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Bound with 3/16" galvanized steel wire, tightly drawn, so that wire is flush with staves.

Inside lined with heat reflector of heavy AAAA charcoal tin plate, which when required is backed up with double lining of asbestos.

Constructed to leave one inch dead air space between pipe and casing.

A—Wrought Iron Pipe.
B—Tin Lining.
C—Standard Wood Casing.
D—Asphaltum Coating.
E—Dead Air Space.
F—Crushed Stone.
G—Drain Tile.
H—Roofing Strips over Tile Joints.

Built up from thoroughly kiln-dried selected staves, tongue and groove.

Outside coated with heavy asphaltum waterproofing and rolled in sawdust to facilitate handling.

This is the service record of ADSCO Red Diamond Brand Casing—the conduit and insulation combined that tests 91% efficient.

It lasts because it is well made of highest grade lumber thoroughly kiln-dried. Doesn’t dry up, shrink, check or crack when steam is turned into line. Cylindrical in form—withstanding the crushing weight of the earth and the surface loads above it.

Cut shows correct method of installation—crushed stone or coarse screened gravel bed and porous drain tile laid to grade with outlets to sewers at all low points.

This construction, utilizing ADSCO Red Diamond Brand Casing is employed by a majority of the large district heating companies for low pressure steam and hot water lines.

FROM the level prairie over which Winnipeg is spread rises a white smoke-stack 245 feet in height. It is as high as the addition to the King Edward Hotel in Toronto, eight feet higher than the C.P.R. building at the corner of King and Yonge Streets, and only five feet less than the Royal Bank building. It is a landmark seen for miles. It is the answer of Winnipeg’s municipal hydro-electric system to the challenge of the elements, the winds that root plant operated in connection with it.

When municipal power was turned on in 1911, Winnipeg did not dream of the necessity of a steam auxiliary. It was rudely awakened to the need for such an emergency source of power by cyclonic storms which swept over Manitoba on May 10th, 1922, tearing up the electric towers and interrupting service for many hours. Clamour from the consumers became so insistent that on June 15th the council directed the hydro management to get estimates for a stand-by plant. Need for haste was emphasized by another storm which came along scarcely a week later doing even more widespread destruction. Hydro cus-
tomers threatened to take their business away if they were not assured a stand-by plant at once. It was promised, and as investigation indicated the desirability of co-ordinating with it a steam-heating plant, Council decided to build the stand-by plant at once, in such a way that a district heating utility could be added at a later date.

Plans for the plant and system were immediately prepared by the city engineers with N. W. Calvert as consulting engineer on the distribution system.

TO-DAY Winnipeg has an auxiliary plant ready to step into the breach if there is any interruption of the hydro service from Pointe du Bois Falls, and operated in connection with it is a district steam-heating plant which last winter heated 157 buildings with a total of 543,285 square feet of radiation. The steam is distributed to customers through four miles of wrought iron mains carried in concrete ducts under the city streets. Though there are vital differences between the Winnipeg plant and the auxiliary steam plant proposed by Mayor Foster for Toronto and endorsed by the experts of the Toronto Hydro Commission, what has been done here should be of interest to Toronto as an illustration of what can be done.

When the district steam-heating plant was mooted, Winnipeg was in the midst of a period of business depression. Real estate was rather a liability than an asset. Opposition to the expenditure of three-quarters of a million was natural, but the by-law was approved by the citizens. The scheme has been carried through successfully. The steam-heating plant has furnished work for the boilers of the auxiliary plant seven months in the year, creating an opportunity for them to pay their own way. Thus, while the auxiliary plant has insured the hydro service against interruption, the steam-heating plant saved the cheap power rates. Though the deficit of the steam plant during the first fifteen months was $90,000, the year 1927 is expected to show a surplus.

Letters from customers state that district steam-heating has saved them ten per cent., twenty-five per cent., and as high as forty per cent. on heating their buildings. Apart from the general advantages of the system, such as elimination of smoke nuisance, coal and ash handling, and so on, there were other factors which induced Winnipeg to vote in favor of adopting the system. It was represented that:

1. Off-peak electricity would be used when available instead of coal for heating the boilers, resulting in a revenue of $75,000 a year.
2. The fixed charges on boiler equipment for the auxiliary plant would be taken care of by the heating system, thus relieving hydro of annual charges of $34,000.
3. With the boilers always under steam, the high pressure fire protection plant could be completely electrified, resulting in a reduction in operating costs to the extent of $63,000 a year.
4. The water works steam reserve plant would be eliminated with an estimated saving of $6,000 a year.
5. Canada's natural resources would be developed by the use of low-grade slack coal from the western mines, thus reducing the importation of thousands of tons of United States coal.

How far the steam-heating plant has done what was expected of it is indicated in a paragraph from the last annual report:

While the amount of steam sold was increased from 167,000,000 lbs. in 1925 to 202,000,000 lbs. in 1926, the amount of coal consumed was reduced from 11,358 tons in the former year to 6,752 tons in 1926. In 1926 nearly 80 per cent of the entire output of steam was produced from electrical energy; over 65,000,000 k.w. hours were utilized in this way. This energy, generated at Pointe du Bois during off-peak hours and hitherto unsalable, during 1926 earned a revenue of $65,000, at a rate of one-tenth of a cent per k.w. hour.
THE coal is handled mechanically from the car on the siding to the furnaces. From the railroad cars it is carried to the top of the plant by a skip-hoist which can handle a carload in thirty minutes. The skip is automatically unloaded and the coal fed through a crusher into a green coal bunker of 110 tons' capacity. In its journey, nails, bolts, horseshoes and other pieces of waste iron such as might damage the machinery, are extracted by an electric magnet. From the storage bin the fuel goes into the drier room; here two ten-ton driers utilize the hot gases from the furnaces to drive out the moisture extracted by an electric magnet. From the bins directly over the furnaces the coal is fed by screw conveyors capable of carrying thirty tons per hour quite handily. Two exhaust fans draw the coal to the top of the plant whence it is dropped into the bunkers ready for the furnaces.

After drying, the coal is fed to the pulverizer room below, where two Raymond mills pulverize it and pass it through a 200 mesh. The rated capacity of these mills is six tons per hour each, though working on high grade coal they can handle ten tons per hour quite handily. Two exhaust fans draw the coal to the top of the plant whence it is dropped into screw conveyors capable of carrying thirty tons per hour. These deposit it in the bunkers ready for the furnaces.

From the bins directly over the furnaces the coal is fed by screw conveyors into a mixing chamber (which corresponds to the carburetor of an automobile) mixed with air and blasted through nozzles of the fish-tail burner type into the furnaces. From the operating floor, through a small opening, one may see the ignited fuel blasted downward in a continuous stream of living fire, filling the furnace with a cloud of white-hot flame. The combustion is so complete that practically no ash remains and the last heat unit is utilized in raising steam.

District Heating is a success in Winnipeg — in London, Ont., and other Canadian Cities. As a result there is a growing interest in the economies of this form of heating, throughout the entire Dominion.

Several important projects are under consideration, and the American District Steam Company in order to serve its growing Canadian customers has organized the Canadian District Steam Company Ltd., with head-quarters at 33 Richmond Street, W., Toronto, Ontario.

Through its Canadian subsidiary ADSCO offers municipalities, Electric Utilities and others the benefit of its fifty years experience in the efficient and economical distribution of steam through underground mains.
Only in ADSCO Variators can you obtain a packless expansion joint in which the required flexibility is provided by a corrugated copper diaphragm thin enough to permit the maximum number of flexings. This is accomplished by the use of heavy steel backing plates that relieve the diaphragm from all pressure strain.

**ADSCO construction eliminates the necessity of building the diaphragm so heavy that its degree of flexibility would be reduced.**

**Service Outlets, Anchorage Saddles**

In the ADSCO Variator, alone, will you find such features as service outlets, anchorage saddles and other cost-cutting combinations.

Each of the three types of ADSCO Variators is built in fourteen sizes to handle expansion in pipe from 3" to 20" in diameter. Compare an ADSCO Variator point for point with any other packless expansion joint and you will understand why less than 1% of all the ADSCO Variators installed since 1904 have been repaired.

**Model "O" Double Variator**
- For pressure up to 50 lbs.
- Total traverse 2". Takes care of 150 feet of pipe at 50 lbs. pressure. Service outlet and anchor plates.

**Model "O" Single Variator**
- For pressure up to 50 lbs.
- Total traverse 1¾". Takes care of 60 feet of pipe at 50 lbs. pressure. Has service outlet, anchor and drip.

**Model "P" Double Variator**
- Smaller diameter and lighter weight than the Model "O." Made in double type only.
- For pressure up to 125 lbs.
- Total traverse 2". Floats in pipe line. Not furnished with service outlets or anchor.

**Steel Backing Plates**

Placed close together back of diaphragm and held in position by brass pins, relieve diaphragm of all pressure strain.

**Thimble Arrangement**

Directs flow of steam thru chamber, reducing friction.

**Built-in Anchorage Saddles**

Furnished with Model "O" Single and Double Variator. Permit anchoring of line in workmanlike manner without use of extra fittings.

**Corrugated Copper Diaphragm**

Annealed by a special process while corrugated, to give extreme flexibility and longevity. Surface of diaphragm large in proportion to the movement caused by expansion and contraction so that strain at any one point is negligible.

**Service Outlets**

to which service lines to consumer's heating system are connected, provided in Model "O" Single and Double Variator. Save cost of buying and installing special fittings.

**Provision for Dripping Steam Line**

Through outlet tapped in Model "O" Single Variator. Eliminates expense of extra drip connection.

**Order Direct**

We recommend the use of a packless expansion joint in which copper is the flexible material, for working pressure up to 125 lbs. in the square inch.
duced is exceedingly low, since the entire cost for steam generation can be absorbed in the sale of steam as such.

In Rochester, N. Y., it was pointed out, the Rochester Gas & Electric Corporation have recently become very active in the improvement and extension of their District Heating service and in order to place themselves in a position necessary to meet the rapidly growing demand for heating service have spent a vast amount of money in new boiler plants and system expansion. High pressure steam is distributed and sold for industrial uses, some of the underground piping being designed for 350 lb. steam pressure. The larger distribution system, however, is for purely heating purposes and for this, steam is distributed at pressures ranging from 2 to 50 lbs. The company has installed over 33,000 ft. of underground piping ranging from 20" pipe down. New customers are constantly being connected and applications for further extensions indicate constantly growing opportunities for the further extension of this modern system.

Other cities enjoying the benefits of District Heating include Detroit, Cleveland, Erie, Akron, St. Louis, Kansas City, Grand Rapids, Kalamazoo, Scranton, Boston, Philadelphia, Atlantic City, Birmingham, Ala., Atlanta, Ga., Little Rock, Ark., Saginaw, Mich., London, Ont., Winnipeg, St. Paul, Denver, Salt Lake City, Seattle, San Francisco, Los Angeles, San Diego and more than a hundred others ranging from the largest cities down to towns and even villages of only one or two thousand population.

In tracing the development of District Heating from its inception by the father of the American District Steam Company back in the seventies, Mr. Slade touched on the difficulties encountered by the pioneers in taking care of the expansion and contraction of the underground piping, and how a solution of these difficulties led to the development of a comprehensive system of packless and slip-type expansion equipment, and the gradual and careful development of this to the present-day high standards which enable District Heating companies and others to meet with confidence and economy not only the expansion difficulties but every other problem encountered in the underground distribution of steam and its sale for power and heating purposes. Other difficulties which were solved during the early years by the application of special equipment, which has subsequently been constantly improved, were proper trapping of the steam lines, accurate measurement of the steam service, dependable regulation of the pressure on individual heating systems, proper anchorage of piping and fittings, accurate alignment and guiding of pipe sections, adequate and correct under-drainage, efficient and durable insulation, the development of conduit systems designed to meet severe underground conditions and a score of other similar problems of which have gone far to advance District Heating to its present state of successful and profitable operation.

A RESUME of changing conditions accounted for the swing of the pendulum from the rapid extension of District Heating in scores of towns and cities to a comparative inactivity and back again from this position to the present day rapidly growing interest in many applications of District Heating which were not previously thought of. The installation of electric generating plants all over the country using reciprocating engines in the production of electric energy permitted the use of vast quantities of exhaust steam for District Heating. Practically any utility company that had a large amount of exhaust steam from the reciprocating engines could well afford to install a distribution system and operate a District Heating plant, since the steam costing little, represented practically a net profit of whatever income was received. This naturally led to the rapid spread of District Heating. Later, following the advent of the steam turbine and the application of condensers, there ceased to be available sufficient exhaust steam for the requirements of the heating system.

This condition, combined with the general practice of inadequate rates for the sale of steam and the rising cost of coal in steam generation at that time, reacted to the disadvantage of District Heating. Later on, applications for increases of steam rates were largely conceded both by the public and Public Service Commissions and similar boards, and it was only a question of time until the public realized that a District Heating service was worth the price necessary to admit of profitable operation, and coincident with this realization, public utility companies began to appreciate that District Heating, if carefully managed, could be operated at a profitable, independent service and even more profitably as an adjunct to their electric service. As a further step also, the introduction of higher pressures and the use of turbo-generators acting as reducing valves between boiler pressure and underground steam distribution pres-
Design, Construction and Application of Expansion Joints

Back in the '70's, during the early days of the American District Steam Company, an expansion joint was known as a "Junction Box." The first junction boxes, designed and built by the forerunners of Ansco, were crude affairs consisting of cast iron housings, stuffing box and gland. One end of the pipe itself provided the slip and was supported and guided into the junction box by means of a cast iron cradle which extended from the box.

Although this type of expansion device was the best procurable in those days, it was far from being satisfactory. The slip, because of leaks, corroded to the gland and caused trouble. To make a satisfactory joint, it was necessary to overcome the leaking and corrosion and with these points in view, the ADSCO engineers re-designed and improved the junction box, made a slip of cast iron, which was carefully machined and highly polished then screwed into a cast brass flange. The device was assembled at the factory and packed ready for instant installation. The junction box then became what is known today as the simple type of expansion joint.

It is a seven-league step from the junction box of 1870 to the line of ADSCO Expansion Joints in use today, even though every one of the ADSCO line has developed from the original junction box.

Experience over this period of nearly a half century has disclosed the most suitable features to be incorporated in ADSCO Joints.

For example, some of the major problems to be solved by our engineers were: How deep should the stuffing box be on a 12" joint operating under 50 lbs. steam pressure? What kind and size of packing should be used? How long a traverse should a joint accommodate? What additional functions besides taking up expansion, should a joint perform? How could the cost of the joints be kept at the minimum for each installation?

The answers to these and hundreds of other questions on expansion have been worked out by fifty-one years of exhaustive experience. Today, the correct solution of every pipe expansion problem is provided for in ADSCO Expansion Joints and the attending engineering service.

If the stuffing box of an expansion joint is too shallow or takes too small a size of packing, the joint will require regular attention and frequent repacking. This interrupts service and is costly. On the other hand, a stuffing box which is too deep (and there are such joints) does not permit the proper degree of compression on all of the packing, and a troublesome joint is the result. There is a correct depth and size for stuffing boxes on every size of joint for various pressure and temperature conditions.

Although ADSCO does not manufacture packing, it has a large number of packings made and these are tabulated for various operating conditions—high or low pressure steam in a number of pressure and temperature steps, hot and cold water, hot oil, gases, etc. The kind of packing is important, but the kind of joint it is to be used in is paramount.

ADSCO Joints can be shipped complete in every detail, packed ready for any service for which they are to be used. A specification of the job indicates the type of joint best suited and the kind of packing recommended.

We have found that a 4" traverse is a good standard for practically all joints. There are many installations, however, where economy can be affected by using longer traverses. All ADSCO Joints can be supplied with long traverses in multiples of 2" up to 12". It is not good practice, we have found, to crowd too much pipe on one slip. It is much better to split a 10" movement on two 5" slips than to carry it all on one 12" traverse joint. A 5" to 7" movement can be carried nicely on an 8" traverse joint; beyond this, in general practice, we would recommend a double joint or two singles.
Expert Says District Heating Will Parallel Electricity

Saving in Capital Outlay an Important Feature

"The development of central plant heat is now following the same course as did the growth of centralized production of light and power," declares F. T. H. Bacon, the foremost expert in the United States on the elimination of waste in building construction and management.

Savings in capital outlay made possible by the development of District Heating in the larger cities have totaled many millions of dollars in recent years. Mr. Bacon says: "The momentum in this direction will some day equal the development of the electric light and power companies."

"Not so many years ago it was standard practice to equip commercial buildings with their own electric generating plants," he points out. "Even where connection was made with the central station, building owners wanted their own equipment in case of emergency. But as the electric light and power companies began to improve this became unnecessary, and the installation of a private plant became an economic waste, expensive in capital outlay and definitely reducing the income of the building."

"The development of central plant heating is now following the same course. Several hundred office build-

ings in New York are serviced in this way, and with the rise of reality values the time will come when it will be too expensive to waste capital and space on private plants.

"Objections are raised to central plant heat, but in the main they are the same as the original objections to central light and power. The fear of interrupted service is the chief objection. Steam companies operating in the big cities are eliminating that by actual records. The record improves as the service expands, because the emergency equipment is necessarily increased. Last year a cable was broken in a New York office building by some accident. An emergency crew ran in a new cable from the street, carrying it over the sidewalk, in less than thirty minutes."

"Similar service is available in steam, in many instances. It is not uncommon for the utility to make provision for two or three different means of access to a building, so that no matter what happens, the service will not be interrupted."

In St. Louis, two prominent newspapers depend on the Union Electric Light and Power Company for 100 lbs. continuous service and in five years on no occasion has it been necessary for them to shut down due to failure of the District Heating Service.

Many Prominent Skyscrapers Choose ADSCO Riser Joints

Low cost, ease of installation and freedom from maintenance have been the primary considerations for using ADSCO All Brass Riser Expansion Joints in the heating systems of world-famous skyscrapers in the largest cities of the United States and Canada.

ADSCO All-Brass Riser Expansion Joints allow expansion up to 8", keep the sediment away from the packing and assure perfect, trouble-free operation under every condition. A bronze guide sleeve attached to the inner end of the slip keeps the slip in true alignment so that it cannot cause unequal pressure or wear on the packing. An internal stop built into the end of the sleeve limits the traverse of the joint.

Thousands of ADSCO All-Brass Riser Expansion Joints have been in continuous service from 10 to 15 years proving, without doubt, that this type of ADSCO joint surpasses "loops," "swings" and other makeshift contrivances.

Write for our valuable book, "Reference Date on Expansion in Pipe Lines" which describes ADSCO Expansion Devices for every pressure and service condition.

ADSCO Riser Joint

American District Steam Company
North Tonawanda, N.Y.
Clothing Manufacturer
Develops Big Business in District Heating

About fifteen years ago Greene-Swift, Limited, London, Ontario, Canada, decided to utilize their surplus boiler capacity and reduce their own costs for heat and power by selling steam to neighboring buildings.

From a few customers at the beginning, the District Heating business of Greene-Swift, Limited, has grown, until today, the Cities Heating Company, Limited, a subsidiary of Greene-Swift, Limited, is a full-fledged public utility, supplying steam to practically the entire business district of London.

During 1927, ADSCO'S Canadian Subsidiary, the Canadian District Steam Company, Limited, installed an additional four thousand feet of high pressure supply and return lines to the company's system of underground mains.

In hundreds of towns throughout the United States and Canada, other manufacturers have an opportunity that is equal or greater than the one which Greene-Swift have capitalized. Electric utilities should find food for thought in the achievement of this successful manufacturer.