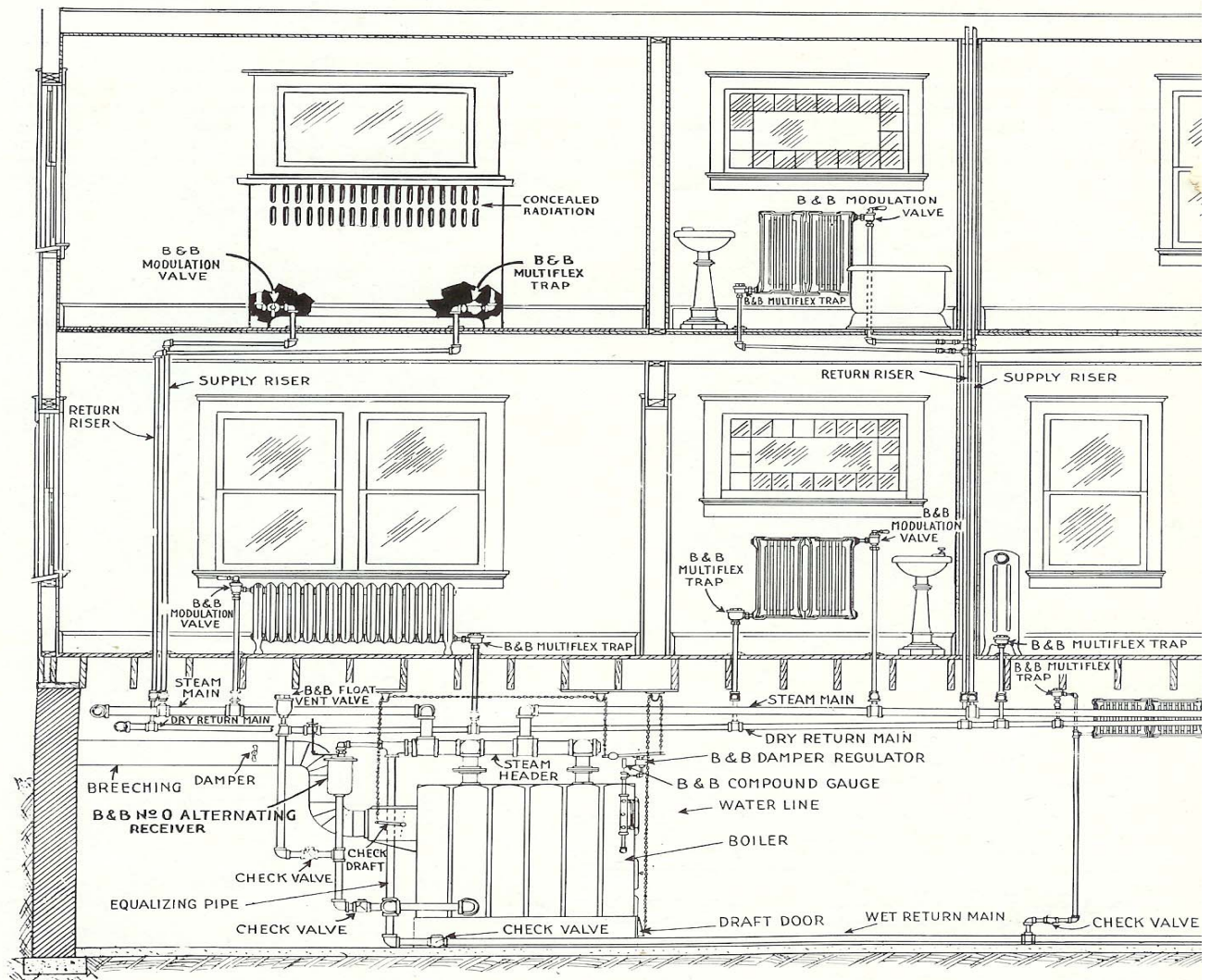


# The Bishop & Babcock Vacuum



## Section Through Building Showing an Installation of the

**T**HE typical installation shown above of the Bishop & Babcock Vacuum-Vapor System of Steam Circulation shows the relative location of the Bishop & Babcock Specialties necessary for the successful operation of the system.

The boiler, boiler connections and supply piping are the same as for an ordinary steam plant.

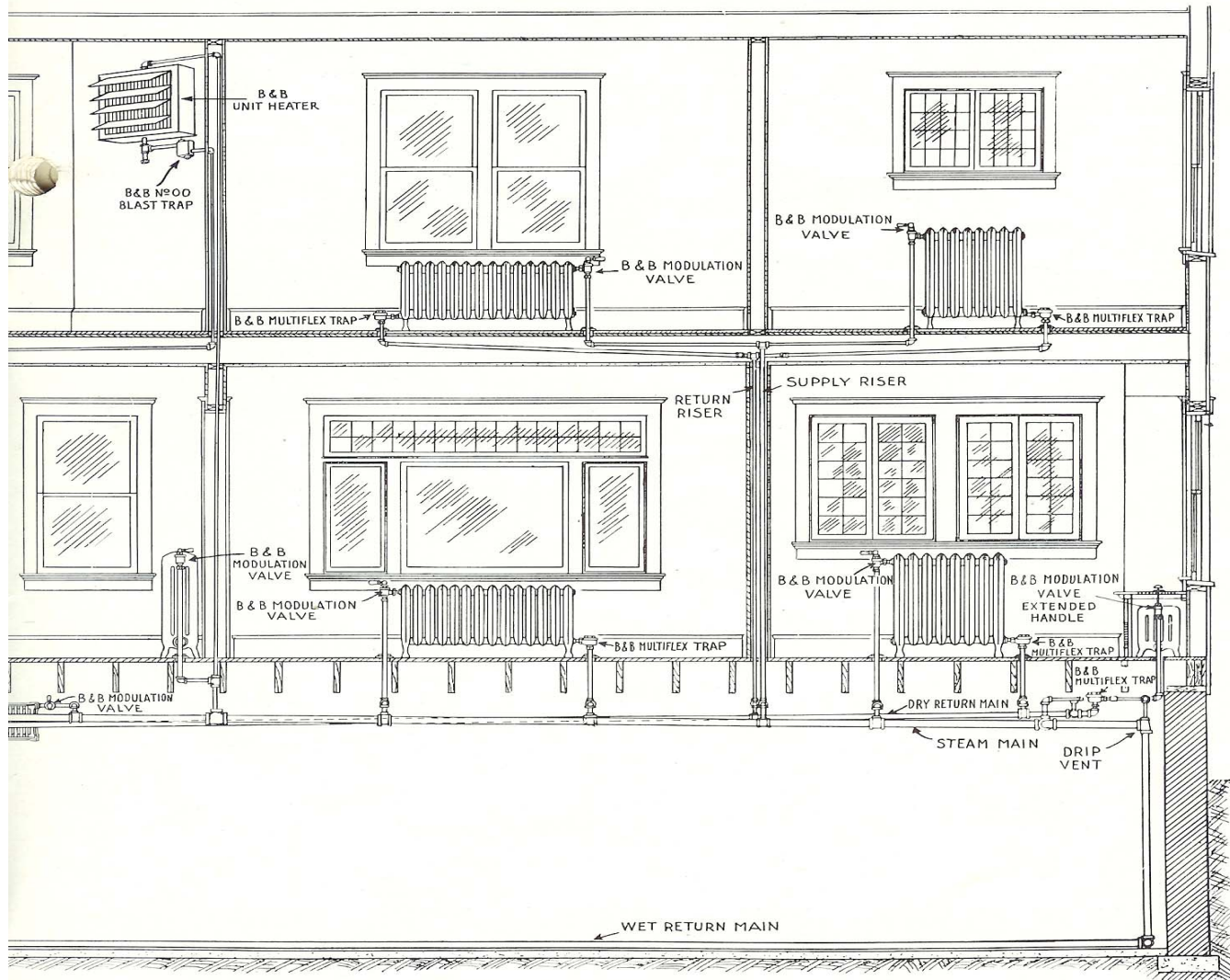
The steam mains branching off from the steam header on the boiler, carry the steam or vapor to the risers and laterals. The steam main pitches away from the boiler and at the end there is a drip. The water of condensation passes down to the wet return and flows back to the boiler while the air is relieved through the  $\frac{1}{2}$ " No. 6 Bishop & Babcock

Multiflex Radiator Trap into the dry return main.

The risers, laterals or run-outs lead to the units of radiation from which the steam or vapor is admitted to the radiators through a Bishop & Babcock Modulation Valve.

The air and water of condensation being heavier than steam or vapor, pass automatically through the Bishop & Babcock Radiator Traps which are connected to the return end of the radiators. The Radiator Trap is normally open, to drain the radiator of air and water of condensation as fast as accumulated. When hot vapor or steam appears the Radiator Trap automatically closes. This operation is continuous and the radiators are always kept full of vapor or

# Vapor System of Steam Circulation



# Bishop & Babcock Vacuum-Vapor System of Steam Circulation

steam, heated to full efficiency.

The air and water of condensation, after passing out of the radiators, flow through the return line by gravity back to the boiler. The air passes out through the Bishop & Babcock Float Valve. This valve is automatic and will not permit the return of air into the system.

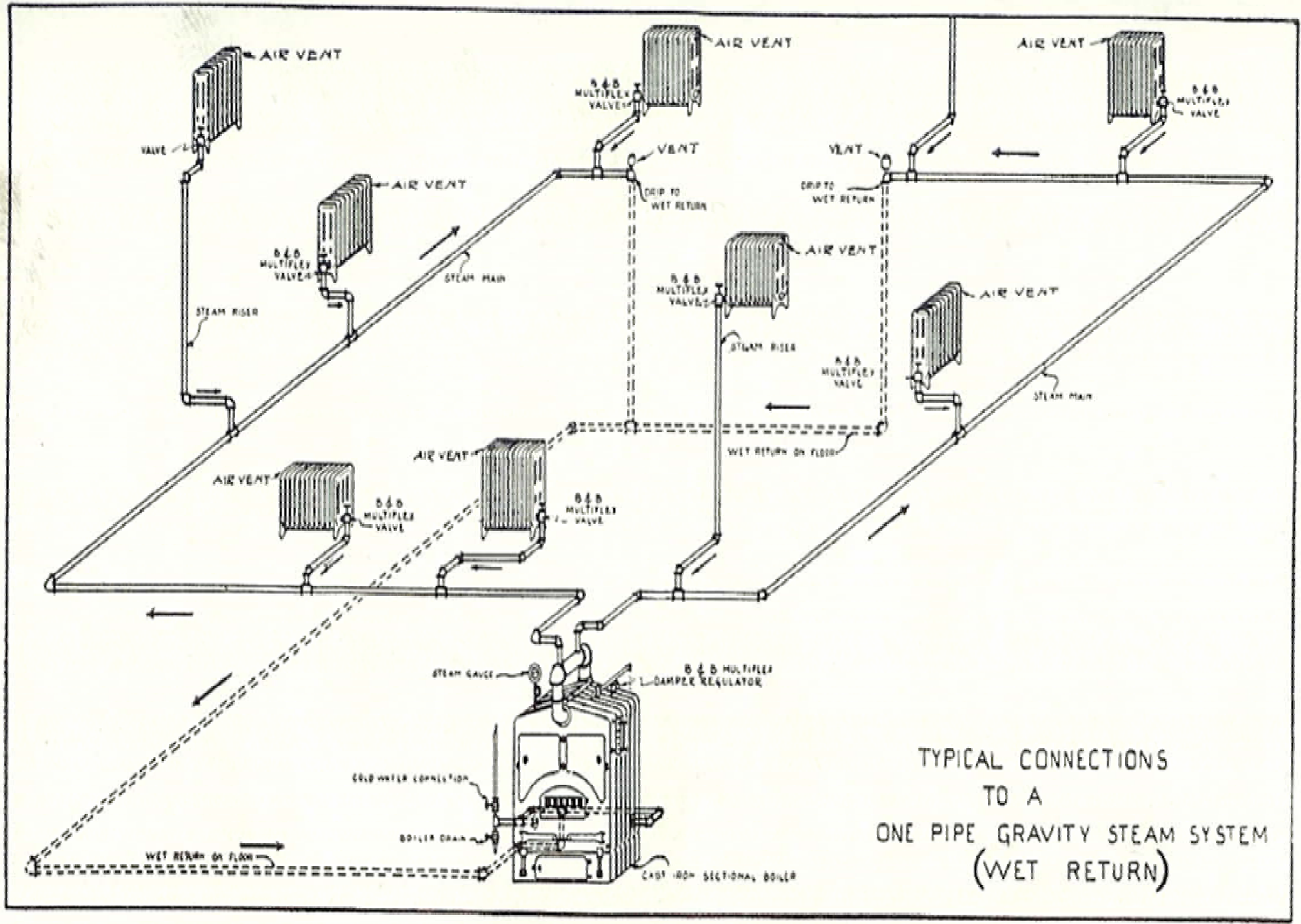
Should at any time the pressure creep up on the boiler and the pressure would not permit the return of water of condensation due to the fact the static head was insufficient, the Alternating Receiver would then automatically return the water of condensation back to the boiler.

The Damper Regulator controls the drafts and check dampers, and insures absolute control of the fire so as to maintain an even vapor pressure. With constant vapor pressure much or little heat can be supplied to any radiator by operating the Bishop & Babcock Modulation Valve. This prevents overheating in mild weather, and gives abundant heat in severe weather.

You will note there are no vent valves used on radiators, no foul odors from the boiler, piping and radiators can enter the room and there is no hissing of radiators to annoy the occupants or dripping water to damage furnishings.



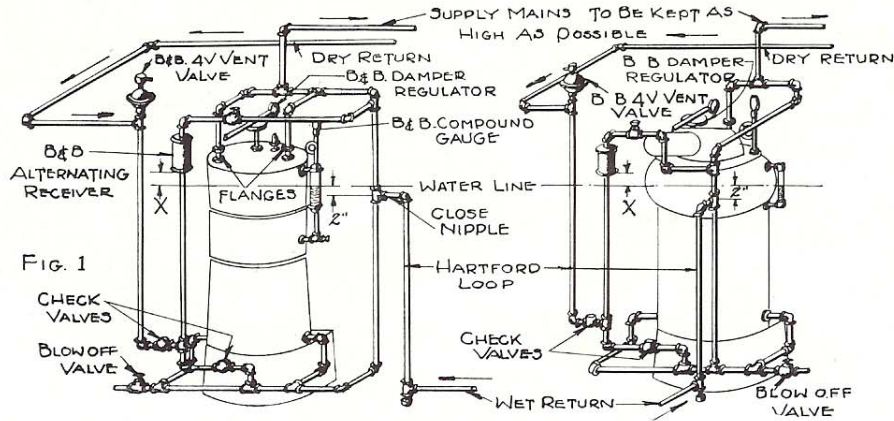
The Evolution of Heating Systems



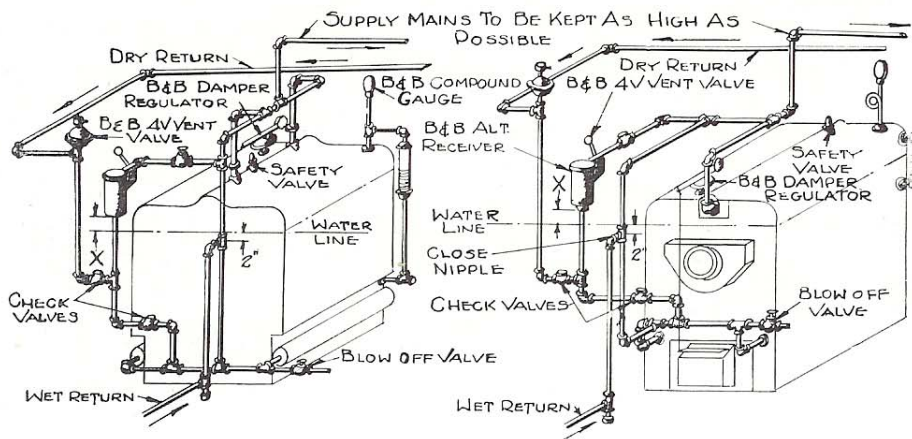
TYPICAL CONNECTIONS TO A ONE PIPE GRAVITY STEAM SYSTEM (WET RETURN)

[121]

Typical Details

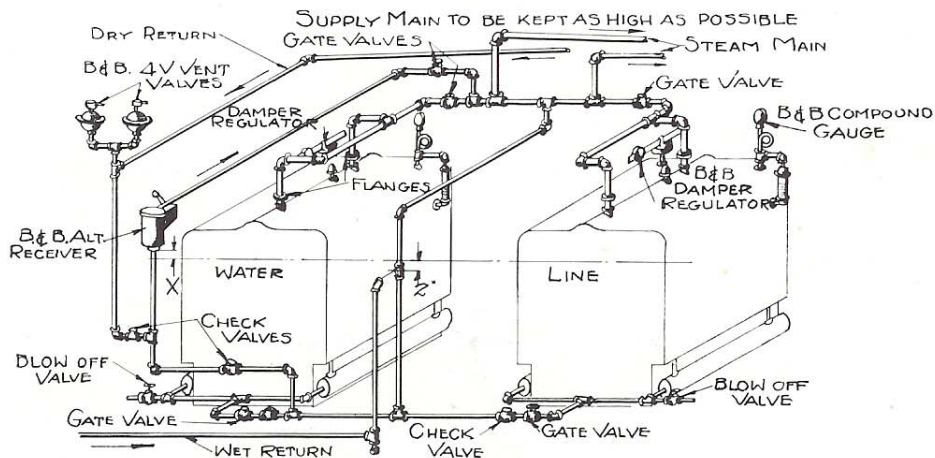


Practical Installation of B&B Material on Round Boilers



Installation on Sectional Boiler

Installation on Steel Boiler



Installation on Twin Boiler Setting

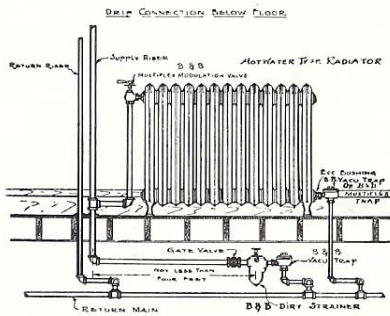
**Important notes applying to the installation of B&B Alternating Receivers**

Distance between water line of boiler and end of Dry Return to be not less than 26 inches.

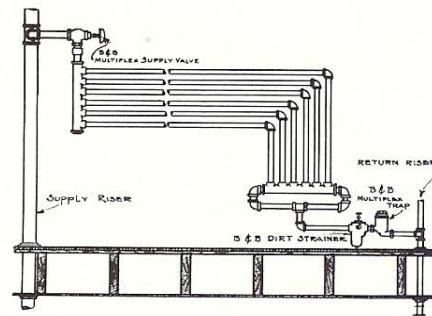
X - To Be Minimum of 12" Above Water Line of Boiler. Should be as Much as Possible Above the Water Line up to the Height of the Low Point of the Dry Return Main.

All Boiler Tappings to be Used Full Size and Boilers Must Be Cleaned Until They Keep A Steady Water Line.

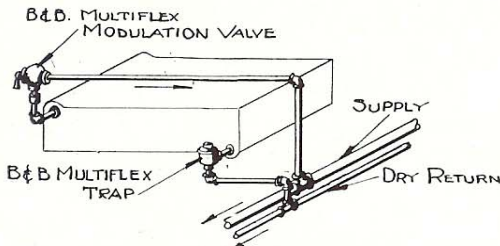




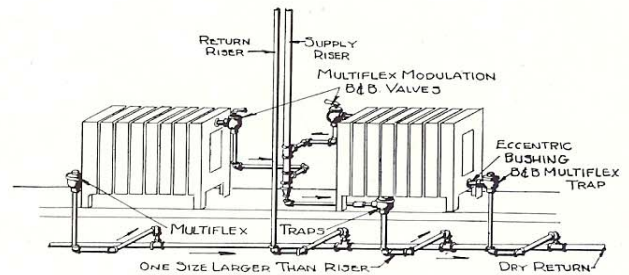
Typical Connections to Hot Water Type Radiator and Drip of Down Feed Riser as Applied to the Bishop-Babcock Vacuum System of Steam Circulation



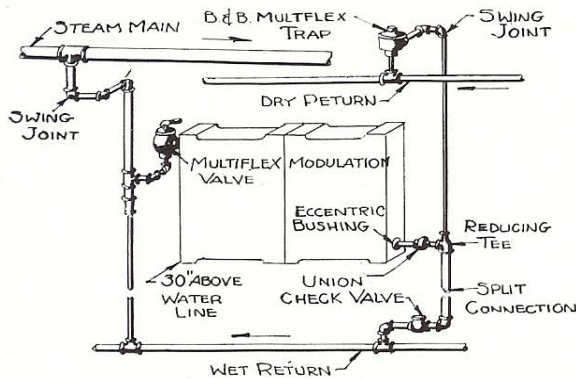
Typical Connections to Pipe Coil Showing Header on Return as Applied to B & B Vacuum System of Steam Circulation



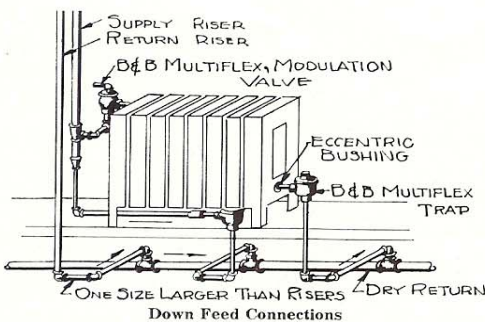
Installation on Indirect Radiator (Above Piping)



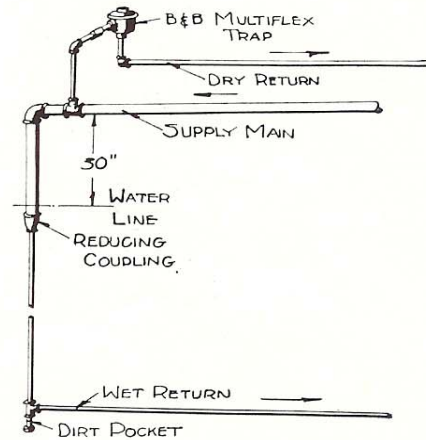
Down Feed Double Connections



Typical Wall Radiator Connection in Basement



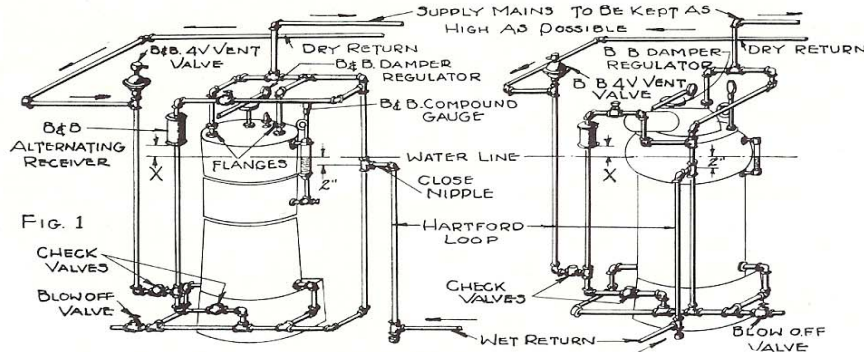
Down Feed Connections



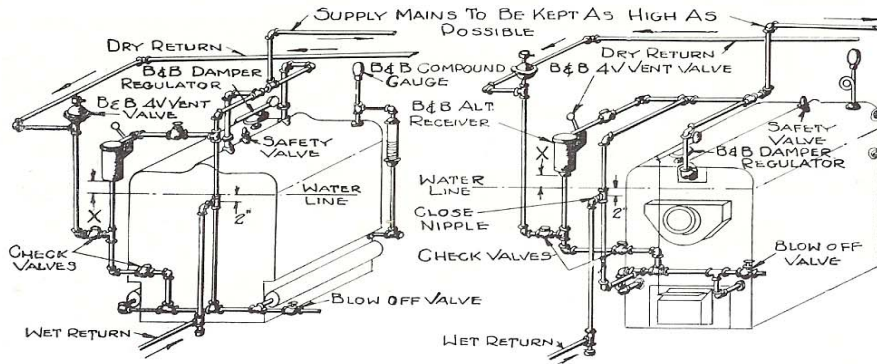
Drip and Vent Connection

All Supply and Dry Return Piping Must be at Least 26" Above the Water Line of the Boiler. All Radiators Must be at Least 30" Above Boiler Water Line. All Pipe Must Be Reamed Clean After Cutting. Arrows Indicate Flow of Condensation and Direction of Pitch. Supply and Return to Pitch 1" in 20 Ft.—Dry, Return to Pitch 1" in 15 Ft.—Horizontal Branches to Pitch 1" in 4 Ft.—Laterals to Pitch 1" in 10 Ft.—All Water Legs to Be 6" Long.

Typical Details

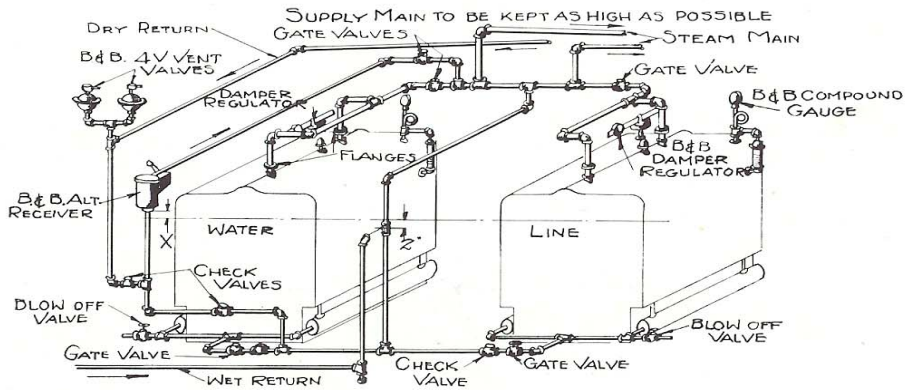


Practical Installation of B&B Material on Round Boilers



Installation on Sectional Boiler

Installation on Steel Boiler



Installation on Twin Boiler Setting

Important notes applying to the installation of B&B Alternating Receivers

Distance between water line of boiler and end of Dry Return to be not less than 26 inches.

X - To Be Minimum of 12" Above Water Line of Boiler. Should be as Much as Possible Above the Water Line up to the Height of the Low Point of the Dry Return Main.

All Boiler Tappings to be Used Full Size and Boilers Must Be Cleaned Until They Keep A Steady Water Line.



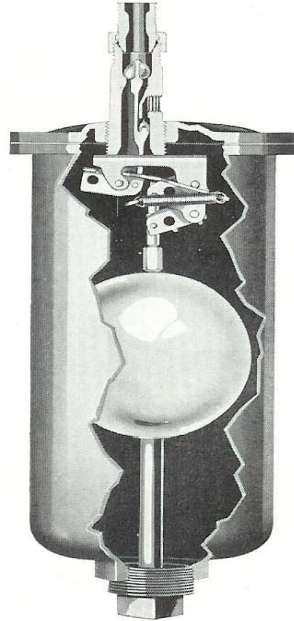
## B & B Line of Alternating Receivers

### No. 0 Direct Return Trap

The B. & B. Direct Return Trap is primarily a safety device, to insure the return of the condensate to the boiler under all conditions of operation of a gravity heating system.

In operation, the condensate returning from the system, enters the return trap at the bottom, raising the ball float, which slides freely on the guide rod. Upon the ball reaching the top of the rod, the pressure of the ball on the lever mechanism causes the valves to trip with a snap action, which promptly closes the vent to the return line, and opens the valve connecting the receiver to the boiler. There being an equal pressure in the boiler and the receiver, the difference in water level between the boiler and the receiver will cause the condensate to leave the latter and return to the former by gravity. When the water level in the receiver drops to the lower limit of the ball float

travel, the weight of the float causes the valve to trip, closing the port to the boiler, and opening the vent to the return line of the system.



The bottom of the direct return trap must be located at least six inches above the water line of the boiler, to which it returns the condensate by gravity. It will not act as a pump, or raise water above its own level. The No. 0 Return Trap will operate on all pressures from atmospheric to 20 lbs. gauge.

The No. 0 Return Trap, though of much simplified design, possesses all of the operating characteristics of larger Alternating Receivers, and serves the same purpose for smaller installations.

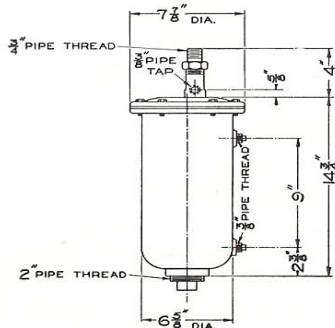
The B. & B. No. 0 Direct Return Trap requires no additional head room for its installation. It is simple, fool proof, positive and noiseless in operation.

### Specifications

1. Body and cover of best fine grained grey cast iron, accurately machined.
2. Seamless copper float.
3. Operating levers of the best brass, accurately machined and fitted.
4. Equalizing valve of the best steam brass, accurately machined, fitted and adjusted.
5. Valve seat, stem and valve proper of the best steam brass accurately machined.
6. Entire assembly thoroughly inspected and factory tested.
7. Screws and gaskets, to the high standard of quality required by the B. & B. Line.
8. Plugged tappings are provided for gauge glass. Gauge glass must be specified extra.

Size	Serial No.	Size	Steam Connections	Weight Lbs.
No. 0	50025	8"x18"	3/4"	45

### Roughing-in Dimensions and Performance Data



Performance: The B. & B. No. 0 Direct Return Trap when connected to return mains as shown in typical drawings, will return all the water of condensation to the boiler without a pump, and effectively prevent air binding of low pressure vapor systems of steam heating. The capacity based on square feet of direct radiation is as follows:

Height of Bottom of Trap above Boiler Water Line	6"	10"
Square Feet	2000	3000

**The B & B Line**  
**Heating Specialties ~ Ventilating Equipment**



**Capacities of Mains and Risers as Applied to the  
Bishop-Babcock Vacuum System of Steam Circulation**

• ONE QUARTER POUND PRESSURE LOSS •

SIZE of Supply INCHES	LENGTH OF SUPPLY AND RETURN PIPING IN FEET FROM SOURCE OF SUPPLY TO FARTHEST RADIATOR. ALLOWANCE FOR ELBOWS AND VALVES MUST BE ADDED TO MEASURED DISTANCE PIPE CAPACITIES IN SQUARE FEET OF DIRECT CAST IRON RADIATION GIVEN FOR EACH LENGTH. SUPPLY RISERS BASED ON LENGTH OF SUPPLY: RETURN RISER $\frac{3}{4}$ " UP TO 800', 1" TO 1500', $\frac{1}{4}$ " TO 2400'								
	200	300	400	500	750	1000	1250	1500	2000
1	66	52	46	40	31	29	26		
1 1/4	118	97	84	75	61	53	47	43	38
1 1/2	195	154	133	123	101	87	79	72	62
2	450	375	325	295	250	210	185	175	150
2 1/2	725	600	525	480	400	340	300	275	245
3	1350	1100	940	850	700	625	600	500	430
3 1/2	1950	1575	1360	1250	1000	900	800	725	625
4	2725	2225	1910	1725	1400	1250	1100	1025	875
4 1/2	3625	2960	2550	2300	1875	1650	1500	1375	1175
5	4850	3975	3410	3090	2500	2225	2000	1825	1600
6	7775	6400	5475	4850	4025	3600	3200	2900	2540
7	11500	9325	7960	7100	5800	5100	4700	4175	3660
8	16000	13000	11200	10000	8100	6800	6300	6000	5100
9	22000	17000	15000	13500	11000	9400	8400	7800	6850
10	29000	23300	20000	18000	14600	12700	11500	10500	9120
12	45000	36750	31810	28400	23000	19700	18100	16800	16200
14	60000	47400	41000	36500	29500	25300	23500	21400	18600
15	70000	57000	49100	43500	35500	30500	27700	25500	22000
16	85000	70000	60500	54000	43600	37900	34200	31000	27000

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Pipe Sizing

THE BISHOP & BABCOCK SALES CO.

**Capacities of Mains and Risers as Applied to the  
Bishop-Babcock Vacuum System of Steam Circulation**

• HALF POUND PRESSURE LOSS •

SIZE of Supply INCHES	LENGTH OF SUPPLY AND RETURN PIPING IN FEET FROM SOURCE OF SUPPLY TO FARTHEST RADIATOR. ALLOWANCE FOR ELBOWS AND VALVES MUST BE ADDED TO MEASURED DISTANCE PIPE CAPACITIES IN SQUARE FEET OF DIRECT CAST IRON RADIATION GIVEN FOR EACH LENGTH. SUPPLY RISERS BASED ON LENGTH OF SUPPLY: RETURN RISER $\frac{3}{4}$ " UP TO 800', 1" TO 1500', $\frac{1}{4}$ " TO 2400'								
	200	300	400	500	750	1000	1250	1500	2000
1	92	72	64	56	44	40	36		
1 1/4	166	136	118	100	86	74	66	60	
1 1/2	274	216	188	172	142	122	110	102	
2	632	528	456	414	350	294	260	246	
2 1/2	1020	850	720	676	564	480	420	386	
3	1900	1420	1320	1174	964	880	840	700	
3 1/2	2740	2200	1910	1760	1404	1264	1120	1020	
4	3800	3120	2680	2420	1970	1760	1550	1440	
4 1/2	5100	4160	3580	3240	2630	2320	2100	1930	
5	6820	5580	4800	4340	3510	3120	2810	2560	
6	10920	9000	7700	6800	5650	5060	4500	4080	
7	16200	13100	11200	10000	8150	7160	6600	5860	
8	22500	18300	15700	14040	11400	9550	8850	8440	
9	30900	23900	21100	19000	14500	13200	11800	10950	
10	40800	32700	28100	25300	20500	17900	16200	14750	
12	63200	51500	44600	40000	32300	27800	25400	23600	
14	84400	66600	57600	51200	41400	36200	33000	30000	
15	98800	80000	68200	61000	49800	42800	38800	35800	
16	119500	98500	85000	75800	59800	53200	48000	43600	

[85]

Pipe Sizing

THE BISHOP & BABCOCK SALES CO.



**Capacities of Mains and Risers as Applied to the  
Bishop-Babcock Air Line System of Steam Circulation  
One-Eighth Pound Pressure Loss**

THE BISHOP & BABCOCK SALES CO.

Size of Supply Inches	Size of Dry Return Inches	Size of Wet Return Inches	Length of Supply and Return Piping in Feet from Source of Supply to Farthest Radiator. Allowance for Elbows and Valves Must be Added to Measured Distance. Pipe Capacities in Square Feet of Direct Cast Iron Radiation Given for Each Length. Supply Risers Based on Length of Supply Mains. Air Risers 1/2" Above First Floor.								
			100	200	300	400	500	750	1000	1250	1500
1	1	1	62	44	36	31	27	22	19	18	16
1 1/4	1	1	118	83	70	59	52	44	37	35	30
1 1/2	1 1/4	1	189	133	109	93	84	70	60	55	50
2	1 1/2	1 1/4	388	280	237	201	182	154	127	117	115
2 1/2	2	1 1/2	657	454	383	322	296	249	208	190	180
3	2 1/2	2	1187	834	657	586	522	435	379	363	340
3 1/2	2 1/2	2	1710	1206	1002	850	775	634	546	503	470
4	3	2 1/2	2450	1720	1440	1220	1100	910	781	717	670
4 1/2	3	2 1/2	3200	2248	1874	1590	1435	1185	1011	942	900
5	3 1/2	3	4175	2947	2460	2087	1882	1052	1330	1235	1000
6	3 1/2	3	6737	4742	3975	3362	2992	2505	2156	1987	1780
7	4	3 1/2	10050	7147	5930	5012	4490	3719	3161	2477	2200
8	4 1/2	4	13950	9860	8205	6962	6230	5149	4262	4027	3800
9	5	4 1/2	19200	13780	11165	9600	8640	6912	5981	5545	4300
10	6	5	25300	18075	14925	12650	11385	9400	7962	7425	7000
12	7	6	40800	28400	23675	20150	18100	14925	12540	11750	10000
14	8	7	59750	42200	33300	28800	25600	20700	18100	16500	15000
15	8	7	70200	49400	40000	34000	30500	24900	21400	19400	17900
16	9	8	83700	59700	49200	42500	37900	29900	26600	24000	21800

Pipe Sizing

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**Capacities of Mains and Risers as Applied to the  
Bishop-Babcock Vacu Vapor System of Steam Circulation**

THE BISHOP & BABCOCK SALES CO.

Size of Supply Inches	Size of Return Inches	Length of Supply and Return Piping in Feet from Source of Supply to Farthest Radiator. Allowance for Elbows and Valves Must be Added to Measured Distance. Pipe Capacities in Square Feet of Direct Cast Iron Radiation Given for Each Length. Supply Risers Based on Length of Supply. Return Riser 3/4" up to 200', 1" to 400', 1 1/4" to 800'.								
		100	200	300	400	500	750	1000	1250	1500
1	1	87	64	50	44	38	30	27	25	20
1 1/4	1	161	114	94	81	71	59	51	45	42
1 1/2	1	267	189	149	129	118	97	84	76	70
2	1 1/4	589	436	363	314	285	242	203	179	169
2 1/2	1 1/4	1026	702	583	502	465	388	330	290	266
3	1 1/2	1862	1308	1023	910	816	671	606	580	483
3 1/2	1 1/2	2662	1905	1524	1316	1212	968	871	740	702
4	2	3725	2630	2152	1848	1669	1383	1212	1066	992
4 1/2	2	4903	3512	2866	2468	2230	1814	1598	1450	1330
5	2 1/2	6620	4698	3845	3305	2992	2420	2152	1936	1766
6	3	10658	7527	6033	5304	4692	3896	3486	3100	2810
7	3 1/2	15500	11150	9029	7713	6883	5616	4936	4550	4040
8	4	21783	15500	12433	10850	9680	7850	6583	6100	5813
9	4 1/2	29066	21800	16466	14533	13083	10333	9100	8133	7550
10	5	38733	28100	22550	19366	17433	14116	12316	11150	10166
12	6	61900	43600	35542	30772	27533	22266	19116	17516	16266
14	7	82333	58133	45900	39700	35316	28550	24966	22750	20700
15	7	96806	68133	55166	47283	42083	36016	29516	26783	24683
16	8	115333	82325	67825	58583	52266	41733	36683	33100	30033

Pipe Sizing

[83]

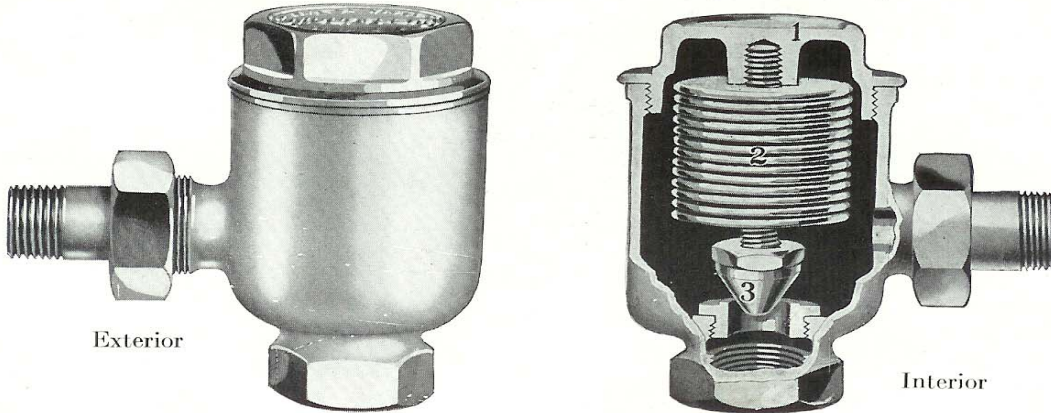
## The B & B Line of No. 3 Multiflex Traps

To meet conditions of sensitiveness for varying steam and vacuum pressures the B & B Line of Multiflex Return Traps is offered. They are essentially a low pressure trap and should not be used where the steam pressure is over 10 pounds. For Medium pressure see page 6.

The Multiflex Return Trap is a thermostatic valve for use with vapor and vacuum systems of steam circulation. It is used on the return ends of radiators, coils, drip points and on blast heaters. Steam in contact with the thermal

member vaporizes the volatile liquid hermetically sealed in the thermal member and closes the valve tightly, preventing the escape of steam. Air and water of condensation cools the member and causes it to contract and open the valve. The Multiflex thermal member is made from a special composition brass, corrugated into thirteen folds or corrugations, having 26 flexing surfaces. This distributes the deflection equally over all the surfaces.

Air and water of condensation are passed noiselessly, automatically and efficiently.



1/2", 3/4" and 1" Multiflex Traps

### For Low Pressures Specifications

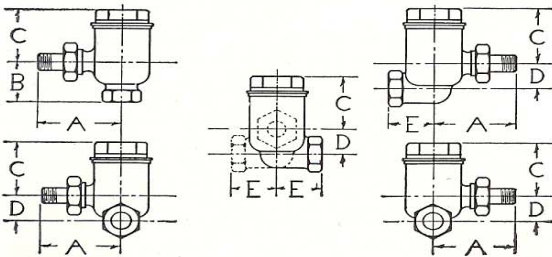
1. Body and cap heavy bronze castings with metal to metal joints, heavily nicked with polished trimmings.
2. Thermal member special composition brass, heat treated and filled with volatile liquid and hermetically sealed by the B & B process.
3. Conical valve and sharp edge seat, made from best steam brass, insures positive seating. Extra large valve opening prevents dirt accumulation.
4. Each trap provided with an extra heavy swivel and nut containing ground ball and socket joint.
5. Operates on varying pressures up to 10 pounds.

Sizes, patterns, serial numbers and weights as follows:

Size and Type Inches	Serial No.	Net Weight Lbs.
1/2" No. 3 Angle	2355B	2 1/2
1/2" No. 3 S. W.	4535B	2 1/2
1/2" No. 3 R. H.	4545B	2 1/2
1/2" No. 3 L. H.	4555B	2 1/2
3/4" No. 3 Angle	4565	3
3/4" No. 3 S. W.	4595	3
1" No. 3 Angle	4575	3 1/2

### Roughing-in Dimensions and Performance Data

Size and No.	A	B	C	D	E
1/2"-3	3 1/4	1 3/8	2 1/2	1 1/8	1 3/4
3/4"-3	3 1/2	2	3 3/8	3/8	1 3/8
1"-3	4	2	3 1/4	—	—



The PERFORMANCE of this type of trap on different work appears in the following table based on square feet of radiating surface.

Size and No.	Direct Radiation		Direct Indirect		Indirect Radiation		Wall and Coil Radiation	
	Vacu Vapor	Return Line	Vacu Vapor	Return Line	Vacu Vapor	Return Line	Vacu Vapor	Return Line
1/2"-3	0-200	0-250	0-150	0-175	0-130	0-150	0-170	0-200
3/4"-3	201-500	251-600	151-350	176-425	131-300	151-350	171-430	201-500
1"-3	501-1000	601-1100	351-700	426-750	301-625	351-700	431-825	501-900

**The B & B Line**  
*Heating Specialties ~ Ventilating Equipment*

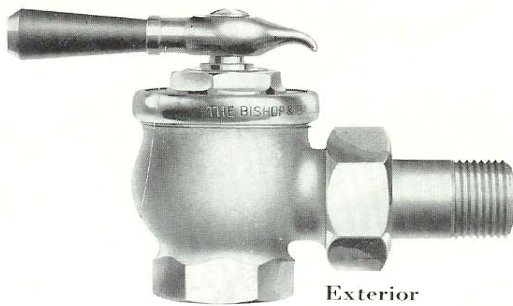


## The B & B Line of Special Multiflex Modulation Valves

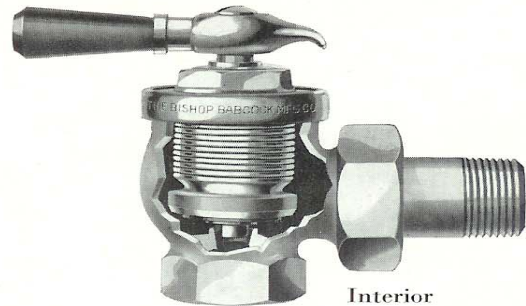
The B & B Multiflex Modulation Valve insures of accurate control of steam entering radiators in vapor and vacuum heating installations. The regulation is self-indicated on the dial, from shut to full open. It is all-metal construction, packless and leakage is impossible, there being no packing boxes. Multiflex bellows replace all packing. One-half turn of the lever closes the valve tightly. This valve is a steam and water tight valve, with valve lift obtained by  $\frac{1}{2}$  turn, graduated into open,  $\frac{3}{4}$  open,  $\frac{1}{2}$  open,  $\frac{1}{4}$  open and shut.

The merits of this valve are tabulated as follows:

1. All-metal construction, handsomely finished in full nickel.
2. Moving parts of special wear-resisting metal.
3.  $\frac{1}{2}$  turn of handle opens full from shut to full opening, modulation correct.
4. Large steam port, renewable Jenkins disc, full lift.
5. Packless, multiflex bellows insures a steam and water-tight valve.
6. Extra heavy swivel and nut.
7. All parts interchangeable.



Exterior



Interior

### Specifications

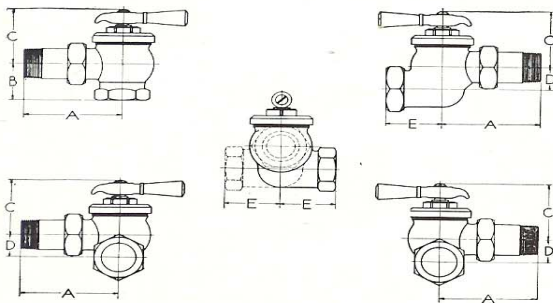
1. Body and bonnet of the best steam brass, fully nickeled.
2. Valve stem, stem guide and disc holder of the best steam brass accurately machined.
3. Diaphragm, heavy B & B Multiflex Bellows of special composition brass.
4. Disc holder contains renewable Jenkins disc.
5. Swivel and nut extra heavy brass, nickeled finished.

All parts are interchangeable, and the trimmings of the valve full nickeled polished. This is a handsome and efficient Modulation Valve.

Sizes, patterns and weights are as follows:

Size Inches	Pattern	Serial No.	Weight Lbs.
$\frac{1}{2}$	Angle	9485	1 $\frac{1}{2}$
	S. W.	9495	1 $\frac{1}{2}$
	R. H.	9505	1 $\frac{1}{2}$
$\frac{3}{4}$	L. H.	9515	1 $\frac{1}{2}$
	Angle	9525	1 $\frac{3}{4}$
	S. W.	9535	1 $\frac{3}{4}$
1	R. H.	9545	1 $\frac{3}{4}$
	L. H.	9555	1 $\frac{3}{4}$
	Angle	9565	2
1 $\frac{1}{4}$	S. W.	9575	2
	R. H.	9585	2
	L. H.	9595	2
1 $\frac{1}{2}$	Angle	9605	3
	S. W.	9615	3
	R. H.	9625	3
2	L. H.	9635	5
	Angle	9645	5
	Angle	9655	7 $\frac{1}{2}$

### Roughing-in Dimensions and Performance Data



Size	A	B	C	D	E
$\frac{1}{2}$ "	2 $\frac{3}{8}$ "	1 $\frac{3}{8}$ "	2 $\frac{1}{8}$ "	1 $\frac{1}{2}$ "	1 $\frac{5}{8}$ "
$\frac{3}{4}$ "	3"	1 $\frac{3}{4}$ "	2 $\frac{1}{8}$ "	1 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "
1"	3 $\frac{3}{8}$ "	1 $\frac{3}{4}$ "	2 $\frac{1}{8}$ "	1 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "
1 $\frac{1}{4}$ "	3 $\frac{3}{8}$ "	1 $\frac{3}{4}$ "	2 $\frac{1}{8}$ "	1 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "
1 $\frac{1}{2}$ "	4 $\frac{1}{8}$ "	2 $\frac{1}{4}$ "	2 $\frac{1}{8}$ "	1 $\frac{1}{2}$ "	2 $\frac{1}{8}$ "
2"	4 $\frac{1}{2}$ "	2 $\frac{1}{4}$ "	3 $\frac{1}{8}$ "	1 $\frac{1}{2}$ "	2 $\frac{1}{8}$ "

The Performance and capacity of the B & B Line of Special Modulation Valves on different service are as follows:

Size In.	Direct Radiation	
	Vacu Vapor	Return Line
$\frac{1}{2}$	0 to 20	0 to 25
$\frac{3}{4}$	21-60	26-75
1	61-120	76-150
1 $\frac{1}{4}$	121-200	151-300
1 $\frac{1}{2}$	201-350	301-500
2	351-450	501-650