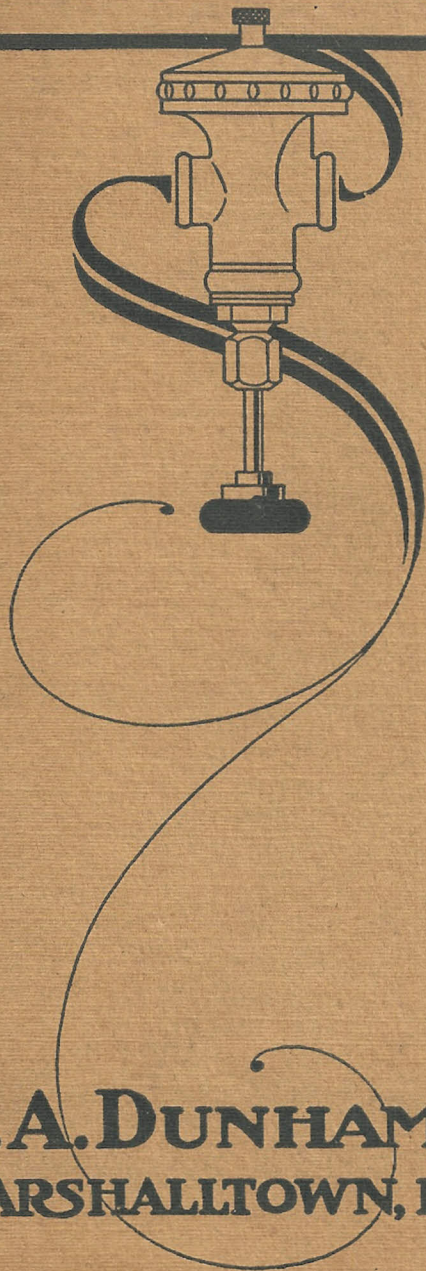


**:- DUNHAM :-
SPECIALTIES**



**|| C.A. DUNHAM Co. ||
|| MARSHALLTOWN, IOWA. ||**

BULLETIN No. 13

June 1, 1916

C. A. Dunham Company

MARSHALLTOWN, IOWA

NEW YORK

CHICAGO

SAN FRANCISCO

Branch Offices in All the Principal Cities

(This Bulletin supersedes all information covering same subject heretofore published by us.)

==SUBJECT==

How to Install The Dunham Vapor Heating System

OTHER BULLETINS WHICH MAY BE HAD ON APPLICATION ARE

- BULLETIN No. 1—The Dunham Vacuo Vapor System of Heating—What it is—How it Operates.
- BULLETIN No. 2—Advantages of Steam for Heating—Why the Dunham Vacuo Vapor System is Superior.
- BULLETIN No. 3—How to Install the Dunham Vacuo Vapor System of Heating.
- BULLETIN No. 4—How to Operate the Dunham Vacuo Vapor System of Heating.
- BULLETIN No. 5—The Dunham Radiator Trap and its Application.
- BULLETIN No. 6—The Dunham Blast Trap and its Application.
- BULLETIN No. 7—The Dunham Air Line Valve and its Application.
- BULLETIN No. 9—The Dunham Reducing Pressure Valve and Vacuum Pump Governor.
- BULLETIN No.10—Some Buildings where the Dunham Systems of Heating are now Installed.
- BULLETIN No.11—The Dunham Vapor System.
- BULLETIN No.12—The Dunham Packless Inlet Valve.

DUNHAM VAPOR HEATING SYSTEM

As a Heating Contractor, you look with pride upon a good heating job of your own making. To aid you in this quest for success, these instructions applying to the Dunham Vapor Heating System have been prepared. We commend them to your thoughtful attention.

Location of Boiler

Locate the boiler as near the chimney flue as possible, so as to admit the use of the shortest and most direct smoke pipe connection. Face the boiler to give easiest access to coal supply. Make sure that there is opportunity for a sufficient supply of air to the boiler room from the outside. A crowded boiler room into which air finds its way with difficulty, hampers and in some cases destroys free combustion of the fuel. Remember *air is essential* to proper fuel combustion and draft.

Capacity of Boiler

No larger boiler is required by the Dunham Vapor System than for any first class steam heating system. Good fuel economy will not follow the use of a boiler that is too small.

All boilers are rated by the manufacturers for standard cast iron direct radiation, and the following *allowances* must be made for Pipe Coil Radiation, Direct-indirect Radiation, Indirect Radiation and for the heating of water for the domestic supply.

The allowances recommended are as follows:

(a) Each square foot of direct Pipe Coil Radiation is equivalent to $1\frac{1}{4}$ square feet of direct radiation.

(b) Each square foot of Direct-indirect Radiation is equivalent to $1\frac{1}{3}$ square feet of direct radiation.

(c) Each square foot of Indirect Radiation is equivalent to two (2) square feet of direct radiation.

(d) Each gallon of capacity of tank for domestic hot water supply is equivalent to two (2) square feet of direct radiation.

When all classes of radiation have been reduced to equivalent cast iron direct radiation and the total obtained, obtain the boiler capacity from Curve on the Boiler and Chimney Chart, Figure No. 1. This curve makes full allowance for all piping. If the steam main is to remain uncovered, a boiler ten per cent. larger should be used.

Most cast iron sectional boilers are rated upon anthracite coal as fuel. If bituminous coal is to be used, the boiler manufacturers' instructions to use a boiler one size larger should be followed.

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Chimney The chimney size is of the utmost importance. A round chimney is the best form, but if this is not practical, then it should be as nearly square as possible. Avoid a rectangular chimney where the short side is less than half the length of the long side. The heating boiler should have a chimney of its own with absolutely no other smoke connections into it. Chimney should extend above highest point of roof.

The chimney sizes for boilers of various capacities are given on the Boiler and Chimney Chart, Figure No. 1.

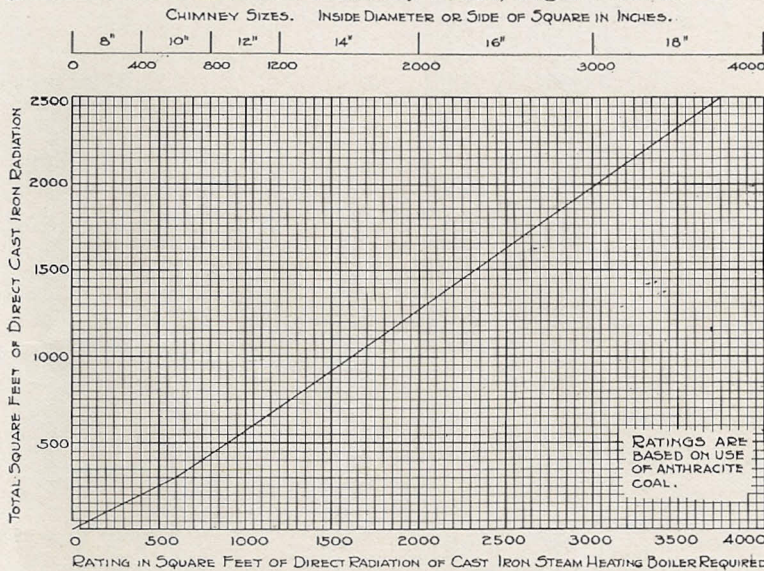


Figure No. 1—Boiler and Chimney Chart

Smoke Pipe The smoke pipe should be the same size as outlet from boiler, as short and direct as possible, free from avoidable bends, and have slight upward slope toward the chimney. A tight fitting, easy moving stop damper for hand control must be placed in smoke connection near boiler.

Balanced In addition to the stop damper above mentioned, a liberal sized balanced check damper should be installed in the smoke pipe

Check Damper between stop damper and chimney. The ordinary check damper furnished as a part of the boiler equipment is usually very small and does not sufficiently check the fire. A Balanced Check Damper of proper size, with suitable collar for bolting to the smoke pipe, is furnished with the Dunham Specialties.

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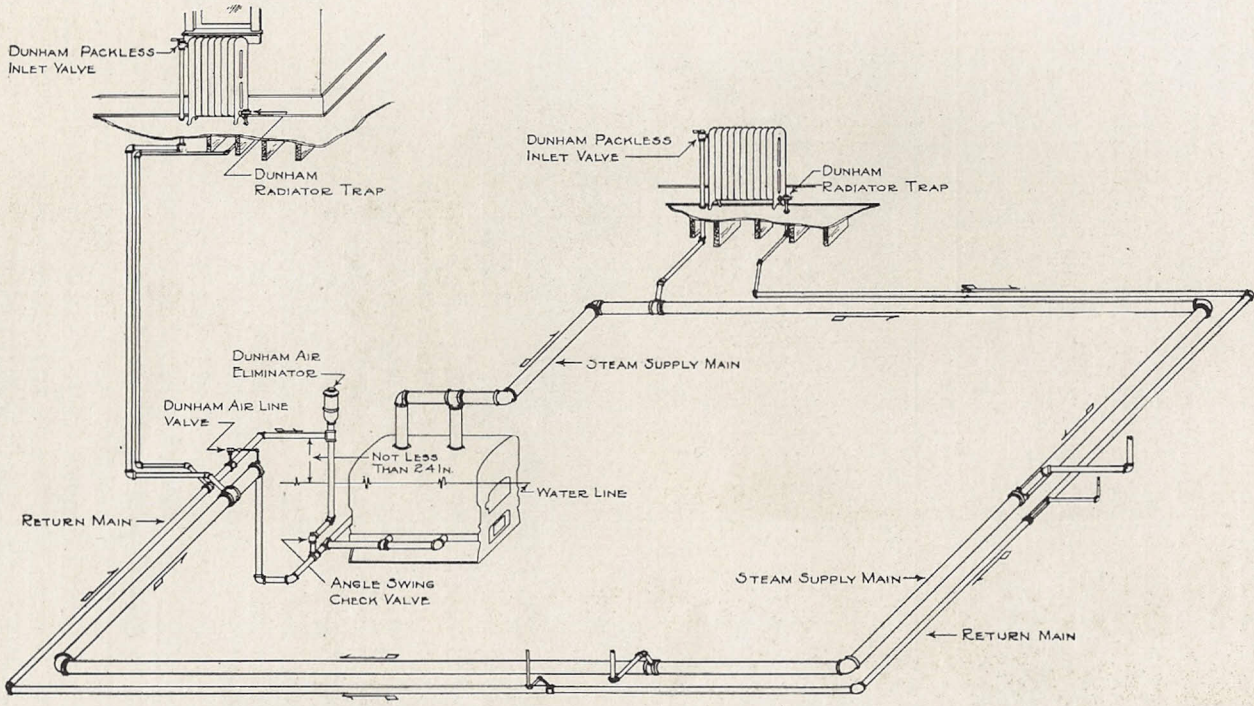
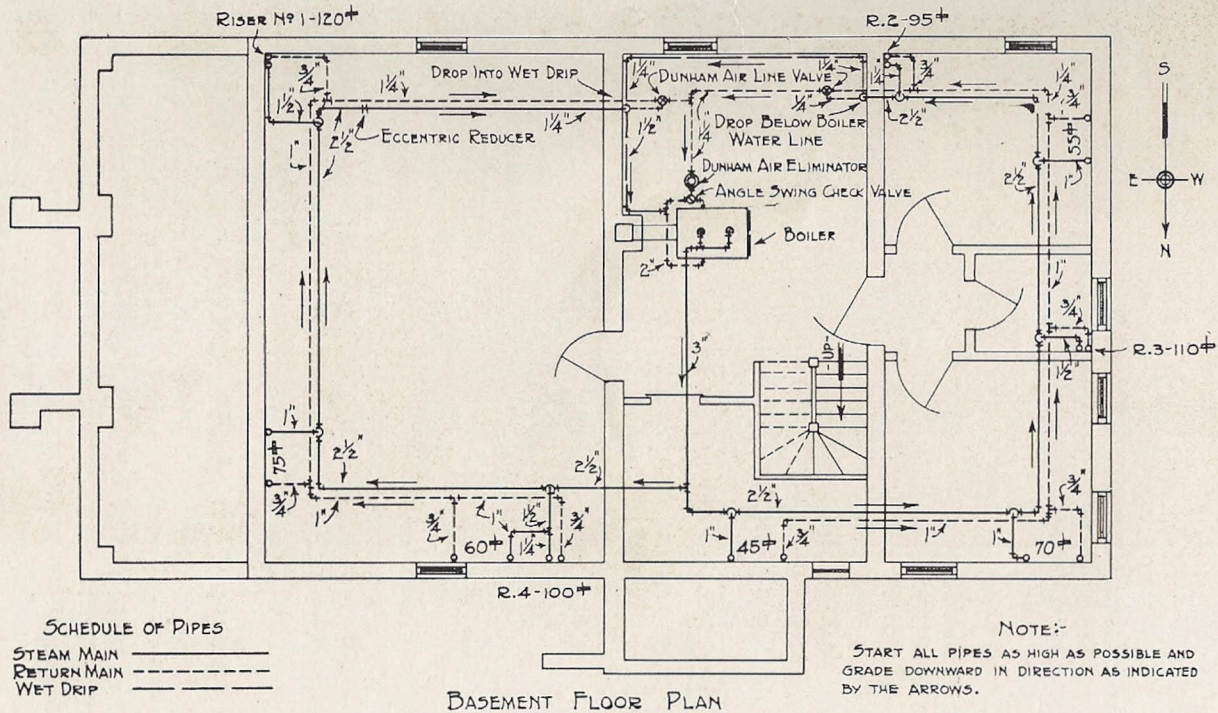


Figure No. 2

DUNHAM VAPOR HEATING SYSTEM

Figure No. 3—Specimen Basement Layout



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Steam Piping The secret of a nice circulating steam heating apparatus is in the piping. The piping to and from the boiler should be liberal in size and well equalized.

All steam tappings in boiler should be used with full sized header into which the steam mains connect.

At least two or more return tappings, one or more on each side of boiler, should be used, and these connected together by a liberal header.

The bleeding or dripping of the main steam header into the main return by a large pipe for equalization is also an excellent practice.

If a screw nipple or header type of cast iron sectional boiler is used, the boiler steam header should be connected with the boiler return headers on both sides of the boiler by a yoke of liberal sized piping. This is to drip the steam header and equalize the boiler.

The steam mains should be installed with high point at the boiler and pitch downward with a grade in the direction of flow of not less than $\frac{1}{2}$ inch in ten (10) feet, with such provision for expansion that the grade is not destroyed when the steam is circulating through them.

A steam main circuit starting three (3) inches in size or smaller should not be reduced, but should be carried full size to end of circuit. Steam mains starting larger than three (3) inches in size may be reduced in proportion as radiation is taken off, down to three (3) inches in size, and then continued without further reduction to end of circuit.

The ends of all main steam circuits should be dripped separately into a wet return leading back to boiler, and should also be vented into a dry return as per detail, Figure No. 4. Do not connect the ends of two circuits together above the waterline. Both should be sealed.

Spring pieces to risers or radiators should be taken from top of steam main at an angle of 45 degrees. Spring pieces longer than eight (8) feet should be avoided. See that spring piece has good fall toward steam main and that it does not form a pocket at base of riser.

The return piping should be graded back to the boiler with a fall of at least one (1) inch in ten (10) feet, and should be carried as near ceiling as possible.

Two or more branch return mains should be joined in one main return before being connected into vertical pipe leading to return header of boiler.

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Angle Swing Check Valve An angle swing check valve should be installed in vertical stand pipe as per detail Figure No. 5. If it is impossible to secure an angle swing check, then a *horizontal swing* check may be used instead. *Never* use a vertical check valve.

IMPORTANT. The end of the main return in the boiler room should be at least twenty-four (24) inches above water line of boiler and as much greater as possible. See Figure No. 5. Check this very carefully and see that you have not

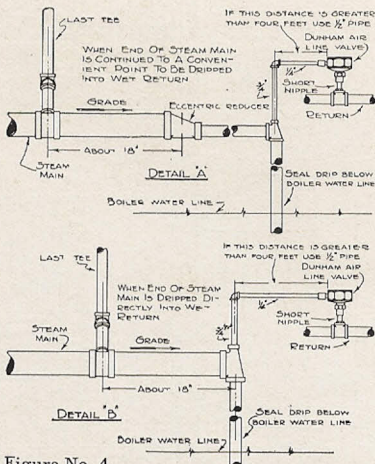


Figure No. 4
Method of Venting End of Steam Mains

less than 24 inches. Before starting the installation work endeavor to determine how the return main may be installed to give proper pitch and yet reach the boiler room at the very greatest distance above the boiler water line.

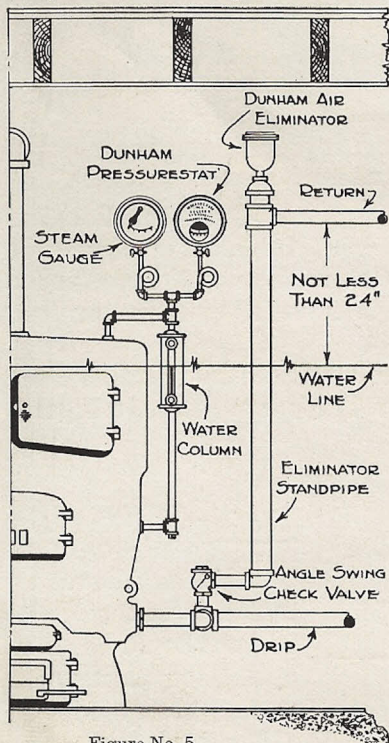


Figure No. 5

Dunham Air Eliminator The Dunham Air Eliminator has a capacity for removing the air from 2000 square feet of direct radiation. One or more eliminators, as may be required, should be installed on the vertical stand pipe where return main drops to return header of boiler, as per Figure No. 5.

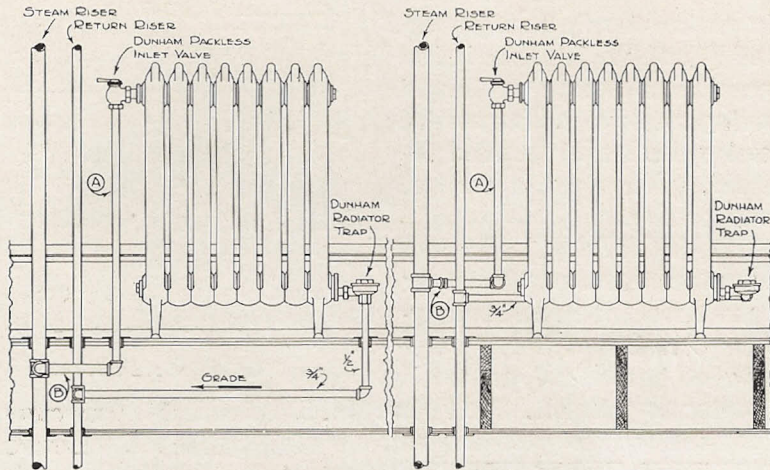
Radiator Connections It is preferable to use hot watertype radiators with

supply connection at top and return connection at opposite end at bottom. See Figure No. 6 for proper connections, and

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also for sizes of traps and inlet valves required.

It is the best practise to locate radiators under windows or along outside walls.



RADIATOR CONNECTIONS—INLET AT TOP ONLY

SQ. FT. OF RADIATION	INLET VALVE	VERTICAL PIPE 'A'	HORIZONTAL PIPE 'B'	TRAP
1 TO 40	$\frac{1}{2}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	Nº 1
41 TO 100	$\frac{3}{4}$ "	$\frac{3}{4}$ "	1"	Nº 1
101 TO 180	1"	1"	$\frac{1}{2}$ "	Nº 2

ALL RADIATOR TRAPS TO HAVE $\frac{1}{2}$ " CONNECTIONS AND $\frac{3}{4}$ " HORIZONTAL RUN-OUTS

Figure No. 6—Detail of Radiator Connections

Inlet Valves and Radiator Traps A Dunham Packless Inlet Valve should be installed on the supply end of each radiator at the top, and a Dunham Radiator Trap should be installed on the return end of each radiator at the bottom.

The roughing-in dimensions for Dunham Packless Inlet Valves and Dunham Radiator Traps are given in Figures Nos. 7 and 8.

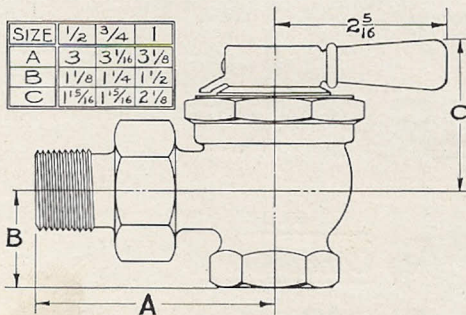


Figure No. 7—The Dunham Packless Inlet Valve

Testing When all the piping has been installed and all radiators connected, the system should be given a test for leaks under water pressure of ten (10) pounds.

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Covering All steam mains and spring pieces in basement should be covered with asbestos air cell covering one (1) inch in thickness.

Boiler should be covered with asbestos cement two (2) inches thick.

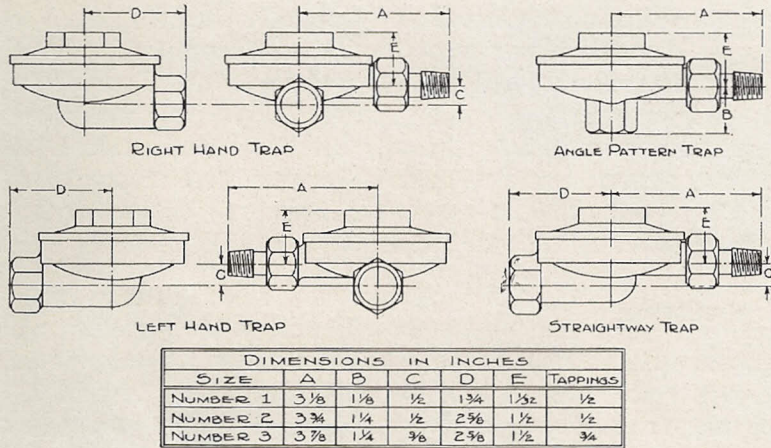


Figure No. 8—The Dunham Radiator Trap

Notice The Pressurestat, Damper Motor and Thermostat, which are termed the Boiler Room Attachments, should not be installed until the system has been thoroughly tested out for leaks and also thoroughly cleaned out.

When ready to install these Attachments, be sure to read the following directions very carefully before proceeding with the work.

Damper Fasten Damper Motor securely to boiler room wall about five feet from floor, on inside wall if possible.

Motor Screws and brackets for this purpose will be found in box with Motor.

If Motor is of *Alternating Current* type to operate on the house lighting circuit, be sure to see that there is a line running to the Motor upon which the current is never turned off. It is best to consult a competent electrician about this if you are not one yourself. Do not take any chances.

Alternating current motors are furnished in two types, one for 110 volt, 60 cycle service, and the other for 110 volt, 25 cycle service. *Be sure that motor furnished is suitable for current available.*

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This alternating current type of Motor is equipped with a small transformer already attached to base of Motor. Two short wires will be found protruding from this transformer and to these two wires should be connected the two wires coming from the Alternating Lighting Circuit. These connections should be soldered and thoroughly taped.

If damper Motor is of the *Direct Current Non-Wind Type*, to be operated by batteries, or of the *Spring Type* where batteries are used for tripping same, the wiring connections are as follows: Fasten battery basket to wall underneath Motor, connect batteries together in usual manner and then connect (using the two-wire cable furnished) to the two uncolored posts on the wall side of the bottom of Motor.

Pressurestat Place the Pressurestat beside the steam gauge, installing same with syphon or "pig tail" and gauge cock. Pressurestat should be above all parts of the piping which connects it to the boiler so as not to be affected by any head of water. It can be installed above the water column as suggested in Figures No. 5 and 9. It is very important that the gauge cock which comes with the Pressurestat be installed in the connection between it and the boiler. If system is given a blowing off, after installation of Pressurestat, be sure to shut off the gauge cock between it and boiler to avoid allowing excessive pressures to come in contact with it.

Wiring Pressurestat and Damper Motor

(Where no Thermostat is used)

A long piece of three-wire cable will be found in box for this purpose. Remove insulation for one (1) inch on each end of three wires on both ends of cable. Take either end and connect to Pressurestat as follows: The red wire to the post marked "Red," the white wire to the post marked "White," and the blue wire to the post marked "Blue." Be sure to see that each connection is solid and well taped to prevent short circuiting.

Then run cable up to ceiling and over and down to Motor. Connect red wire to red binding post on Motor, white wire to white post, and blue wire to blue post, being sure to tape all connections.

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When all connections are made to Motor and Pressurestat and the current is turned on, the Motor will operate once and assume its normal position, if it was not in this position before being connected to the lighting circuit or batteries.

Adjusting Arms on Motor

The arm on front side of motor should control the front draft and rear arm should be connected to check damper.

If indicator hand on the Pressurestat is touching the low contact, the front arm should point down, and the arm on the back side point up.

Fastening Damper Chains and Pulleys

In connecting the chains to the draft damper and Balanced Check Damper, the arrangement shown in Figure No. 9 should be followed as closely as possible. Draft door should open $\frac{1}{4}$ in. to $\frac{3}{4}$ in. depending upon the intensity of the draft. Check Damper should open full wide.

If two boilers are installed, see Figure No. 10.

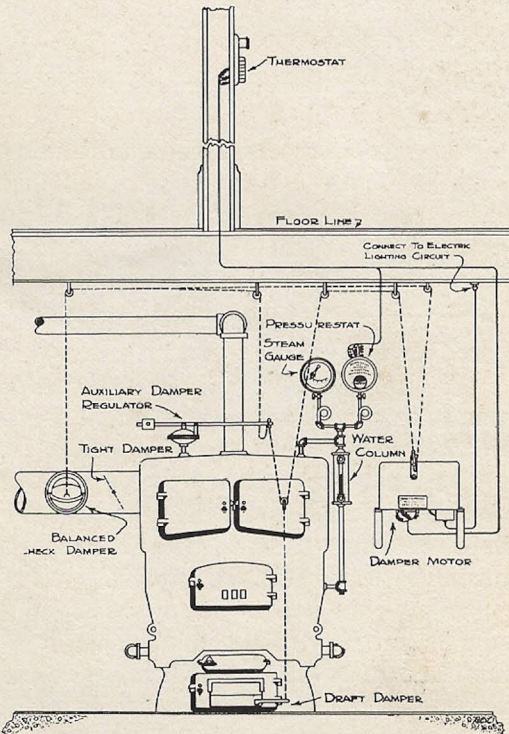


Figure No. 9—Method of Installing Damper Chains (One Boiler)

DUNHAM VAPOR HEATING SYSTEM

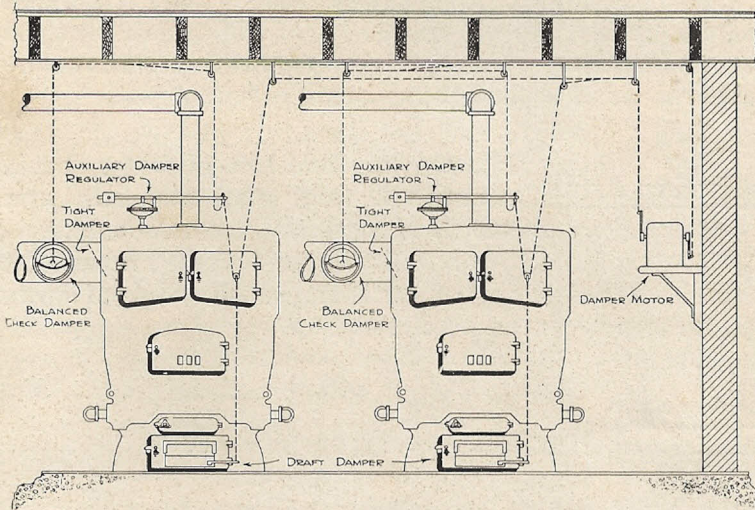


Figure No. 10—Method of Installing Damper Chains (Two Boilers)

Installing Thermostat

If Thermostat is used, it should be installed about five (5) feet from the floor on an inside wall, preferably in a room which is near end of steam main. Thermostat should not be placed behind a door or near a radiator or hot pipe.

A "Special Cable" is furnished where Thermostat has been purchased. All ends of this "special cable" are tagged showing where they should be connected. The cable running to Thermostat can either be concealed or run up on wall in room, as owner desires. Be sure to tape connections to back plate on Thermostat to prevent short circuiting after Thermostat has been screwed to wall.

Much time and work can be saved by dropping a small rope or wire down from point of outlet of Thermostat to basement below, before the walls are plastered. This provides an easy means of pulling the cable for the thermostat up from below at the time of installation.

When a Thermostat is installed, the arms on Motor should be adjusted from the Thermostat rather than from the Pressurestat. To do this, turn the indicator on Thermostat to point considerably higher than temperature shown on the thermometer on Thermostat. The arm on front of Motor should then be pointing down, and arm on back pointing up.