V V V

P S

PERFECT SYSTEM

"B"

VAPOR VACUUM PRESSURE

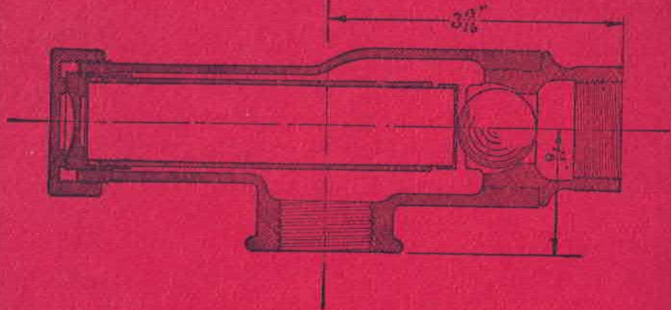
3 SYSTEMS IN ONE

O-E Specialty Manufacturing Co.

General Offices and Works

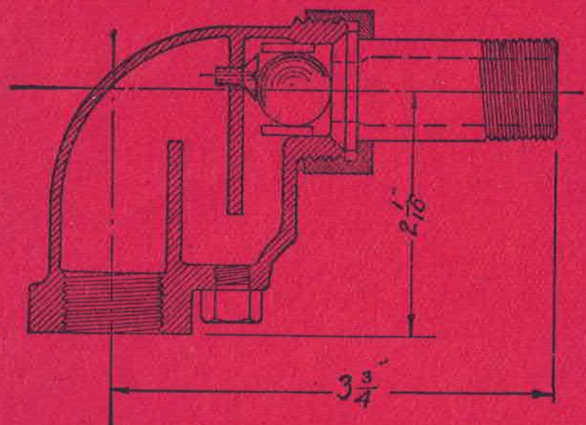
MILWAUKEE, WIS., U. S. A.

Patented



Exhauster and Vacuum Valve

Patent Pending



Roughing-in Dimensions

The Water Seal in the "O-E" return Fitting positively prevents vapor from short circuiting into the air line return after air is eliminated and the exhauster is closed. The very small amount of vapor that may pass through the air vent will condense about as fast as it passes through, which accounts for the fact that "O-E" System air and water return lines are always cool.

THE FITTER MUST OBSERVE THE SUGGESTIONS BELOW

SIMPLE METHOD OF PIPING

HOW TO OBTAIN BEST RESULTS AND ESSENTIAL POINTS TO REMEMBER WHEN INSTALLING THE "O-E" PERFECT SYSTEM

CONNECT all Boiler Supply Tappings, and extend full size of openings **to highest possible point,** then refer to table of pipe sizes, page 7 to determine proper size for main. If necessary to reduce, use reducing ell at this point; **never reduce at the boiler.** Extend main from boiler around building to be heated, pitching down at least one inch to every 15 or 20 feet. This main may be reduced in size as the duty on it grows less, as indicated on typical plan. Where radiators are located considerable distance from boiler two or more mains should be used to equalize the distribution of the vapor; and use full size supply if possible. When main reaches point where first radiator is to be connected use 45° elbow and short nipple, and extend arm **one size larger than riser,** and, while not absolutely necessary, would be well to have riser one size larger than valve opening. **Pitch arms up from main at least 1 inch to 3 feet,** so they will drain back freely.

RETURN AIR LINE

The return air line main **must be started where the first radiator is taken off of supply main.** The riser and arm should be **one size larger** than radiator return openings. Can reduce under floor to ½-in. The main air line return should be extended along with the vapor main, either parallel or below same, from where first radiator is connected, **pitching down** same as vapor main, and properly increased in size to provide for the added duty.

RETURN MAIN CONNECTIONS AT BOILER

Observe carefully method of connecting supply return drip, and air line return. These returns should be at least 28 inches above water line in boiler, where they end, or at point as shown in typical plan, where ells are connected to drop to return at boiler. If possible to have **30 or even 36 inches** between water line and end of return, **do so.** Of course, on a large job, or long main **it is absolutely necessary** to have ample distance between points mentioned to provide for loss in pressure. Where the returns, both drip and air line, connect to return opening in boiler, high grade **"O-E." swing check valves should be used.** See page 11.

"O-E." AIR EXHAUSTER AND VACUUM VALVES

Refer to typical plan and observe that **Air Exhauster must be connected in a horizontal position,** and the opening from pipe to flue should turn down, then piped into smoke flue. While not absolutely necessary to connect in flue, we advise it for the reason that

draught in flue produces a partial vacuum in piping and makes it unnecessary to have pressure in order to expel air from the system. This air exhauster should be adjusted to meet the requirements of the particular system it is used on, in the event it is not properly adjusted when received from us (we try to have it adjusted for ordinary use,) it is a very easy matter to take off the cap and open the set screw a few turns until air is freely expelled, then turn down carefully and slowly, while vapor is on, until vapor is cut off, then put on cap and screw down, which will lock set screw and prevent same getting out of order. This is only necessary **once.**

Note: Use standpipe three sizes larger than return line, (not less than 2½") between air line return and exhauster. See page 10.

CAUTION

While it is possible to connect more than one air line return into one Exhauster **it is safer to use an Exhauster for each line,** as when more than one line is connected, unless all are carrying the same amount of radiation, the one carrying small amount will be relieved of air first and is likely to close Exhauster before others are relieved.

LOW BASEMENT CEILING

Where, owing to lack of room, it is not possible to have distance between water line and end of return as indicated on pages 2 and 10, and the return is too close to water line, the "O-E" trap should be used, and we can furnish same at a very low price if desired. But we recommend having ample distance between water line and end of return so as to avoid the necessity of traps.

"O-E." VALVE CONNECTIONS

Valves may be connected at either end of radiator, but we recommend same end as return, unless the radiator is **three times the length of its height**, in which event we would have opposite end, it should **always** be placed at **top** of radiator.

"O-E." RETURN ELBOW, CHECK VENT AND SEAL

The return elbow should be **carefully connected** and should be level to obtain best results; this will be obvious to good mechanics. This return fitting ½-inch size will handle up to 250 square feet of radiation, therefore no other size need be used, or carried in stock. This little fitting is almost human, and, in the event sediment should collect on seat, the ball will revolve until same is dislodged. You may be sure that if this ball makes a slight noise there is some foreign substance interfering that should be removed, through cleanout opening.

HOW TO ORDER RADIATORS FOR "O-E." SYSTEMS

"Wash thoroughly for vacuum system, plug all openings with wooden plugs, and plug air vent tappings with iron plugs. Tap all radiators at top and ½-inch bottom, same end, unless otherwise specified. Tap eccentric or use eccentric bushings. Use hot water radiation throughout, and be sure to send only radiators that have been cleaned thoroughly of core sand and other foreign matter."

IMPORTANT

Unless all connections, including boiler trimmings, are tight it will be impossible to hold a vacuum a reasonable length of time, and the best feature embodied in the O-E System is thereby lost. A vacuum should be held in the O-E System at least ten hours continuously. We know of many O-E Installations holding a vacuum over thirty hours. The fitter will avoid trouble and expense if the installation is made with reasonable care. Examine Pop Valve and Gauge Connections on the boiler carefully, as they are the source of most trouble in connection with loss of vacuum. (We will supply O-E vacuum proof Pop Valve at a reasonable price if desired.)

NOTE

If all above instructions are carefully followed, and proper amount of radiation and boiler of sufficient capacity used, we positively guarantee that the system will do all we claim for it.

The heating contractor can install the O-E System for *much less* than hot water. His customer will "jump at the chance" to have a Vapor-Vacuum and Pressure System installed at the same price as water; owing to the fact that our "O-E." Perfect System will do all that the regular Vapor or Vacuum system will do, and more, without the complicated and expensive machinery, traps, pumps and adjustable return fittings that are usually out of order.

HELPS SELL OR RENT PROPERTY

Property will sell quicker and bring much better price than if the old style system is used. Best for renting purposes, because more satisfactory to tenants, saves them fuel, will not freeze and nothing to get out of order. Cost of maintenance less than any.

Can be used in the cottage or largest building.

EXTRA FITTINGS

"O-E." Perfect Compound Vacuum and Pressure gauge should be used with this system. We can furnish same, if desired, at lowest market price.

We can furnish the "O-E." Perfect Damper Regulator, for vacuum and pressure, at a very reasonable price if desired.

We can also furnish, when desired, a device that is *absolutely infallible* for returning condensation to the boiler should conditions make the return pipes too close to the water line to return by gravity.

TESTIMONIALS

Can refer to numerous homes, hotels, office buildings, churches, apartment houses, municipal government and other buildings in which "O-E" type system is installed and giving perfect satisfaction.

We do not solicit or contract to do installation work under any circumstances.

EXTRA PRECAUTION

Blow out boiler and clean system before testing apparatus.

Under the terms of our guaranty it is *essential* that the system be tested both by hydraulic and vacuum tests: first, a vacuum of 15 inches should be maintained for at least half an hour, and then a water pressure of at least 50 lbs. for the same length of time.

Boiler must be free from grease as the same will foam and throw water up in vapor mains.

TABLE 1.

Sq. Feet of Radiation	Maximum Length of Main in Feet Including Additions for Fittings									
	ft. 15	ft. 25	ft. 40	ft. 60	ft. 80	ft. 100	ft. 200	ft. 400	ft. 850	ft. 1500
	MAIN SIZES									
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
50	1½	1½	1½	1½	1½	1½	2	2	2	2½
125	1½	1½	1½	1½	1½	2	2	2	2½	2½
200	2	2	2	2	2	2	2	2½	2½	2½
350	2	2	2	2	2	2½	2½	2½	2½	3
400	2	2	2	2	2½	2½	2½	2½	3	3
650	2	2½	2½	2½	3	3	3	3	3	3½
800	2½	2½	3	3	3	3	3	3½	3½	4
1000	3	3	3	3	3	3½	3½	4	4	4
1400	3	3	3	3½	3½	4	4	4	4½	4½
1600	3½	3½	3½	4	4	4	4½	4½	4½	5
2100	4	4	4	4	4½	4½	4½	4½	5	5
2600	4½	4½	4½	4½	4½	4½	4½	5	5	6
3000	4½	4½	4½	5	5	5	5	6	6	6
3500	5	5	5	5	5	6	6	7	7	7
4000	5	6	6	6	6	6	7	7	7	7
4500	6	6	6	6	6	7	7	7	7	8
5000	6	6	6	6	7	7	7	7	8	8
6000	6	6	7	7	7	7	7	8	8	9
8500	7	7	7	7	7	8	8	8	9	9
10000	7	7	8	8	8	9	9	9	9	10

NOTE: When estimating length of main be sure to make allowance to offset resistance in elbows, as follows:

Size Pipe (in.)	1¼	1½	2	2½	3	3½	4	4½	5	6	7	8
45° Elbows (ft.)	2½	2¾	3	3½	4	5	6½	8	10	14	16	18
90° Elbows (ft.)	3	3½	5	6½	7½	9½	12½	15	18	24	30	36

Radiator Connections
1 to 75 sq. ft.—¾x½
75 to 126 sq. ft.—1x½
Above 125 sq. ft. 1¼x½

Supply Risers
See Table 5
Return Risers
See Table 3

NOTE:—All pipe should be figured as radiation; if covered, take ½ of surface, if uncovered, take 2 x surface.

Length of main is distance to farthest radiator. Make allowance for unusual exposure. See page 18.

TABLE NO. 2

O-E AIR AND WATER RETURN MAINS

Square Feet of Radiation	Size
0— 100	¾ in.
100— 450	1 in.
450— 800	1¼ in.
800— 1400	1½ in.
1400— 2600	2 in.

TABLE NO. 3

O-E RETURN RISERS

Square Feet of Radiation	Size
0— 50	½ in.
50— 125	¾ in.
125— 350	1 in.
350— 650	1¼ in.
650— 1350	1½ in.

TABLE NO. 4

O-E WET RETURN MAINS

Square Feet of Radiation	Size
0— 375	1 in.
375— 800	1¼ in.
800— 1400	1½ in.
1400— 5000	2 in.
5000—11500	2½ in.
11500—20000	3 in.

All Above Tables Based on Normal Conditions.

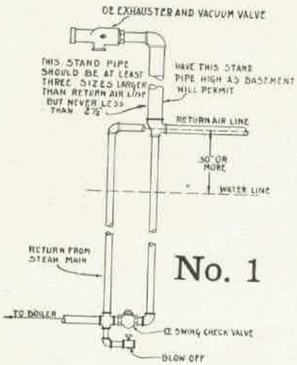
Table No. 5

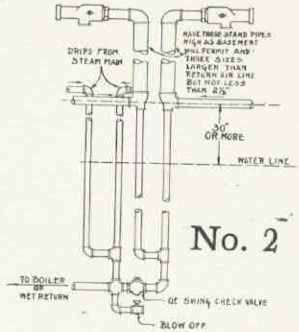
RADIATION

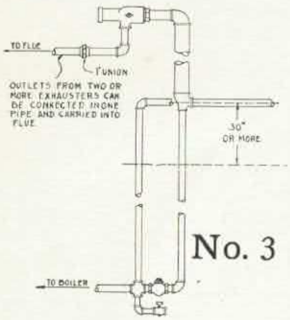
Length of Riser Inc. Fttgs.	sq. ft. 25	sq. ft. 40	sq. ft. 50	sq. ft. 60	sq. ft. 85	sq. ft. 105	sq. ft. 115	sq. ft. 155	sq. ft. 225	sq. ft. 325	sq. ft. 425	sq. ft. 525	sq. ft. 625	sq. ft. 725	sq. ft. 825	sq. ft. 925	sq. ft. 1025
ft. 10	in. ¾	in. ¾	in. ¾	in. 1	in. 1	in. 1¼	in. 1¼	in. 1¼	in. 1¼	in. 1½	in. 2	in. 2	in. 2	in. 2	in. 2½	in. 2½	in. 2½
20	¾	¾	¾	1	1	1¼	1¼	1¼	1¼	1½	2	2	2	2½	2½	2½	2½
30	¾	¾	¾	1	1	1¼	1¼	1¼	1½	1½	2	2	2	2½	2½	2½	2½
40	¾	¾	1	1	1	1¼	1¼	1¼	1½	1½	2	2½	2½	2½	2½	2½	3
50	1	1	1	1	1	1¼	1¼	1¼	1½	2	2½	2½	2½	2½	2½	2½	3
60	1	1	1	1	1¼	1¼	1¼	1¼	1½	2	2½	2½	2½	2½	2½	3	3
70	1	1	1	1	1¼	1¼	1¼	1½	1½	2	2½	2½	2½	2½	2½	3	3
80	1	1	1	1	1¼	1¼	1¼	1½	1½	2	2½	2½	2½	2½	3	3	3
90	1	1	1	1¼	1¼	1¼	1¼	1½	2	2	2½	2½	2½	3	3	3	3
100	1	1	1	1¼	1¼	1¼	1½	1½	2	2	2½	2½	3	3	3	3	3½
150	1	1	1¼	1¼	1¼	1½	1½	2	2	2½	2½	3	3	3	3	3½	3½
200	1	1¼	1¼	1¼	1½	1½	2	2	2½	2½	3	3	3	3	3½	3½	3½
400	1	1¼	1¼	1¼	1½	1½	2	2	2½	2½	3	3	3	3½	3½	3½	3½

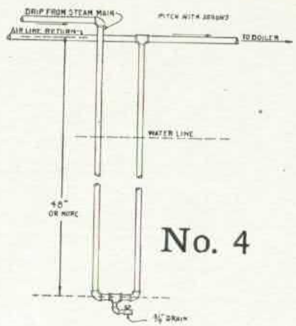
O-E SUPPLY RISERS ABOVE THE FIRST FLOOR

The "O-E" AIR EXHAUSTER and VACUUM VALVE must be installed properly to obtain good results. We illustrate below proper method for installing to meet varying conditions.









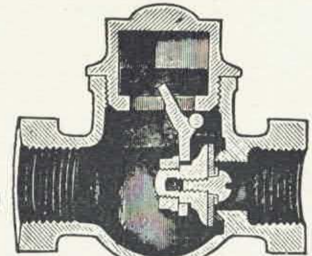
No. 1 Standard installation when conditions are normal.

No. 2 Method of installation when one or more exhausters are connected into a wet return or where two exhausters are connected into the return on the same side of the boiler.

No. 3 Illustrates how to connect outlet from exhauster into smoke flue.

No. 4 Illustrates proper method for connecting drip from steam main into air and water dry return.

"O-E" ROUSE PATENT BALANCED SWING CHECK VALVE.



Owing to the fact that it is almost impossible to obtain a perfect and reliable Swing Check Valve, and that in order to install a Perfect "O-E" VAPOR-VACUUM-PRESSURE SYSTEM, it is necessary every fitting should be mechanically perfect, we feel the trade will appreciate the high grade "O-E" ROUSE BALANCED SWING CHECK illustrated above. It can be used as a vertical or horizontal check valve. Bonnet can be removed and the parts taken out in a moment. Has ground seat and clapper, made with leather disc when so ordered. The valve can not get out of place, as it slips in at an opening in a slot or groove, then drops down to its proper place, where it works as a hinge, when bonnet is screwed in, thus bearing comes equal on valve all around, caused by this slotted adjustment. Valve is balanced so as to work like a Poppet valve.

We furnish these valves in sizes and at prices as follows:
(Sizes given in inches)

Size	No. 87	No. 87a	No. 88	No. 89	Distance end to end Screwed	Distance face to face Flanged	Diameter of Flanges
½	$ 2.00	$2.65	$.....	$.....	2½	....	....
¾	2.25	2.90	.....	.....	3	....	....
1	2.80	3.60	.....	.....	3½	....	....
1¼	3.65	4.65	.....	.....	4	....	....
1½	4.75	6.00	.....	.....	4¼	....	....
2	6.75	8.25	.....	.....	5⅜	....	....
2½	15.00	....	12.00	14.50	7⅛	8	7
3	24.00	....	13.50	17.00	7⅝	8¾	7½
3½	.....	....	17.50	21.00	7¾	9½	8½
4	.....	....	20.00	24.00	8¾	10	9
5	.....	....	30.00	34.00	9¾	10⅝	10
6	.....	....	36.00	41.00	10¾	12⅞	11

No. 87 is Brass valve screwed. No. 87a is the same with leather disc.
No. 88 is Iron body, brass mounted, screwed end.
No. 89 is Iron body, brass mounted, flanged.

DAMPER REGULATOR

The "O-E" Combination All Metal "3-in-1" Vapor-Vacuum-Pressure Damper Regulator with guaranteed Metal Diaphragms is the most sensitive of any. Will fit all types of low pressure boilers and operate on ounces from 0 to 15 lbs. pressure. Price reasonable. It is not absolutely necessary to use other than the ordinary Regulator supplied with the boiler, on account of the "3-in-1" feature, and the fact that most operators of heating apparatus prefer to bank the fire and close draft dampers at night, which would put the special damper Regulator out of commission. When ordering the boiler for the "O-E" System, specify that all Draft Dampers and levers **must be counter-balanced, and operate freely.** When operating under a Vacuum, if regulation is desired, it is simply necessary to shift the weight on the Regulator Lever from one side to the other. However, since the Drafts usually remain closed at night, when the System is under Vacuum, regulation is unnecessary.

WHEN THE "O-E" SYSTEM IS NOT IN OPERATION, open all supply valves and drain water from the System. Remove exhauster body from Vacuum valve, clean ball and seat carefully, and replace body. When the System is again put in operation, it is best to again clean exhauster ball and seat, and remove any foreign matter that may have accumulated.

Note: If outlet from Exhauster is connected into flue, a union should be placed near Exhauster so that the Exhauster body can be easily removed for cleaning.

USEFUL DATA

Water expands, in heating from 39 degrees to 212 degrees, one twenty-third, or about 4% in bulk.

A cubic inch of water evaporated at atmospheric pressure, 14.7 pounds, makes about one cubic foot of steam.

The height of a column of water multiplied by .434 gives pressure in pounds.

A column of water 27.67 inches high equals one pound pressure per square inch. However, for convenience, it is usually estimated that every foot equals a half-pound pressure.

231 cubic inches of water equals one gallon (U. S.)

One cubic foot of water weighs 62.32 pounds, or 7.48 U. S. gallons.

One square foot grate area will consume about 3 to 5 lbs. anthracite coal per hour, in L. P. steam boilers, or 12 lbs. in H. P. steam boilers.

Ice weighs 56½ lbs. per cubic foot.

Thirty-four and one-half pounds of water evaporated at 212 degrees Fahrenheit equal one horse power.

One square foot of C. I. radiation will condense 1-4 pound of steam per hour, with two pounds guage pressure, and 70 degrees temperature in the room.

Fifteen square feet of heating surface equal one horse power in tubular boiler, 12 square feet in water tube boiler, or 10 square feet in fire box boiler.

One horse power will supply one hundred square feet of direct steam radiation.

2545 heat units per hour equal one horse-power.

One pound of coal requires for combustion about 300 cu. ft. of air.

966 B.t.u. required to evaporate one pound of water into steam at 212 degrees, therefore, as one square foot of steam radiation emits about 240 B. t. u. per hour, four feet of radiation is required to condense a pound of steam, or, to transmit 966 B.t.u. to the air of the room.

Expansion of Wrought Iron Pipe

Temperature of the air when Pipe is Fitted.	Length of Pipe When Fitted	Length of Pipe when Heated to							
		215°		265°		297°		338°	
	Ft.	Ft.	In.	Ft.	In.	Ft.	In.	Ft.	In.
Zero	100	100	1.72	100	2.12	100	2.31	100	2.70
32°	100	100	1.47	100	1.78	100	2.12	100	2.45
64°	100	100	1.21	100	1.61	100	1.87	100	2.19

The heat emission of different types of radiators, table by James A. Donnelly.

Cast Iron Direct Radiators

B. t. u. per square foot per hour under standard conditions. Room 70° temperature, radiator 210°.

	45 in.	38 in.	32 in.	26 in.	22 in.
1 column...	262	270	275	279	285
2 column...	241	250	257	263	270
3 column...	222	231	240	248	255
4 column...	210	218	225	233	240

Wrought pipe coils 1 in. to 2 in diameter...... 300
Cast iron wall radiators, on side.............. 290
Cast iron wall radiators, on end.............. 280

Dimensions and Capacities of Standard Wrought Iron Pipe

Nominal Inside Diameter	Area, Square Inches Inside	Weight per foot.	Gallons of Water per 100 Ft. of Length	Black per Ft. Price
⅛	.06	.245	.3	$0.05½
¼	.10	.425	.5	.06
⅜	.19	.568	1.0	.06
½	.30	.852	1.6	.08½
¾	.53	1.134	2.7	.11½
1	.86	1.684	4.5	.17
1¼	1.50	2.281	7.7	.23
1½	2.04	2.731	10.6	.27½
2	3.36	3.678	17.4	.37
2½	4.78	5.819	24.8	.58½
3	7.38	7.616	38.4	.76½
3½	9.89	9.202	51.3	.92
4	12.73	10.889	66.1	1.09
4½	15.96	12.642	82.9	1.27
5	19.99	14.810	103.8	1.48
6	28.89	19.185	150.0	1.92
7	38.74	23.769	202.0	2.38
8	50.02	28.554	260.0	2.88
9	62.73	33.907	326.0	3.45
10	78.82	41.132	410.0	4.12
11	95.03	46.247	495.0	4.63
12	113.09	50.706	590.0	5.07

Compiled from various Standard authorities but not guaranteed.

SAFE VELOCITIES

1 -in.	16	3½-in.	44	8-in	80
1¼-in.	20	4 -in.	49	9-in.	90
1½-in.	23	4½-in.	55	10-in.	95
2 -in.	29	5 -in.	58	12-in.	103
2½-in.	35	6 -in.	66		
3 -in.	40	7 -in.	75		

Based on one (1) ounce drop in pressure.

Short Method of Computing Velocities

Multiply the condensation in pounds by the volume in cubic feet corresponding to the pressure. This will give the volume of steam or vapor passing through pipe per hour. Dividing this product by 3600 times the area of the pipe in square feet gives velocity in feet per second.

CHIMNEY SIZES REQUIRED

Radiation	Size	Minimum Height
400 sq. ft. & less	8x12 in.	35 ft.
400 to 700 sq.ft.	8x12 "	40 "
700 " 900 " "	12x12 "	40 "
900 " 1200 " "	12x12 "	45 "
1200 " 1400 " "	12x16 "	45 "
1400 " 1600 " "	16x16 "	45 "
1600 " 2000 " "	16x20 "	50 "
2000 " 3000 " "	20x20 "	55 "
3000 " 4500 " "	22x22 "	60 "
4000 " 6000 " "	24x24 "	70 "

Down draft boilers require larger and higher flues. Adhere to size flue recommended by the manufacturer.

Area of chimney should be one-seventh to one-tenth area of grate.

EFFICIENCY TEST IN WARM WEATHER

It is an easy matter to test a heating job at any season of the year by means of Prof. Carpenter's table of outside and inside temperatures below:

To Equal a Temperature of 70 Degrees Fahrenheit in Zero Weather

If outside temperature is 10 below zero, Fahrenheit	It is necessary to maintain an inside temperature of 64 above zero, Fahrenheit
zero, "	70 " " "
10 above " "	75 " " "
20 " " "	81 " " "
30 " " "	85 " " "
40 " " "	90 " " "
50 " " "	98 " " "
60 " " "	104 " " "
70 " " "	110 " " "
80 " " "	117 " " "
90 " " "	123 " " "

Capacities of Wrought Iron Pipe

Inside Dia., In.	1	1¼	1½	2	2½	3	3½	4	5	6
L'gth of pipe per sq. ft. extern. surf.	2.9	2.3	2.0	1.6	1.32	1.09	0.95	0.84	0.68	0.57
Square feet surface per 1 lin. foot.	0.34	0.43	0.50	0.62	0.75	0.92	1.05	1.18	1.46	1.74

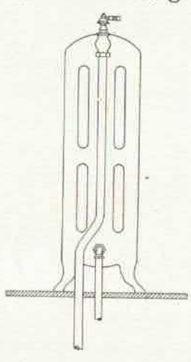
Boiling Point of Water Under Vacuum, and Temperature of Steam at Different Guage Pressures

Vacuum guage inches of vacuum	Temperature of steam or boiling point of water
29.92 ins.	98 deg.
29 "	100 "
28 "	102 "
27 "	114 "
26 "	125 "
25 "	133 "
24 "	140 "
23 "	146 "
22 "	152 "
21 "	157 "
20 "	161 "
19 "	165 "
18 "	169 "
17 "	172 "
16 "	175 "
15 "	178 "
14 "	181 "
13 "	184 "
12 "	186 "
11 "	188 "
10 "	191 "
9 "	194 "

Vacuum guage inches of vacuum	Temperature of steam or boiling point of water
8 ins.	196 deg.
7 "	199 "
6 "	201 "
5 "	203 "
4 "	205 "
3 "	207 "
2 "	208 "
1 "	210 "
0 "	212 "
Steam guage pounds pressure.	
1 pound	215 "
2 "	219 "
3 "	222 "
4 "	225 "
5 "	227 "
6 "	230 "
7 "	232 "
8 "	235 "
9 "	237 "
10 "	240 "

The tables and other information used in this book are selected from good authorities, and gained by long experience, but are not guaranteed by us.

Offset supply with bend as shown



Will save time and fittings

TABLE OF ALTITUDES AND BOILING POINT OF WATER

Locality	Elevation Above Sea Level, Ft.	Boiling Point of Pure Water Deg. F.	Gauge Pressure to give 212 deg. *F., Lbs. and Oz.	Temp. of Steam at 2 Lbs. Gauge Press., Deg. F.	Normal Barometic Pressure Inches of Mercury	Normal Atmos. Pressure per Sq. In., Lbs.
Atlanta, Ga.........	1,000	210.0	...9	216.9	28.88	14.18
Buffalo, N. Y.......	600	210.8	...5	217.5	29.33	14.40
Butte, Mont.	5,700	201.1	2.14	209.1	24.14	11.86
Carson, Nev.	4,660	203.0	2. 6	210.7	25.12	12.33
Chattanooga, Tenn..	674	210.6	...6	217.4	29.25	14.36
Cheyenne, Wyo.....	6,000	200.5	3...	208.6	23.86	11.72
Chicago, Ill.........	600	210.8	...5	217.5	29.33	14.40
Cincinnati, O........	500	211.0	...4	217.7	29.44	14.46
Cleveland, O........	642	210.7	...6	217.5	29.28	14.38
Col'rdo Spr'gs, Col..	5,982	200.5	3...	208.6	23.88	11.73
Dallas, Tex.........	425	211.1	...4	217.9	29.52	14.50
Denver, Col.........	5,279	201.9	2.11	209.7	24.53	12.04
Detroit, Mich.......	600	210.8	...5	217.5	29.33	14.40
Helena, Mont.......	4,000	204.3	2. 1	211.8	25.76	12.65
Knoxville, Tenn.....	933	210.1	...8	217.0	28.95	14.22
Leadville, Col.......	10,190	192.9	4.12	201.9	20.34	9.98
Missoula, Mont.....	3,200	205.8	1.10	213.1	26.55	13.03
Nashville, Tenn.....	450	211.1	...4	217.8	29.50	14.48
Ogden, Utah........	4,300	203.7	2. 4	211.3	25.47	12.51
Pike's Peak, Col....	14,108	185.9	6. 2	196.0	17.52	8.60
Provo, Utah........	4,512	203.3	2. 5	211.0	25.26	12.40
Pueblo, Col.........	4,660	203.0	2. 6	210.7	25.12	12.33
Rochester, N. Y....	531	210.9	...5	217.7	29.41	14.44
St. Cloud, Minn.....	1,020	210.0	...9	216.8	28.86	14.17
St. Louis, Mo.......	450	211.1	...4	217.8	29.50	14.48
St. Paul, Minn......	750	210.5	...7	217.3	29.16	14.32
Salt Lake City, Utah	4,300	203.7	2. 4	211.3	25.47	12.51
San Antonio, Tex...	675	210.6	...6	217.4	29.24	14.36
Saranac Lake, N. Y.	1,574	208.9	..14	215.9	28.25	13.87
Spokane, Wash.....	1,900	208.3	1...	215.3	27.90	13.70

*To give a temperature equal to 2 lbs. pressure at sea level (the basis on which Boilers are rated) add 2 lbs. to the figures given in third column.

Note—The above table, by Mr. C. B. Thompson, shows the necessity of taking into account the locality of installation in estimating amount of radiation, size of Boiler, etc.

Simple Rule for Figuring Radiation Necessary For "O-E" Perfect System

A simple rule that we can recommend for use when figuring amount of radiation necessary in connection with "O-E." Perfect Vapor-Vacuum-Pressure System follows

One foot of radiation for 200 cubic feet of space.

One foot of radiation for 10 square feet of wall exposed to weather.

One foot of radiation for 2 square feet of glass.

The result will give 70 degrees Fahr. inside when zero outside.

For every degree below zero add 1 per cent to above result.

EXAMPLE

Room 10x12 feet, two sides exposed, 10 ft. ceiling and 30 square feet of glass:

10x12=120x10= ....1200÷200=6
Exp. wall 10+12=22x10= ....220÷10=22
Glass ....30÷2=15

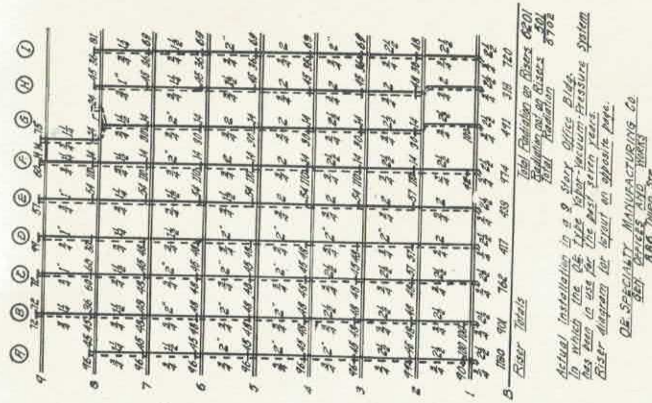
Total for 70 degrees when zero, sq. ft.....43
Add if to take care of 20 degrees below zero
20 per cent 8.6
Net total for 70 degrees inside when 20 degrees below zero outside ....sq. ft. rad. 51.6

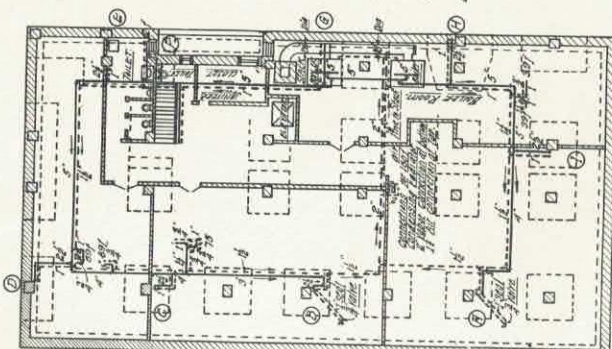
Of course the above is for use in ordinary work and due allowance should be made for unusual exposures and construction. Rooms on the south side of a building are warmer than on the north side, therefore a small amount of the radiation could be taken from the southside rooms and added to the north side if desired. However, the above rule will give good results regardless.

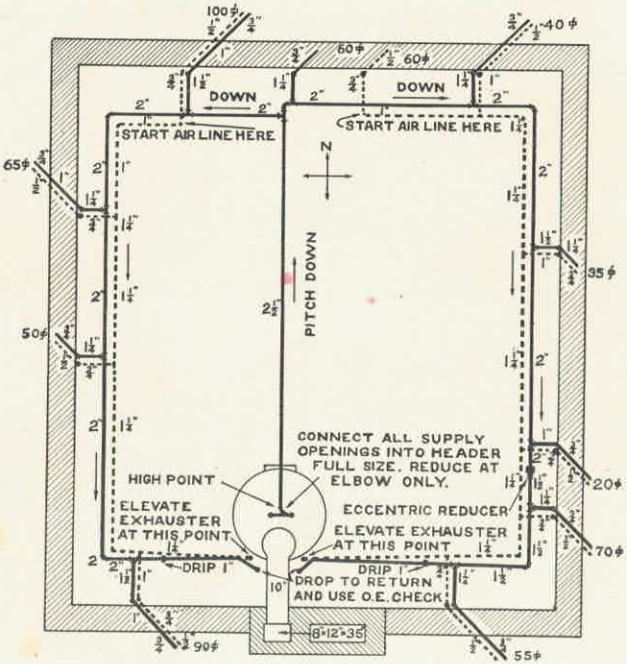
For Sun Porch, or when there is an unusual amount of glass or exposed walls, we recommend 180 for cu. contents, 10 for exposed walls, and 2 for glass.

For direct indirect radiation add 33 1/3% to amount of direct. For indirect add 75%.

10% should be added to North Rooms.
10% " " " if heated daytime only.
20% " " " " " " " and building is exposed, or when there are long intervals of non-heating.
10% added for open fiireplace.
15% " " radiator under seats.
15% " " " on inside walls.
25% to 40% added for Bath Rooms.
Floors and ceilings exposed to unheated rooms figured as ½ **exposed wall.**





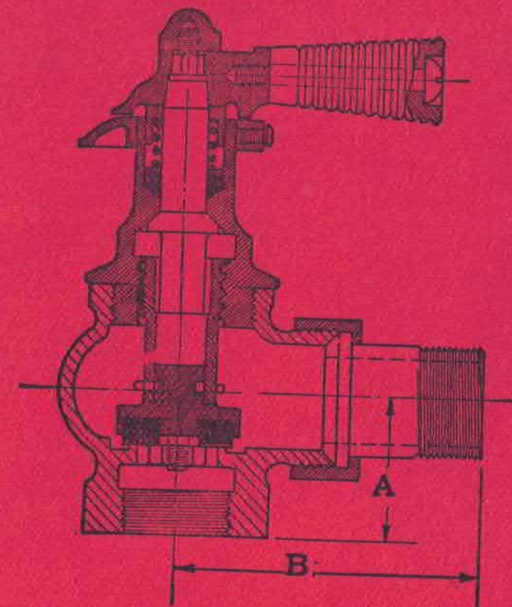


O. E. Layout when Boiler is located in warm side of building.

Reverse layout if Boiler is in cold side.

Let us tell you how to convert unsatisfactory Hot Water, Steam or Vapor job into "O-E" Sytem.

Patented



ROUGHING IN DIMENSIONS

	3/4"	1"	1 1/4"
A	1 3/8"	1 7/16"	1 21/32"
B	2 11/16"	3 9/32"	3 1/2"