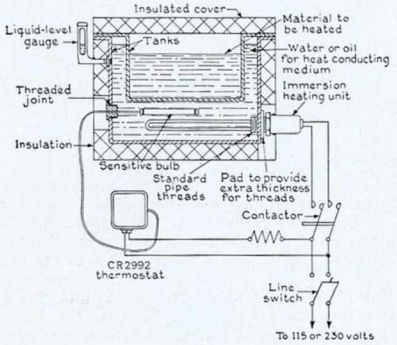
The "over-the-side" type of electric immersion heater (as illustrated in Fig. 7 to 15 inclusive) is also very easily installed, since it readily slips over the edge of a tank, with the terminals hanging down on the outside walls.

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.

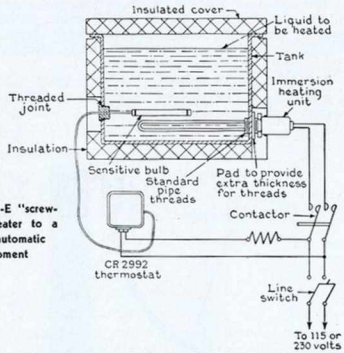


G-E immersion heater connected for three heats

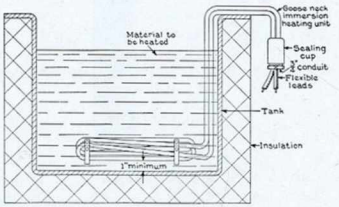
Note: Each size of switch is connected differently. Connection diagram accompanies every switch



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 ⅞ 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 Ship. 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

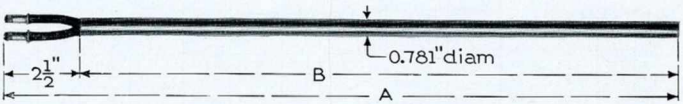


Fig. 1
G-E Calrod insertion heater for platens, die blocks, hollow bolts, etc.

G-E AIR-HEATING AND CLAMP-ON UNITS

Watts	Volts	No. of Heats	AIR-HEATING UNIT Cat. No.	AIR-HEATING UNIT Price	CLAMP-ON UNIT Cat. No.	CLAMP-ON UNIT Price	Approx Ship. Wt in Lb	APPROX DIMENSIONS IN INCHES Over-all Length	Length of Heating Surface	Width of Heating Surface Air-heating Unit	Width of Heating Surface Clamp-on Unit
*350	115	1	.....	.....	28X702	**$3.30**	2	18⅛	14⅜	..	1½
500	115	1	30X603	**$3.50**	30X607	**3.70**	2	23¾	20	2	1½
500	230	1	30X604	**3.50**	30X608	**3.70**	2	23¾	20	2	1½

* 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.

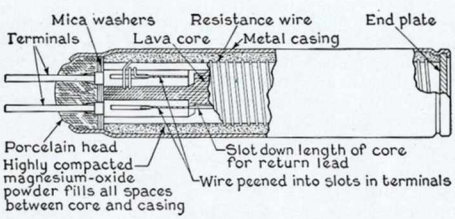
Clamp-on Unit

One steel strip for the clamp-on unit is bent up along either edge to form a channel about ¼ 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 ⅜ 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
3/8	1 1/2	2	30	115	2A63	**$2.00**
	1 1/2	2	30	230	2A64	**2.00**
3/8	2 3/8	2	75	115	2A65	**2.25**
	2 3/8	2	75	230	2A66	**2.25**
	3	2	90	115	2A67	**2.50**
	3	2	90	230	2A68	**2.50**
1/2	2 3/8	2	75	115	141-H	**2.35**
	2 3/8	2	75	230	141-X	**2.35**
	2 3/8	2	100	115	142-H	**2.35**
	2 3/8	2	100	230	142-X	**2.35**
	3	2	120	115	184-H	**2.55**
	3	2	120	230	184-X	**2.55**
5/8	2 3/8	2	90	115	188-H	**2.60**
	2 3/8	2	90	230	188-X	**2.60**
	2 3/8	2	150	115	143-H	**2.60**
	2 3/8	2	150	230	143-X	**2.60**
	4	2	150	115	182-H	**3.20**
	4	2	150	230	182-X	**3.20**
5/8	5 1/2	2	285	115	185-H	**$3.75**
	5 1/2	2	285	230	185-X	**3.75**
3/4	2 3/8	2	200	115	151-H	**2.85**
	2 3/8	2	200	230	151-X	**2.85**
	6	2	350	115	186-H	**4.20**
	6	2	350	230	186-X	**4.20**
15/16	2 1/2	2	275	115	145-H	**3.20**
	2 1/2	2	275	230	145-X	**3.20**
15/16	4 7/8	3	200	115	6A80	**4.10**
	4 7/8	3	200	230	6A81	**4.10**
15/16	4 7/8	3	400	115	6A82	**4.10**
	4 7/8	3	400	230	6A83	**4.10**
	4 7/8	1	300	115	*179-H	**5.60**
	4 7/8	1	300	230	*179-X	**5.60**
	4 7/8	1	460	115	*180-H	**5.60**
	4 7/8	1	460	230	*180-X	**5.60**
15/16	6	3	450	115	187-H	**$4.55**
	6	3	450	230	187-X	**4.55**
1 5/16	6	1	660	115	*181-H	**6.00**
	6	1	660	230	*181-X	**6.00**
1.25	6	3	800	440	6A84	**6.20**
	8 1/2	3	1200	440	6A85	**7.40**
1.25	5	3	300	115	163-H	**4.65**
	5	3	300	230	163-X	**4.65**
	5	3	600	115	156-H	**4.65**
	5	3	600	230	156-X	**4.65**
1.293	8 1/2	3	650	115	164-H	**6.00**
	8 1/2	3	650	230	164-X	**6.00**
	8 1/2	3	1000	115	170-H	**6.00**
	8 1/2	3	1000	230	170-X	**6.00**
	8 1/2	3	1200	115	152-H	**6.00**
	8 1/2	3	1200	230	152-X	**6.00**

* Single unit with double winding to give three heats. Watts are "high heat".
Shipping weights of cartridge units vary from ½ to 2 lb depending on size.

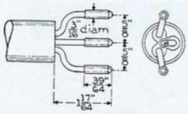


Fig. 1

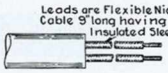


Fig. 2

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

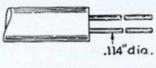


Fig. 3

Symbol	Length of Solid Leads in In.
152	2 7/16
156	3/4
163	3 11/16
164	7 3/16
170	7 3/16
187	7 3/16
6A80	7 3/16
6A81	7 3/16
6A82	7 3/16
6A83	7 3/16
6A84	7 3/16
6A85	7 3/16

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

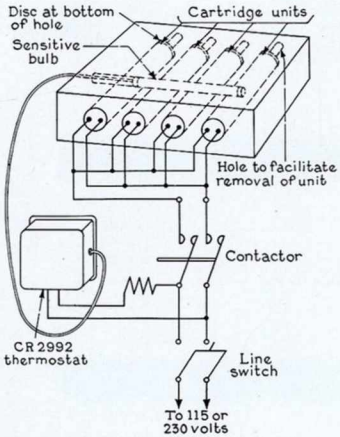
Cartridge units with end (opposite terminal) sealed by brazing are supplied at the following additions to the price:
Cartridges 1.25 in. in diameter and under.....add *$0.15*
Cartridges 1.293 in. in diameter.....add *$0.25*

For control equipment, see pages 39 to 47.

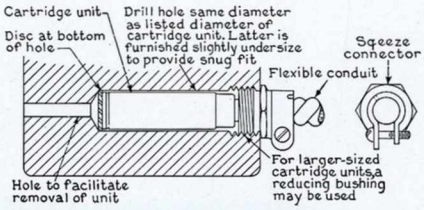
G-E CARTRIDGE UNITS

INSTALLATION AND APPLICATION

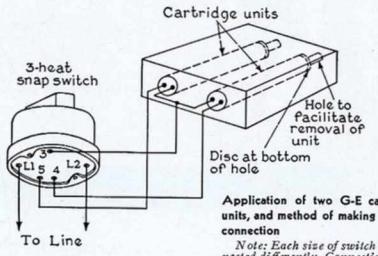
When installing a G-E cartridge-type heating unit, it is necessary only to provide a hole, in the part to be heated, of a diameter equal to the listed diameter of the cartridge unit to be inserted, which is slightly undersize. Wherever possible, it is advisable to extend the hole entirely through the 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.



Application of G-E cartridge units with automatic temperature control



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.)



Application of two G-E cartridge units, and method of making 3-heat connection

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

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.

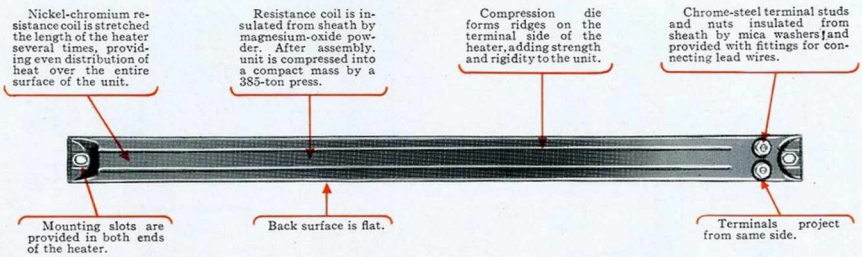
The coating is *not* an electric insulator, and care must be taken not to get any on the porcelain heads of cartridge units or other insulators.

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



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-enameled 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 Ship. 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	30⅜	26⅝	29⅜	....
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**	.....	...	...	....	2	23½	20	22¾	....
.....	...	...	....	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	17⅝	14⅛	16⅞	....
51X339	350	230	**2.10**	2A246G2	500	230	**2.70**	2	17⅝	14⅛	16⅞	....
51X336	250	115	**1.90**	2A245	350	115	**2.40**	2	11¾	8¼	11	....
51X337	250	230	**1.90**	2A245G2	350	230	**2.40**	2	11¾	8¼	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	30⅜	26⅛	29⅜	....
.....	....	...	....	2A259	750	230	**3.55**	3	30⅜	26⅛	29⅜	....
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	....
.....	...	...	....	2A258	500	115	**2.95**	2	23½	19½	22¾	....
.....	...	...	....	2A258G2	500	230	**2.95**	2	23½	19½	22¾	....
2A152	350	115	**2.10**	2A232	500	115	**2.70**	2	17⅝	13⅜	16⅞	....
2A152G2	350	230	**2.10**	2A232G2	500	230	**2.70**	2	17⅝	13⅜	16⅞	....
.....	...	...	....	2A257	350	115	**2.70**	2	17⅝	13⅜	16⅞	....
.....	...	...	....	2A257G2	350	230	**2.70**	2	17⅝	13⅜	16⅞	....
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	17⅝	13½	16⅞	14⅞
51X347	350	230	**2.10**	2A252G2	500	230	**2.70**	2	17⅝	13½	16⅞	14⅞
51X344	250	115	**1.90**	2A251	350	115	**2.40**	2	11¾	7¼	11	9
51X345	250	230	**1.90**	2A251G2	350	230	**2.40**	2	11¾	7¼	11	9
51X342	150	115	**1.80**	2A250	200	115	**2.20**	1	7	2½	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 9/16 in., thickness 15/32 in., height over terminals 1 1/32 in., height under terminals ½ in. Use 3/16 in. bolt max.

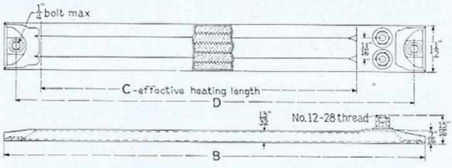


Fig. 1
Dimensions of G-E strip heater with parallel terminals at one end

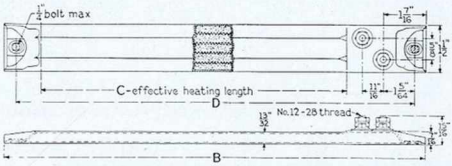


Fig. 2
Dimensions of G-E strip heate with offset terminals at one end

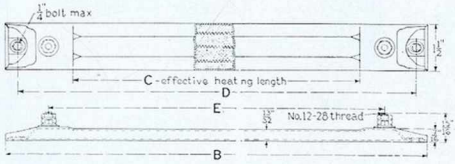


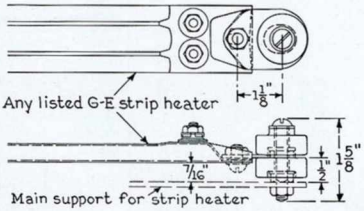
Fig. 3
Dimensions of G-E strip heater with terminals on both ends

For control equipment, see pages 39 to 47.

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 1/32 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

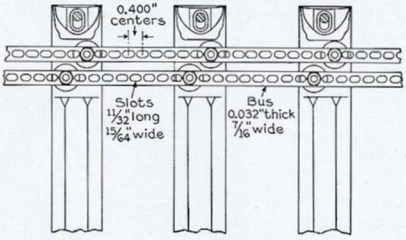
These wires may be used at temperatures as high as the strip heaters will stand in an oven.

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.

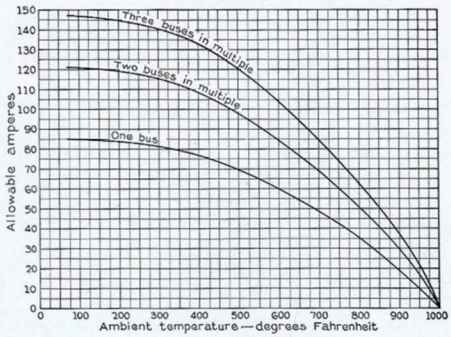


A typical application of bus bars to offset-terminal strip heaters

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

Bus Bar—12 ft long, Cat. No. 2A188.

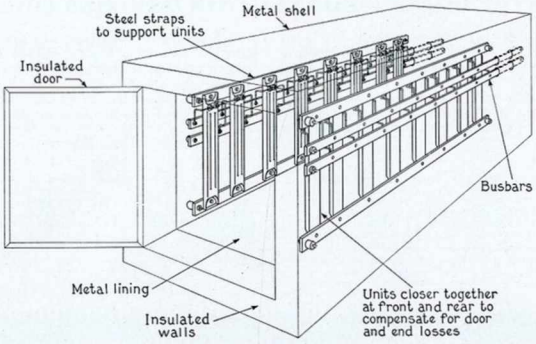
Price $1.00 each



Current capacity of Cat. No. 2A188 bus bars

G-E STRIP HEATERS

INSTALLATION AND APPLICATION



G-E strip heater mounted in a small oven

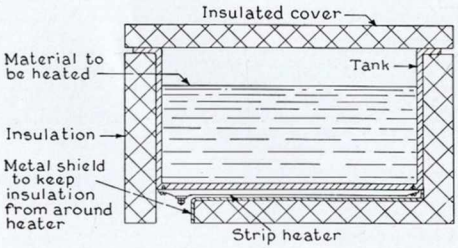
Maximum allowable oven temperatures when G-E strip heaters are used.

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

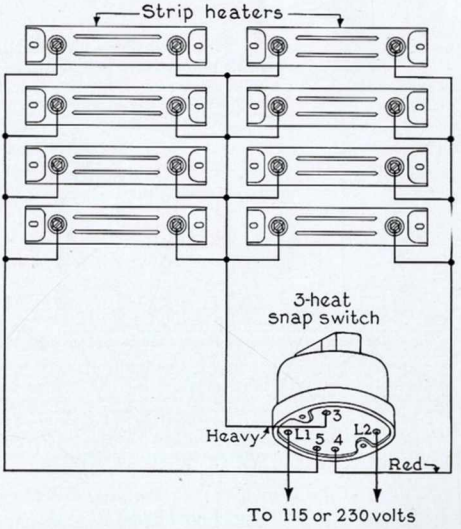
G-E Strip Heaters—Easy to Install

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.



Contact heating of tanks by means of G-E strip heaters



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 ⅜ in. wide by $\frac{1}{16}$ 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.

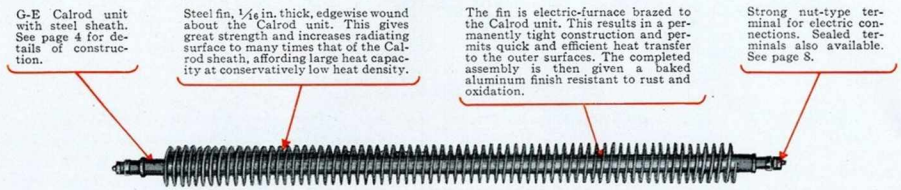


Fig. 1

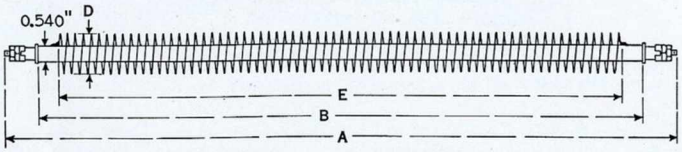


Fig. 2

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)				* Watts	Cat. No.	† Price	Approx Ship. Wt in Lb
△A	△B	D	Effective Heating Length Dimension E				
24	22	1¼	20	2000	7A110	**$6.80**	4
34	32	1¼	30	3000	7A111	**9.50**	6
44	42	1¼	40	4000	7A112	**12.20**	8
54	52	1¼	50	5000	7A113	**15.00**	10
64	62	1¼	60	6000	7A114	**17.80**	12
74	72	1¼	70	7000	7A115	**20.60**	14
84	82	1¼	80	8000	7A116	**23.40**	16
94	92	1¼	90	9000	7A117	**26.60**	18
104	102	1¼	100	10000	7A118	**30.60**	20

△A 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.

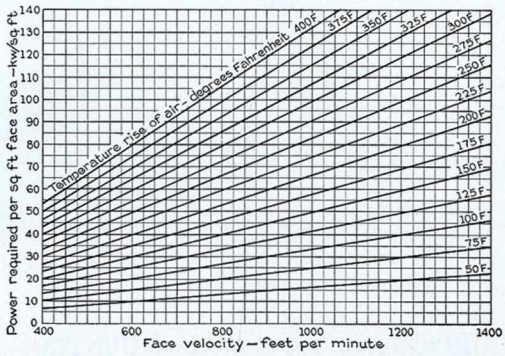


Fig. 3

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.

(a) $\frac{2000\ (\text{ft})^3/\text{min}}{4\ (\text{ft})^2} = 500$ ft/min face velocity.

(b) $\frac{60\ \text{kw}}{4\ (\text{ft})^2} = 15$ kw/sq ft of face area.

(c) Read vertically at 500 ft/min to where line intersects horizontal 15 kw/sq ft.

(d) This intersection is on sloping line 90 F—temperature rise.

(e) 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

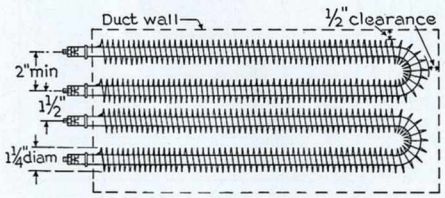


Fig. 4
Typical cross section of air duct, showing suggested arrangement of fin Calrod units in hairpin formation (see page 22 for additional price for bending unit)

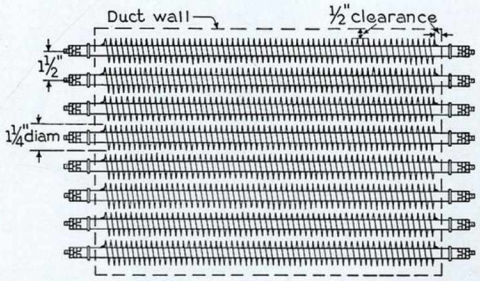


Fig. 5
Typical cross section of air duct, showing suggested arrangement of fin Calrod units in straight lengths

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
Valve houses
Pump houses
Warehouses
Crane cabs
Airplane hangars
Electric locomotives
Blower rooms
Repair shops
Service stations
Laboratories
Garages
Scale rooms
Watchmen's houses
Elevators
Drying rooms
Waiting stations
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.	Price	CAT. NO.			Price		A	B	C	D	E	F
	115 Volts	230 Volts		440 Volts		115 Volts	230 Volts	440 Volts								
1000	2A133	2A133G2	**$20.00**	2A195	**$24.00**	2A134	2A134G2	2A156	**$17.00**	22	9½	7¾	10⅜	11¼	25¾	23¾
2000	2A135	2A135G2	**27.00**	2A164	**31.00**	2A136	2A136G2	2A157	**23.00**	32	12¼	10½	13⅛	14	25¾	23¾
3000	.....	2A137	**34.00**	2A165	**38.00**	.....	2A138	2A158	**29.00**	40	16	14¼	16⅞	17⅜	25¾	23¾
4500	.....	2A139	**45.00**	2A166	**49.00**	.....	2A140	2A159	**39.00**	50	16	14¼	16⅞	17¾	32⅜	30⅜

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

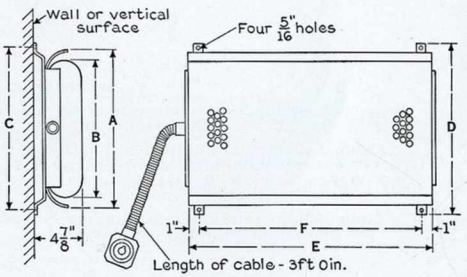


Fig. 2

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.

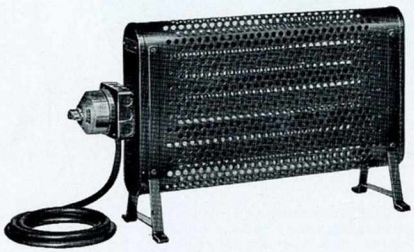


Fig. 3

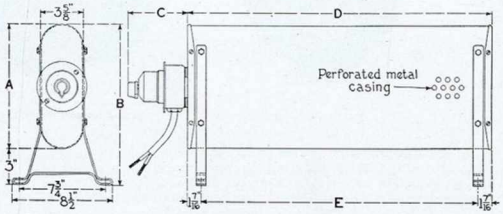


Fig. 4

Watts	CAT. NO. 115 Volts	CAT. NO. 230 Volts	Price	CAT. NO. 440 Volts	Price	Approx Ship. Wt in Lb	DIMENSIONS IN INCHES (See Fig. 4) A	B	C	D	E
1000	54X146	54X147	**$20.00**	2A196	**$24.00**	25	7¾	10¾	4¼	25⅝	22¾
2000	2A194	54X149	**27.00**	2A112	**31.00**	33	10 7/16	13 7/16	5	25⅝	22¾
3000	.....	54X151	**34.00**	2A113	**38.00**	40	14¼	17¼	5¼	25⅝	22¾
4500	.....	2A168	**45.00**	2A114	**49.00**	50	14¾	17¾	5¾	32¼	29⅝

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		4386917G102	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. 4980281G18, 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

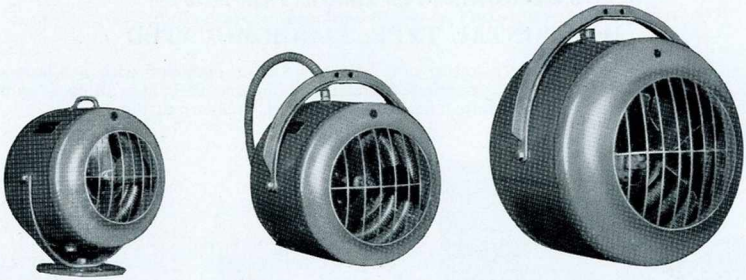


Fig. 1
G-E forced-convection unit air heaters

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 manyfold. 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. * Single-phase, 50/60 Cycles, A-c		Price	Ship. Wt in Lb	Dimensions See Fig.	Approximate Conditions under Normal Operation					
	115 Volts	* 230 Volts				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 Inlet	TEMP DEG F 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.

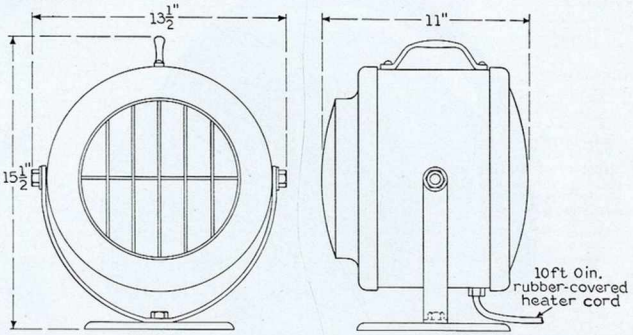


Fig. 3

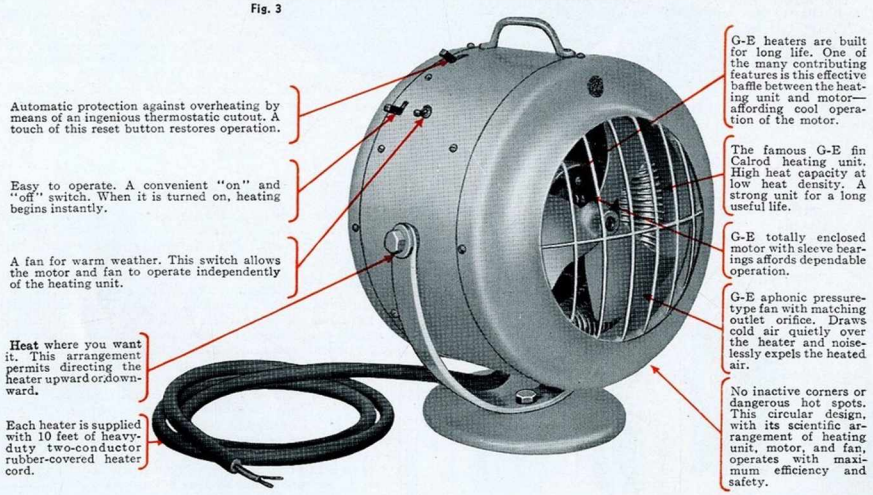


Fig. 4

For control equipment, see page 29.

G-E UNIT HEATERS

FORCED-CONVECTION TYPE

Suspension Style—For Wall or Ceiling Mounting

Kw	CAT. NO. * 230 Volts Single-phase 50/60 Cycles A-c	CAT. NO. * 230 Volts Three-phase 50/60 Cycles A-c	△ Price	Ship. Wt in Lb	Approximate Conditions under Normal Operation: 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: Inlet	Outlet	DIMENSIONS IN INCHES (See Fig. 6): A	B	C	D	E	F	G	H
5	2A177G27	.....	**$75**	80	17,060	71.1	894	536	70	115	1½	¾	½	10 5/16	17¼	3/16	15	13¾
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	5/8	14 3/8	25 1/8	¼	22	19½
12.5	.....	2A202	**135**	150	42,650	178	1753	1565	70	106								
15	.....	2A203	**145**	160	51,180	213	1782	1590	70	112								

△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 elements, 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.

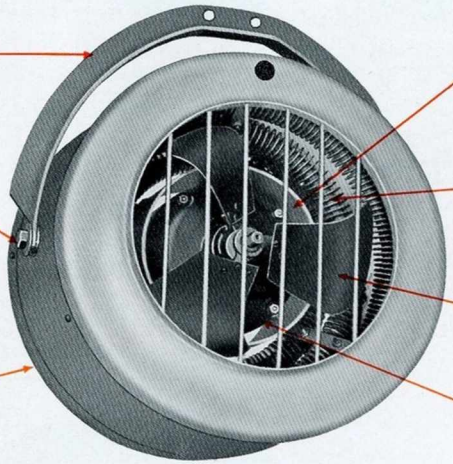


Fig. 5

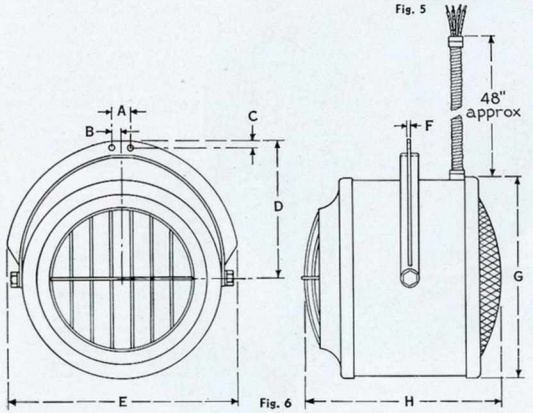


Fig. 6

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	Tumbler switch included on heater housing	CR7865-Z1A	CR7865-C1A2	4386917G102	CR7865-Z1A plus adapter plate	4386917G102	4980281G18	None	Tumbler switch included on heater housing
2A174G30			CR7865-C1A5	None		4988126C3		None	
2A175G23			CR7865-C1A2	4386918G102		4386918G102		4386918G102	
2A175G30				None		4986311A3		None	
2A176G30				4386917G103		4386917G103		None	
2A177G27	Trumbull Cat. No. 20221. Price **$3.60**		CR7865-C1A5	4386917G103		4386917G103		4386917G103	Trumbull Cat. No. 2328 Price **$1.60**
2A178G27	Trumbull Cat. No. 20222. Price **$6.00**			4386918G103		4386918G103		4386918G103	

* 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. 4980281G18, 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 **9.20**
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

Fig. 9
Magnetic switch

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

MAGNETIC SWITCH

Cat. No.	Price	Cat. No.	Price
4386917G102	**$12**	4986311A3	**$9**
4386917G103	**12**	4988126C3	**7**
4386918G102	**23**	4383134G103	**25**
4386918G103	**23**	4988126C2	**7**

D. Thermostat Cat. No. 4980281G18 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.*

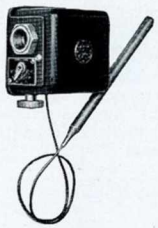


Fig. 10
Thermostat
Cat. No. 4980281G18

Fig. 11
Relay

Fig. 12
Push-button station

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

Fig. 14
Trumbull
Cat. No. 2328

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	19½	12	2½
2.55	110	3884886G1	**12.30**	28	19½	12	2½
3.8	110	1908371G1	**14.75**	35	26 5/16	12	2½
5.0	220	3884887G1	**16.50**	40	33⅛	12	2½
2.5	110	1908370G1	**17.90**	45	36½	12	2½
FOR INDUSTRIAL OVENS OPERATING FROM 750 TO 1150 F							
1.8	110	3884885G2	**$22.00**	28	19½	12	2½
2.55	110	3884886G2	**23.00**	28	19½	12	2½
3.8	110	1908371G13	**26.25**	35	26 5/16	12	2½
5.0	220	3884887G2	**28.00**	40	33⅛	12	2½

* 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.

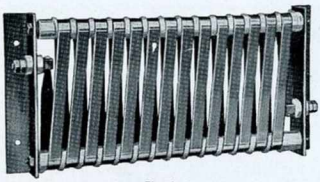


Fig. 1
Form G heater to be mounted on feet for floor mounting or on straps for wall mounting

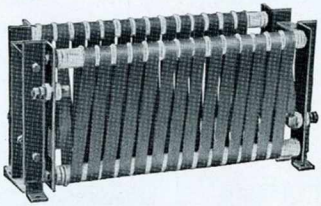


Fig. 2
Two Form G heaters mounted together on floor supports

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

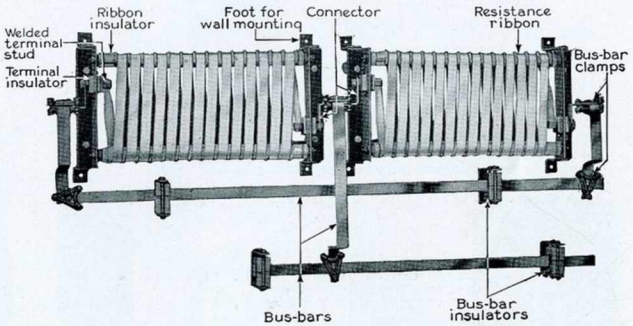
This heater has been designed for use in large japanning and enameling ovens where a low-gradient heater is required. This heater costs somewhat more than other heaters and should be used only where low gradient is necessary.

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 supported 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.

CAPACITY IN LB (Approx)				Volts	Cat. No.	* Price	Approx Ship. Wt in Lb	WATTAGE			Approx Dimensions in Inches				SINGLE HEATING UNITS (See dimensions below)			
50/50 Solder	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	2881146G3	**$32.50**	50	750	....	....	6	4	9	10	750	4X994	**$18.25**	12
28	35	†	25	115	2881146G2	**32.50**	50	750	....	....	6	4	9	10	750	4X993	**18.25**	12
28	35	33	25	230	2881146G5	**32.50**	50	1000	....	....	6	4	9	10	1000	4X996	**19.75**	12
28	35	33	25	115	2881146G4	**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	18¾	20½	2000 3000	297553 297555	**25.25** **31.00**	30 30
330	425	390	270	115	2666407G2	**136.00**	250	5000	3000	2000	12	9	18¾	20½	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. 2881146G4 or Cat. No. 2881146G5.

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

Cat. No. of Unit	DIMENSIONS IN INCHES (FIG. 2)					Volume in Cu. In.
	A	B	C	D	E	
4X994 4X993 4X996 4X995	5½	4½	2½	1½	2½	26

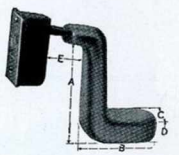


Fig. 2
Type of cast-in immersion unit used with metal-melting pots illustrated by Fig. 1

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

Cat. No. of Unit	DIMENSIONS IN INCHES (FIG. 4)					Volume in Cu. In.
	A	B	C	D	E	
297551 297549 297550 297548	8¼	7 5/16	1⅜	2	3¾	36
297555 297553 297554 297552	11½	11	2⅜	2¾	4¼	96

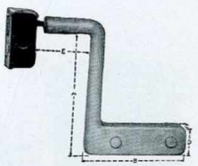


Fig. 4
Type of cast-in immersion unit used with metal-melting pots illustrated by Fig. 3

For control equipment, see page 48.

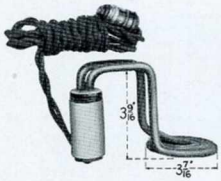
G-E METAL-MELTING POTS

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		
							INSIDE		OUTSIDE				
50/50 Solder	Lead						Diam	Depth	Diam	Depth	Cat. No.	Price	Approx Ship Wt in Lb
12	16	115	3887185G2	**$18.50**	18	550	4¼	3⅞	9	6½	48X260	**$7.50**	3
12	16	230	3887185G3	**18.50**	18	550	4¼	3⅞	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		△HEATING UNIT	§CORD AND PLUG
					Diam	Depth	Diam	Depth	Price	Price
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 Ship. Wt in Lb	Fig. No.	APPROX DIMENSIONS IN INCHES					
						A	B	C	D	E (Should be specified when ordering)	Volume in Cu In.
5000	115	15X736	**$42.00**	40	1	12¼	16	2⅜	3	4 min to 9 max	135
5000	† 230	15X737	**42.00**								
5000	115	297560	**42.00**	55	1	19¼	16	2⅛	4	5¾ min to 8 max	180
5000	† 230	297561	**42.00**								
5000	† 230	64X61	**42.00**	45	1	24⅝	16	1⅜	3⅛	5¾ min to 9 max	145
5000	† 230	15X596	**42.00**	32	1	7¾	22	1⅜	3½	4½ min to 8½ max	104
5000	† 230	64X62	**42.00**	55	1	10¼	26	4	2⅜	4½ min to 8½ max	180
2000	115	39X79	**25.25**	15	3	4⅛	7	2½	1½	4¼ min to 5 max	40
2000	230	39X80	**25.25**								
1500	115	39X65	**22.50**	13	2	2	8½	3¼	2	.....	27
1500	230	39X66	**22.50**								
2200	115	39X67	**26.50**	17	2	2	12½	3¼	2	.....	41
2200	230	39X68	**26.50**								
3000	115	39X69	**31.00**	22	2	2	18	3¼	2	.....	57
3000	230	39X70	**31.00**								
4000	440	3A177	**38.00**	35	2	2 1/16	24	△	3	.....	121
5000	† 230	29X741	**42.00**	32	4	13¾	7	....	10⅝	4½ min to 9 max	100
5000	† 230	29X742	**42.00**	35	5	18½	7	....	10⅝	4½ to min 9 max	110
10000	† 230	29X743	**70.00**	60	6	19	9	....	11	4½ 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.

△This unit has a square mounting flange—3⅜ in. square. The four bolt holes are on a 4⅛-in. circle and are 9/16 in. in diameter.

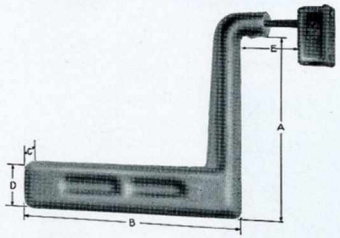


Fig. 1

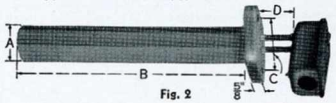


Fig. 2

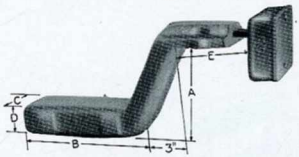


Fig. 3

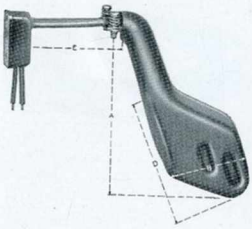


Fig. 4

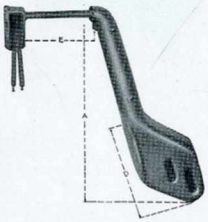


Fig. 5

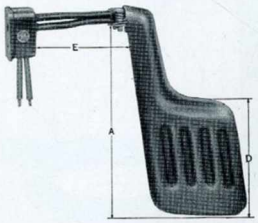


Fig. 6

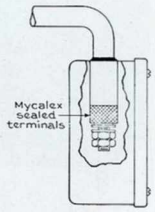


Fig. 7

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 temperature-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**	4¾	6 1/16	6
1	230	70	1	269855	**16.00**	4¾	6 1/16	6
2	115	90	1	259989	**18.00**	5½	7¼	7
2	230	90	1	259991	**18.00**	5½	7¼	7
4	115	140	1	259994	**21.00**	7⅜	9⅛	8 5/16
4	230	140	1	259996	**21.00**	7⅜	9⅛	8 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	6¼	7¼	45	145
1	230	75	150	300	2	280487	**18.00**	**16.75**	25	6¼	7¼	45	145
2	115	115	230	460	2	280488	**20.00**	**18.75**	28	8¼	8¼	40	145
2	230	115	230	460	2	280489	**20.00**	**18.75**	28	8¼	8¼	40	145
4	115	165	330	660	2	280490	**24.00**	**22.75**	40	8½	11	60	145
4	230	165	330	660	2	280491	**24.00**	**22.75**	40	8½	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**	5¼	7¼	7
1	150	230	6A126G2	**18.00**	**16.75**	5¼	7¼	7
2	250	115	6A111	**20.00**	**18.75**	7¼	7¼	8
2	250	230	6A111G2	**20.00**	**18.75**	7¼	7¼	8
4	350	115	6A139	**24.00**	**22.75**	9	8¾	10
4	350	230	6A139G2	**24.00**	**22.75**	9	8¾	10

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

Fig. 1
G-E automatic gluepot

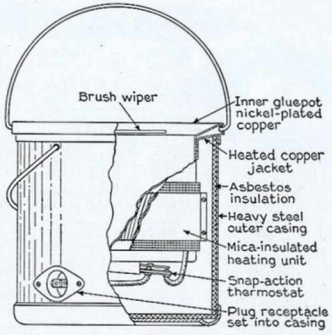


Fig. 2
Construction details of G-E automatic gluepot

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.

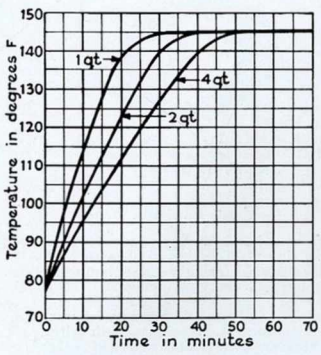


Fig. 3

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, calorized 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	WEIGHT Ship. in Lb
FOR LIGHT DUTY							
7/16	100	I-80	43X700	115	**$4.95**	17	1½
7/16	100	I-80	43X701	230	**4.95**	17	1½
½	75	I-75	291880	115	**5.25**	17	1½
½	75	I-75	291882	230	**5.25**	17	1½
FOR INTERMITTENT DUTY							
¾	100	I-76	291883	115	**$5.80**	18	1½
¾	100	I-76	291885	230	**5.80**	18	1½
1	150	I-77	291886	115	**6.45**	27	2¼
1	150	I-77	291888	230	**6.45**	27	2¼
FOR HEAVY DUTY							
1	225	I-78	291889	115	* **$9.70**	27	4½
1	225	I-78	291891	230	* **9.70**	27	4½
1¼	350	I-79	291892	115	* **11.70**	38	5¼
1¼	350	I-79	291894	230	* **11.70**	38	5¼

* 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.

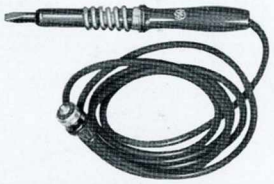


Fig. 2
Typical light-duty soldering iron, Type I-80

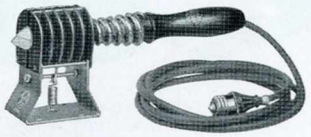


Fig. 3
Typical heavy-duty soldering iron, Type I-78 or I-79, with radiating stand. (These irons should be placed in radiating stand as shown when connected but not in use. Such precaution will promote longer life of heating unit and tip.)

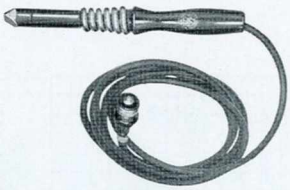


Fig. 1
Typical light- or intermittent-duty soldering iron, Type I-75, I-76, or I-77

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.

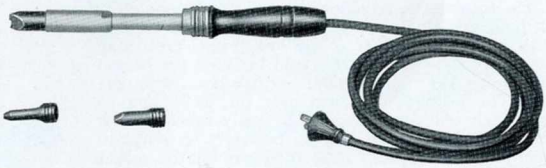


Fig. 4
Type CI soldering iron. Complete iron shown is Cat. 6A108 with ¾-in. tip. Other irons are the same except for tip sizes and electrical ratings.

G-E SOLDERING IRONS

Type CI Soldering Irons

* Diam of Tip in In.	Watts	Type No.	Cat. No.	Volts	Price	WEIGHT IN OZ Net	WEIGHT IN OZ Ship.
3/16	80	CI-80	6A106	115	**$4.30**	17	22
3/8	80	CI-80	6A106G2	230	**4.30**	17	22
1/2	90	CI-75	6A107	115	**4.30**	18	23
1/2	90	CI-75	6A107G2	230	**4.30**	18	23
3/4	110	CI-76	6A108	115	**4.30**	19	24
3/4	110	CI-76	6A108G2	230	**4.30**	19	24

* 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.

Soldering Irons for Extra-heavy Duty

Diam of Tip in In.	Watts	Cat. No.	Volts	Price	Net Wt in Lb
1 3/16	650	63X535	115	**$25.00**	6
1 3/8	650	3A101	230	**25.00**	6
2	1250	6A113	115	**45.00**	8 1/2
2	1250	6A113G2	230	**45.00**	8 1/2

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, unbraze it from the heating head and braze (silver solder) on a new one.

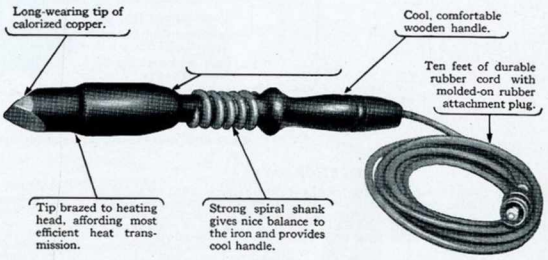


Fig. 5
Typical extra-heavy-duty G-E soldering iron

G-E SOLDERING IRONS

RENEWAL PARTS

Complete Irons Cat. No.	HEATING UNITS Cat. No.	HEATING UNITS Price	† TIPS Cat. No.	† TIPS Price	CORD AND PLUG Cat. No.	CORD AND PLUG Price	RADIATING OR SUPPORTING STAND Cat. No.	RADIATING OR SUPPORTING STAND Price	HANDLE SUPPORT Cat. No.	HANDLE SUPPORT Price	HANDLE Cat. No.	HANDLE Price	INSULATING BEADS Cat. No.	INSULATING BEADS Price	LEAD CLAMPING SCREW Cat. No.	LEAD CLAMPING SCREW Price	LEAD CONNECTION INSULATORS Barrier Between Leads Cat. No.	LEAD CONNECTION INSULATORS Barrier Between Leads Price	LEAD CONNECTION INSULATORS Tube Covering Connection Cat. No.	LEAD CONNECTION INSULATORS Tube Covering Connection Price
291880	174-H‡	**$2.35**	561352	**$0.90**		**$0.60**	2575987P2	**$0.20**	2576902P2	**$0.70**	2575968P2	**$0.35**		**$0.03**	5215157P4	**$0.05**		**$0.05**		**$0.05**
291882	174-X‡	**2.35**	561352	**.90**		**.60**	2575987P2	**.20**	2576902P2	**.70**	2575968P2	**.35**		**.03**	5215157P4	**.05**		**.05**		**.05**
291883	175-H‡	**2.85**	561353	**.90**		**.60**	2575987P2	**.20**	2576902P2	**.70**	2575968P2	**.35**		**.03**	5215157P4	**.05**		**.05**		**.05**
291885	175-X‡	**2.85**	561353	**.90**		**.60**	2575987P2	**.20**	2576902P2	**.70**	2575968P2	**.35**		**.03**	5215157P4	**.05**		**.05**		**.05**
291886	176-H‡	**3.20**	561354	**1.20**		**.60**	2575987P2	**.20**	2576901P2	**.75**	2576911P2	**.45**		**.03**	5215157P2	**.05**		**.05**		**.05**
291888	176-X‡	**3.20**	561354	**1.20**		**.60**	2575987P2	**.20**	2576901P2	**.75**	2576911P2	**.45**		**.03**	5215157P2	**.05**		**.05**		**.05**
291889	177-H‡	**3.20**	2580786	**1.00**		**.60**	2576903G1	**3.00**	2576901P2	**.75**	2576911P2	**.45**		**.03**	5215157P2	**.05**		**.05**		**.05**
291891	177-X‡	**3.20**	2580786	**1.00**		**.60**	2576903G1	**3.00**	2576901P2	**.75**	2576911P2	**.45**		**.03**	5215157P2	**.05**		**.05**		**.05**
291892	178-H‡	**3.50**	561359	**1.50**		**.60**	2576904G1	**3.80**	2576901P3	**.95**	2576911P2	**.45**		**.03**	5215157P2	**.05**		**.05**		**.05**
291894	178-X‡	**3.50**	561359	**1.50**		**.60**	2576904G1	**3.80**	2576901P3	**.95**	2576911P2	**.45**		**.03**	5215157P2	**.05**		**.05**		**.05**
43X700	183-H‡	**2.35**	3920240	**.30**		**.60**	2575987P2	**.20**	3902158P21	**.70**	3902157P21	**.35**		**.03**	5215157P4	**.05**		**.05**		**.05**
43X701	183-X‡	**2.35**	3920240	**.30**		**.60**	2575987P2	**.20**	3902158P21	**.70**	3902157P21	**.35**		**.03**	5215157P4	**.05**		**.05**		**.05**
6A106	3A73	**2.50**	5215147	**.30**		**.60**	2575987P2	**.20**	5204181G1	**.95**	5222391	**.35**		**.10**	5215157P1	**.05**		**.05**		**.05**
6A106G2	3A74	**2.50**	5215147	**.30**		**.60**	2575987P2	**.20**	5204181G1	**.95**	5222391	**.35**		**.10**	5215157P1	**.05**		**.05**		**.05**
6A107	3A75	**2.50**	5215148	**.30**		**.60**	2575987P2	**.20**	5204181G1	**.95**	5222391	**.35**		**.10**	5215157P1	**.05**		**.05**		**.05**
6A107G2	3A76	**2.50**	5215148	**.30**		**.60**	2575987P2	**.20**	5204181G1	**.95**	5222391	**.35**		**.10**	5215157P1	**.05**		**.05**		**.05**
6A108	3A77	**2.50**	5215149	**.30**		**.60**	2575987P2	**.20**	5204181G1	**.95**	5222391	**.35**		**.10**	5215157P1	**.05**		**.05**		**.05**
6A108G2	3A78	**2.50**	5215149	**.30**		**.60**	2575987P2	**.20**	5204181G1	**.95**	5222391	**.35**		**.10**	5215157P1	**.05**		**.05**		**.05**
63X535	3A173	**14.50**	3952837	**2.70**		**.90**	None	.....	2576901P3	**.95**	5222308P1	**.45**		**.03**	5215157P3	**.05**		**.05**		**.05**
3A101	3A173G2	**14.50**	3952837	**2.70**		**.90**	None	.....	2576901P3	**.95**	5222308P1	**.45**		**.03**	5215157P3	**.05**		**.05**		**.05**
6A113	3A179	**23.00**	5236601	**4.00**		**.90**	None	....	5239713P21	**1.20**	5239710P21	**.60**		**.03**	5215157P3	**.05**		**.05**		**.05**
6A113G2	3A179G2	**23.00**	5236601	**4.00**		**.90**	None	.....	5239713P21	**1.20**	5239710P21	**.60**		**.03**	5215157P3	**.05**		**.05**		**.05**

Cord and plug: 52223091P1 (6A106, 6A106G2, 6A107, 6A107G2, 6A108, 6A108G2, 63X535, 3A101, 6A113, 6A113G2); 52223091P2 (291880, 291882, 291883, 291885, 291886, 291888, 291889, 291891, 291892, 291894, 43X700, 43X701, 3A73, 3A74, 3A75, 3A76, 3A77, 3A78, 3A173, 3A173G2, 3A179, 3A179G2).

Insulating beads: 1592840 (291880, 291882, 291883, 291885, 291886, 291888, 291889, 291891, 291892, 291894, 43X700, 43X701, 3A73, 3A74, 3A75, 3A76, 3A77, 3A78, 3A173, 3A173G2, 3A179, 3A179G2); *1592840 (6A113, 6A113G2).

Barrier between leads: 5215490 (291880, 291882, 291883, 291885, 291886, 291888, 291889, 291891, 291892, 291894, 43X700, 43X701, 3A73, 3A74, 3A75, 3A76, 3A77, 3A78, 3A173, 3A173G2, 3A179, 3A179G2).

Tube covering connection: 5236075 (291880, 291882, 291883, 291885, 291886, 291888, 291889, 291891, 291892, 291894, 43X700, 43X701, 3A73, 3A74, 3A75, 3A76, 3A77, 3A78, 3A173, 3A173G2, 3A179, 3A179G2).

Lead clamping screw: 5215153P1 (6A106, 6A106G2, 6A107, 6A107G2, 6A108, 6A108G2); 3960615P31 (63X535, 3A101); 5236077 (6A113, 6A113G2).

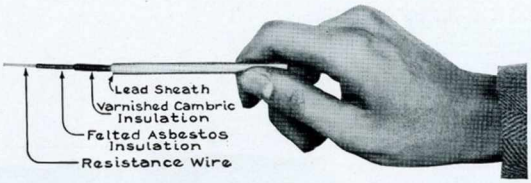
* This iron also has a heating-unit-head insulator, which covers the leads immediately adjacent to the head. This insulator is Cat. No. 3974435. Price **$0.25**.
† G-E lubricating paint A-58, listed on page 17, greatly facilitates the easy removal of soldering-iron tips.
‡ Symbol No.; *not* Cat. No.

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

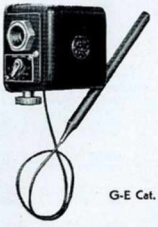
Finished Diameter: .240 in.

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



G-E Cat. No. 4980281G18 thermostat

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 6⅝ in. long by $\frac{1}{16}$ in. in diam. The capillary tube is 18 in. long.

Heating cable applied to pipe line carrying molasses

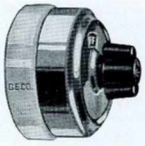
Heating cable installed in a greenhouse bench

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

3-heat snap switch

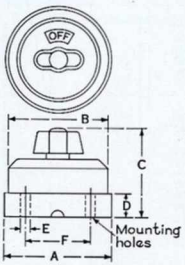


Fig. 1
Single-heat

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	$\left(\frac{W_1 \times W_2}{W_1+W_2}\right)$

* 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

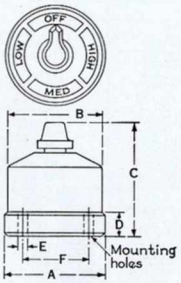
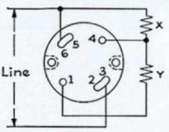


Fig. 2
Three-heat

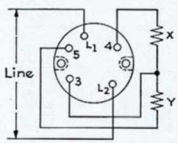
Circuits	Fig. No.	Cat. No.	Amp	Volts	DIMENSIONS IN INCHES A	B	C	D	E	F	Price
Single-heat	1	60451	10	250	2 13/32	2 9/32	1 15/16	9/16	3/16	1 1/2	$1.00
Three-heat	2	29X924	7 1/2 15	250 125	2 1/4	2 1/8	2 11/16	1/2	5/32	1 5/8	1.50
Three-heat	2	278607	10 30	250 125	2 13/16	2 11/16	3 1/16	5/8	3/16	2 1/16	2.40
Three-heat	2	278610	30 50	250 125	3 3/4	3 17/32	3 17/32	1 9/32	1/4	2 3/4	4.50

CONNECTION DIAGRAMS FOR THREE-HEAT SWITCHES

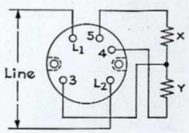
Cat. No. 29X924



Cat. No. 278607



Cat. No. 278610



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) Volts	HEATER CIRCUIT (60 Cycles Where A-c) Phase	Control Circuit, Volts (Single-phase 60 Cycles Where A-c)	Thermostat, Price and Specifications	MAGNETIC SWITCH Cat. No.	MAGNETIC SWITCH Price	Fusible Line-disconnection Switch	Wiring Diagram, See Fig.
0–25	115 a-c	1	115 a-c		none	.....		1
0–22	115 a-c	3	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		4383134G102	**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 -ac		none	.....		1
0–22	230 a-c	3	230 a-c		3885954G103	**13.00**	See table below	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 △		† 4981364G102	**13.00**		3
22–45	440 a-c	1 or 3	115 a-c △		† 2241537G102	**25.00**		3
45–70	440 a-c	1 or 3	115 a-c △	See pages 42 to 47	† 4388311G102	**43.00**		3
70–135	440 a-c	1 or 3	115 a-c △		† 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
23–36	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.

△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.

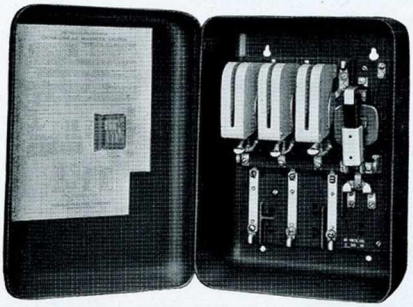
Magnetic Switch (440 Volts, A-c)	Kva Rating of Transformer for 110-volt Control Circuit	Transformer Cat. No. 440/110 Volts, 60 Cycles	Price
4981364G102	0.100	71G27	**$5.80**
2241537G102	0.150	71G28	**7.40**
4388311G102	0.500	61G20	**13.80**
4981365G2	1.500	61G30	**27.50**

Fusible Line-disconnection Switch

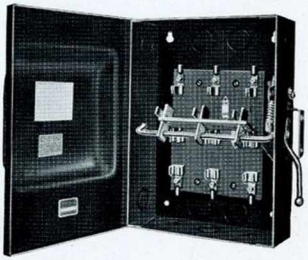
Heater Circuit, Amperes	Volts	Phase	FUSIBLE LINE-DISCONNECTING SWITCH Trumbull Cat. No.	FUSIBLE LINE-DISCONNECTING SWITCH Price
0–25	115 to 230	1	40221	**$4.00**
25–50	115 to 230	1	40222	**6.90**
50–80	115 to 230	1	40223	**12.00**
80–160	115 to 230	1	40224	**16.50**
0–25	115 to 230	3	40321	**5.10**
25–50	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 swtich

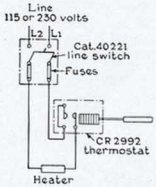


Fig. 1

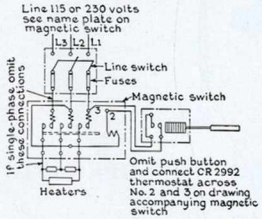


Fig. 2

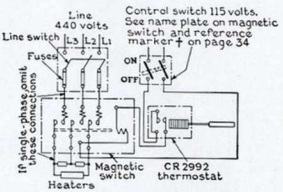


Fig. 3

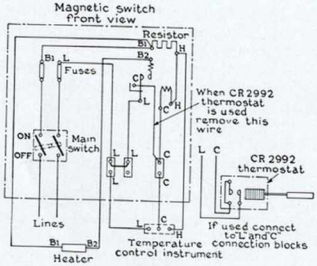


Fig. 4

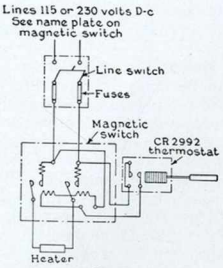


Fig. 5

G-E CONTROL EQUIPMENT

AUTOMATIC

Thermostat, with Temperature-setting Indicator

For Use with Industrial Heating Units

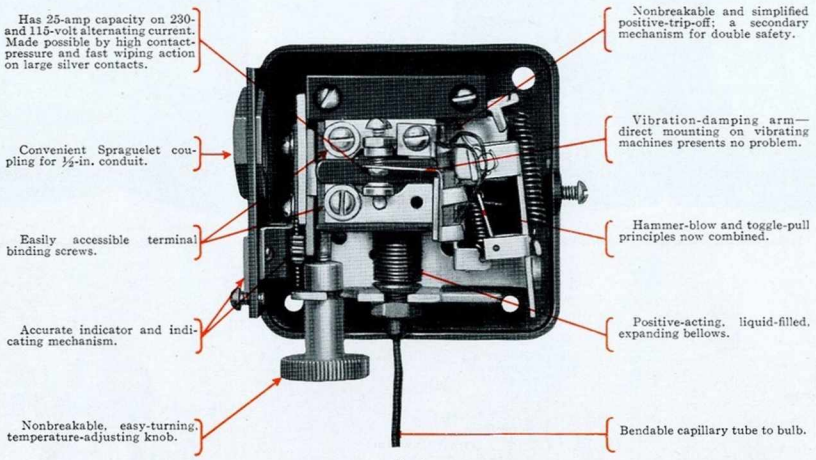


Fig. 1

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 CR2922 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

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. (See Dimen. "P" (Fig. 2)	Diameter of Bulb in In. (See Dimen. "C" (Fig. 2)	CR2992-R1 (Normally Closed Contacts) CAT. NO. DETERMINED BY LENGTH OF CAPILLARY TUBE, SEE DIMENSION "D," FIG. 2				Price	Approx Ship. Wt in Lb
Min.	Max.				D..8 in.	D..25 in.	D..60 in.	D.120 in.		
65	135	ϕ 4.5	7 1/4	1/4	4980281G16	4980281G111	4980281G62	4980281G34	$12	3
120	190	ϕ 4.5	7 1/8	1/2	4980281G112	4980281G113	4980281G114	4980281G115	12	3
170	240	ϕ 4.5	7 1/8	1/2	4980281G116	4980281G117	4980281G118	4980281G119	12	3
220	290	4.5	7 1/8	1/2	4980281G120	4980281G121	4980281G122	4980281G123	12	3
270	370	ϕ 6.5	7 1/4	1/4	4980281G124	4980281G125	4980281G126	4980281G127	12	3
350	450	ϕ 6.5	7 1/8	1/2	4980281G128	4980281G129	4980281G130	4980281G131	12	3
430	530	ϕ 6.5	7 1/8	1/2	4980281G132	4980281G133	4980281G134	4980281G135	14	3
500	600	ϕ 6.5	7 1/8	1/2	4980281G136	4980281G137	4980281G138	4980281G139	14	3
30	120	ϕ 6.5	6 3/4	7/16	4980281G90	4980281G49	4980281G54	4980281G38	12	3
70	175	ϕ 6.5	6 5/8	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 5/8	7/16	4980281G99	4980281G100	4980281G101	4980281G102	12	3
320	470	ϕ 9.5	6 5/8	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	5/8	.....	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 babbitt, 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 §250 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 Non-inductive	§ AMPERES Inductive	△ Condenser Capacity, Microfarads	§ Volts D-c	§ AMPERES Non-inductive	§ AMPERES Inductive	△ Condenser Capacity, Microfarads
32	0–20	0–5	None	230	0–0.25	0.10	None
115	0–0.5	0–0.25	None		0.25–0.7	.....	1/4
	0.5–1.5	.....	1/4		0.7–1.5	.....	1/2
	1.5–3	.....	1/2		1.5–2.5	.....	1
	3–5	.....	1				
	5–8	.....	2				

§ 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.

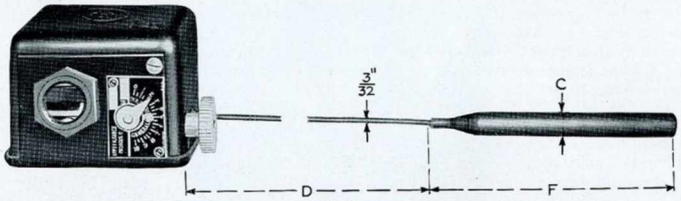


Fig. 2

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

Dimensions

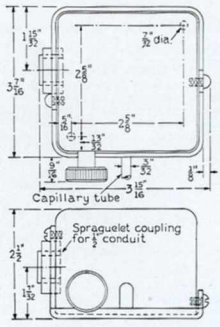


Fig. 3

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
Cat. No. 4980281G107 to 4980281G110, incl
Cat. No. 4980281G132 to 4980281G139, incl
} Price *$6.50*

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.

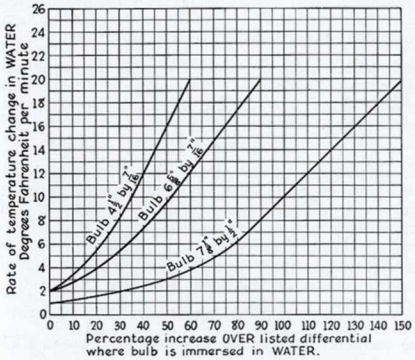


Fig. 4

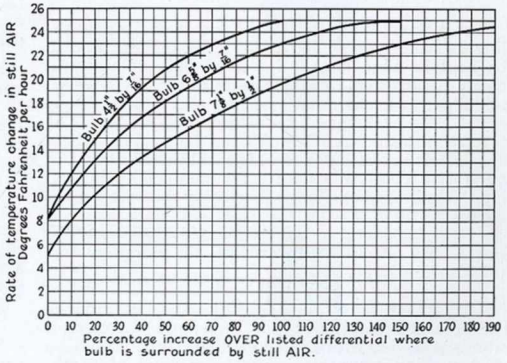


Fig. 5

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.

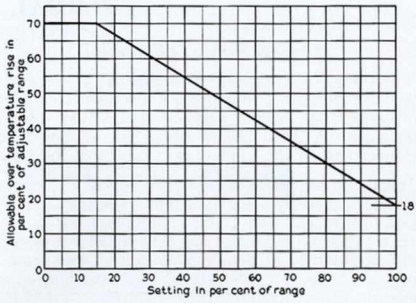


Fig. 6

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 $\frac{7}{16}$, $6\frac{5}{8}$ 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 ½-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 $\frac{9}{16}$-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.

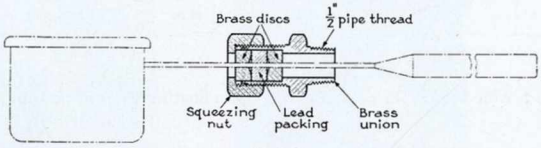


Fig. 7

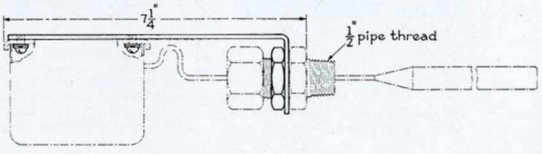


Fig. 8

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	WATTAGE 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	Three-heat Control					
	Cat. No. of Switch	Price	No. Required for Each Pot	WATTAGE High	WATTAGE Medium	WATTAGE 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

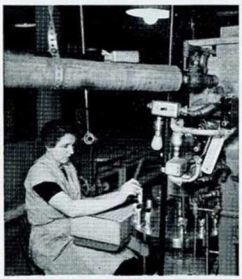
For Melting Pot Cat. No.	Control Panels					
	115 VOLTS, 60 CYCLES, SINGLE-PHASE, A-C		230 VOLTS, 60 CYCLES, SINGLE-PHASE, A-C		230 VOLTS, D-C	
	Cat. No.	Price	Cat. No.	Price	Cat. No.	Price
2881146G3 or 2881146G5	.....	.....	4388473G3	**$37.00**	3656232G3	**$40.00**
2881146G2 or 2881146G4	4388473G2	**$37.00**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

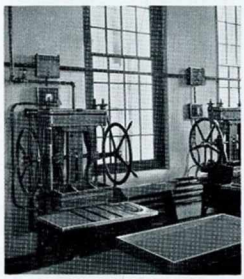
G-E HEATING UNITS AND DEVICES

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

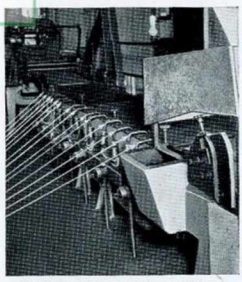
In the Geometric Stamping Company's plant, Cleveland, eight "Strips of Heat" in this oven supply, at low cost, heat for baking emery dust onto polishing wheels. Note the simplicity of the installation.

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.

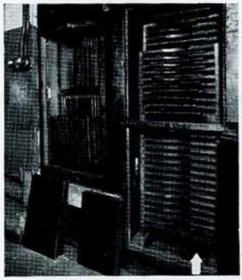
HEATING CLEANING TANKS

"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.



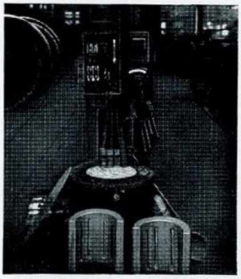
IMPREGNATING WAXES

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.

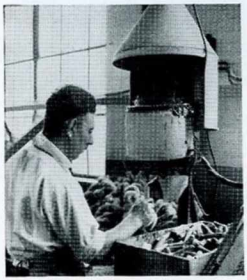


SOFT-METAL MELTING

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

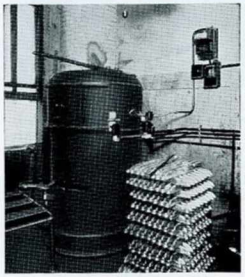
CAN SOLDERING

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.



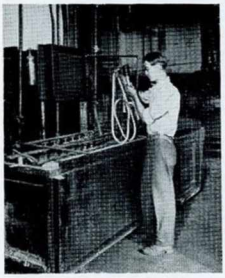
CEMENTING BRUSH HANDLES

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.



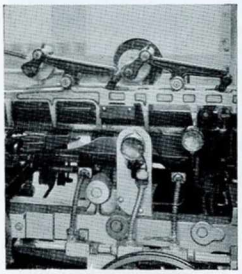
REPIGGING TYPE METAL

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.



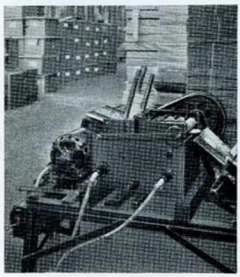
PLATING TANKS

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.



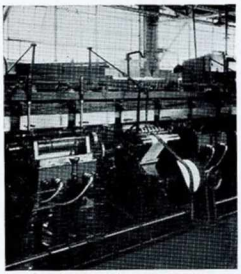
PACKAGING MACHINERY

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



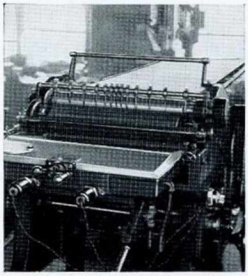
MELTING PARAFFIN

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

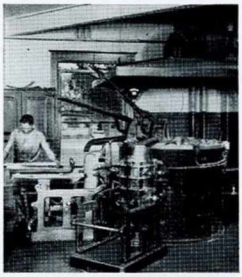
Why go to the expense of extending steam lines to isolated offices like this? An inexpensive air heater will keep you comfortably warm all winter long.

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.

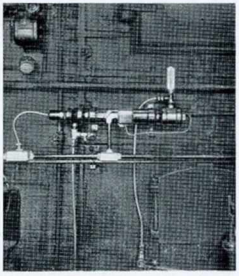
TRADE-MARKING PRODUCTS

"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 = wt in lb × specific heat × temp rise in deg F = 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	..	....	...
Copper	.10	75	1981	550
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	.453	....
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

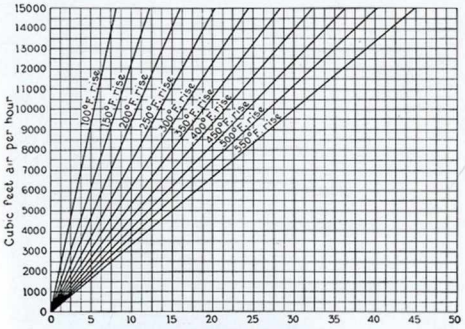


Fig. 1—Air heating
Curve based on specific heat of 0.237, and weight of 0.08 lb per cu ft—air at 70 F

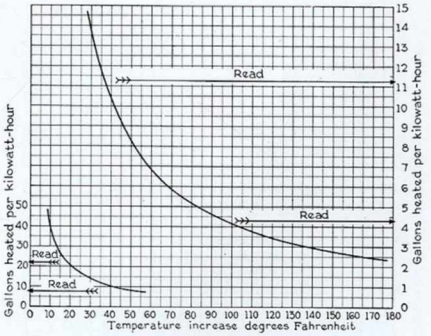


Fig. 2—Water heating
Curve based on 100 per cent efficiency

USEFUL INFORMATION

HEAT LOSSES

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

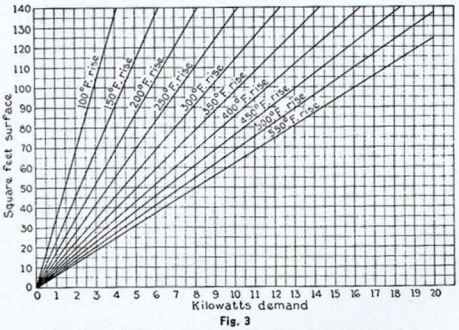


Fig. 3

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, Filinsul, etc. If insulation is 2 in. thick, divide curve valves by 2; if 4 in. thick, divide by 4, etc.

Heat Losses from Molten-metal Surfaces

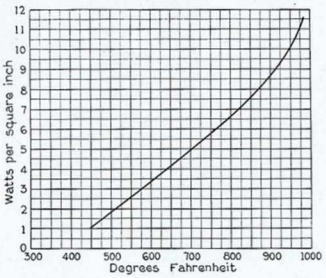


Fig. 5
Heat losses for lead, tin, type metal, babbitt, etc.

Heat Losses from Surfaces of Oil Baths

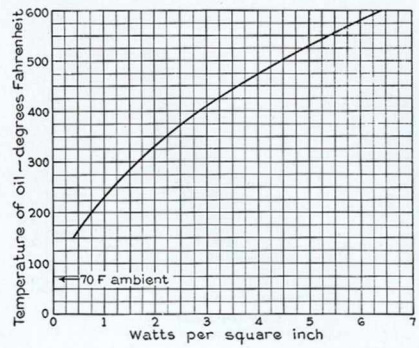


Fig. 6

Heat Losses from Vertical, Solid, Smooth Surfaces

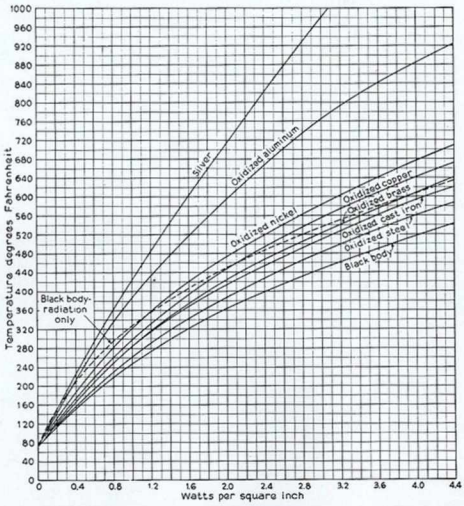


Fig. 4

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

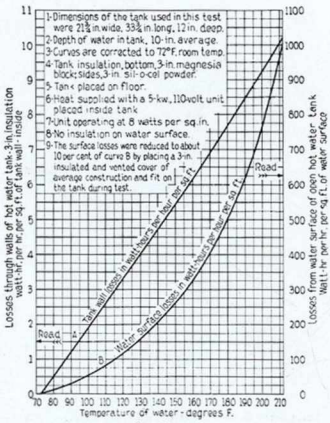


Fig. 7

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.

$$\frac{200 \times .12\ (250 - 70)}{3412} = 1.27 \text{ kw-hr}$$

4 changes of air = $4 \times 2 \times 3 \times 3 = 72$ cu ft per charge

$72 \times .08$ 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 $2 \times 3 \times 1\frac{1}{2} = 9$ 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 consists 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 = $(1.8 \times \text{Deg C}) + 32$

Deg Centigrade = $.555\ (\text{Deg F} - 32)$

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

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

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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
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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

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SCHENECTADY, N. Y.

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