"LOCK JOINT" REINFORCED CONCRETE PIPE
"LOCK JOINT" REINFORCED CONCRETE PIPE

VICTORIA, B.C., SYPHON, 80 FEET DEEP
"LOCK JOINT"
REINFORCED CONCRETE PIPE

PRESSURE - SEWER - CULVERT
and
SUBAQUEOUS PIPE

MANUFACTURED BY
LOCK JOINT PIPE COMPANY
165 BROADWAY, NEW YORK

PLANT AT AMPERE, NEW JERSEY

CANADA LOCK JOINT PIPE, LTD., WINNIPEG
PACIFIC LOCK JOINT PIPE COMPANY, SEATTLE
UTAH LOCK JOINT PIPE COMPANY, SALT LAKE CITY
"LOCK JOINT" PRODUCTS
IN GENERAL

"LOCK JOINT" products consist of Sewer Pipe, Culvert Pipe, Pressure Pipe and Subaqueous Pipe, all of which are made of the best quality of reinforced concrete. The Sewer and Culvert Pipes are made to provide for the reinforcement of one pipe to overlap the reinforcement of the adjacent pipe, thereby securing a joint as strong as the pipe itself. Size of pipes 24 to 108 inches. The Pressure Pipes are all provided with tight expansion joints. Size of pipes 8 to 108 inches. The Subaqueous Pipes are provided both with a rigid type of joint and a flexible type. Size 24 to 108 inches.

In the aggregate many hundreds of miles of "Lock Joint" Pipe, varying in diameter up to nine feet, have been installed and all of these lines are continuing to satisfactorily perform all the functions for which they were designed.

While we carry a stock of pipe at our various yards, whenever the quantity of pipe warrants it, we ship our plant and manufacture the pipe as near as practicable to the point of installation.
YARDS AT WINNIPEG, CANADA, WHERE 10 MILES OF 66-INCH AND 2½ MILES OF 48-INCH PRESSURE PIPE WERE MANUFACTURED. HEADS 45 TO 95 FEET
REINFORCED CONCRETE PRESSURE PIPE

The experience which we have gained in manipulating the great quantities of concrete entering into these pipes, together with a vast amount of experimental work, has given us a great opportunity to collect data from which we have been able to successfully extend the use of our pipe to water lines operating under considerable pressures.

The first requisite of a concrete pipe to carry water under pressure without leakage is of course great density in the comparatively thin walls of concrete and this is secured, not by the use of any of the so called "waterproofing" compounds, but by the proper proportioning of the aggregates and the care in mixing and handling the concrete into the forms. The sources, quality, and grading of sand, gravel, and stone available in various parts of the country prevent the adoption of any arbitrary "mix," but this approximates 1:1½: 2½.

The forms are steel, held by cast iron top and bottom rings, which insure great accuracy and exceptional smoothness in finish, so important in water lines.

The coefficient of friction is as low as that of any other type of construction, and much lower than most types, with the added advantage that there is no loss in carrying capacity with age due to pitting or other causes, nor is the flow of water retarded by rivet heads or seams. When the pipe is laid and jointed it becomes a continuous smooth conduit, without roughness or obstruction of any kind at the joints, as will be shown later on.

The reinforcement varies in amount with the diameter of the pipe and the hydrostatic head under which it operates, and consists of properly fabricated cages of bars or mesh, or a combination of both, either in one or two concentric rings, depending on the size of pipe, weight of backfill, and other conditions encountered.

Individual pipe sections are made in lengths of 6 feet, 8 feet, 10 feet, or 12 feet to meet specific conditions—8 feet, however, being a standard length for the larger sizes and 12 feet for the smaller sizes.

Internal diameters vary from 8 to 10½ inches. The larger size pipes are generally made with copper expansion joints. The smaller sizes are made with lead expansion joints. A description of both will be found in the following pages.

It is clear that the making of individual lengths of pipe to successfully withstand internal pressure is a matter only of providing sufficient steel incased in a wall dense enough to prevent the passage of water, but to connect these individual lengths and form a pipe line, or conduit, of any length that is equally tight, means that the connection between pipe units must be water-tight under all conditions and must have at the same time such a degree of flexibility that the expansion and contraction of the line, due to temperature changes, may be localized as to each pipe unit.
"LOCK JOINT" REINFORCED CONCRETE PIPE

Only the development of such a joint has permitted the use of reinforced concrete pipe for water lines operating under pressure.

It is apparent that the joint between pipe sections must be of a material equally as permanent and durable as the pipe itself and this eliminates any form of asphaltic or rubber gasket or fibre calking.

In order to localize and control these contraction cracks in a reinforced concrete pipe line it is necessary to build the line of precast units with proper provision for a flexible but tight joint between each unit.

On pages 50 and 51 the detail of our copper expansion joint shows it to consist of a strip of copper formed into an endless ring having a small crimp or bead rolled into it.

Part of the ring is moulded in the pipe so that the bead lies just outside of the end of the spigot, and part of the copper ring projects from the spigot end of the pipe. When the pipes are laid up the copper extends into the joint and is overlapped by the reinforcing metal which projects from the bell end of the adjacent pipe.

A sealing form is placed over the joint recess inside the pipe and through a hole broken in the top of the bell is poured a 1:1 grout. Before the pipes are jointed the end and outer surface of the spigot are painted to prevent this grout adhering to the spigot end of the pipe, the result being that when the grout joint or key has hardened, it has become a part of the bell end of the pipe through the medium of the protruding mesh, and also grips tightly the beaded copper of the spigot, but is not attached in any way to the concrete of the other pipe. Movements between individual pipe sections can now take place. When the temperature of the air or water falls the pipe line will contract and a large percentage of the joints will open. When this opening occurs the bead in the copper also opens and serves as an effective water stop under all conditions of expansion and contraction in the pipe line.

Small Pressure Pipe, Lead Expansion Joint

In sizes from 8 to 48 inches the lead expansion joint is generally used. The detail of this joint shown on page 52.

These pipes are generally made in twelve-foot lengths. Bell and spigot cast iron rings are moulded in the ends of each pipe. The faces of these rings are accurately machined to form true cylindrical surfaces. The gasket consists of a lead pipe filled with a fibre core, which gives to the gasket elasticity which it otherwise would not have. The gaskets are rolled to slightly flattened shape and bent to a ring of the proper size and the ends are soldered together forming an endless ring and sealing the fibre core. This gasket is then placed in the bell end
"LOCK JOINT" REINFORCED CONCRETE PIPE

PRESSURE TEST ON 60 INCH PIPE
of the pipe. The bell end is provided with a shoulder and a groove in the form of a reverse wedge. The end of the spigot is tapered and back of this taper is a perfect cylinder. When the pipes are pulled together the taper of the spigot comes in contact with the lead gasket and forces it radially against the bell, and at the same time pushes it forward against the shoulder of the bell and into the groove or reverse wedge. The pipes are forced together until the taper portion of the spigot has passed beyond the lead, and the lead lies between the bell end and the cylindrical portion of the spigot.

By reference to the drawing it will be seen that the lead cannot blow out, but remains always in a definite and fixed position in relation to the bell, while the spigot can slide back and forth on the lead without permitting any leakage. This joint allows for an extreme of expansion and contraction and also provides for a great deal of distortion to care for settlement. There is no need for melting or calking the lead and the amount of lead used is only about ten per cent. of that which is ordinarily used in cast iron pipes.

It is possible to take the pipes apart and use the gaskets over again. The wall thickness of the concrete varies; on sizes from 8 to 18 inches it is 2½ inches; 20 to 30 inches it is 3 to 3½ inches, and on 36 to 48-inch pipe, 4 to 5 inches.

We will be glad to furnish additional information and estimates upon request.

It will greatly facilitate our giving estimates if enquirers would furnish us with the approximate cost of sand, gravel or stone, cement and labor in the locality where the pipes are to be used, as the pipes are generally made locally where they are to be installed. It is also necessary for us to know the size, quantity and head under which the pipe line will operate.

We have found through actual examination of many lines that contraction and expansion occur at practically every joint and that to maintain a line tight under all conditions it is necessary to provide for this movement by the use of flexible joints. We have demonstrated, however, that if such a joint is used in each pipe unit it then becomes practical to install and maintain a line of any length that conforms to the highest standards as regards leakage and carrying capacity.

Properly made premoulded reinforced concrete pipe is as near "permanent construction" as is known, and combined with its long life is—reasonable cost—less than cast iron or steel pipe of equal capacities.

Of the various methods used in supporting large pipe in the trench, the one shown on top of page 53 is recommended as best combining low cost with stability.

Openings in the pipe for manholes, branch connections to other lines, etc., are readily provided by moulding suitable cast iron collars into the pipe sections when manufactured. These collars are machined and tapped to receive the connection. The pipes can also be made with provision to tap for service connections under pressure.
"LOCK JOINT" REINFORCED CONCRETE PIPE

ROLLING AND ASSEMBLING REINFORCEMENT

REINFORCEMENT AND BRANCH CONNECTION

HANDLING STEEL FORMS
"LOCK JOINT" REINFORCED CONCRETE PIPE

LAYING 48-INCH THROUGH STREETS AT WINNIPEG
"LOCK JOINT" REINFORCED CONCRETE PIPE

ALL FORMS ARE STEEL.

TURNING 48-INCH PIPE 10 FEET LONG
"LOCK JOINT" REINFORCED CONCRETE PIPE

42-INCH AT SEATTLE, WASH. HEADS 40 TO 90 FEET

SEATTLE YARD
"LOCK JOINT" REINFORCED CONCRETE PIPE

48-INCH PRESSURE PIPE, FORT WORTH, TEXAS
HEADS 20 TO 60 FEET
"LOCK JOINT" REINFORCED CONCRETE PIPE

MANUFACTURING PIPE

DELIVERING PIPE

TURNING PIPE

36-INCH SEWAGE FORCE MAIN, DALLAS, TEXAS. HEADS 30 TO 50 FEET
"LOCK JOINT" REINFORCED CONCRETE PIPE

PATENTED CONTROLLABLE BUCKETS. THESE BUCKETS GIVE THE CONCRETE AN ADDITIONAL MIX WHILE BEING PLACED IN THE FORMS.

108-INC PRESSURE PIPE 6 FEET LONG, WEIGHING 11 TONS
"LOCK JOINT" REINFORCED CONCRETE PIPE

VIEWS OF 108-INCH PIPE

DOUBLE CAGE OF REINFORCEMENT
INNER CAGE: TRIANGLE MESH
OUTER CAGE: 1/4-INCH BARS, 3-INCH CENTERS

PLACING PIPE IN TRENCH

SETTING PIPE IN TUNNEL

LIFTING AND TURNING
108-INCH PIPE
WEIGHT: 11 TONS
"LOCK JOINT" REINFORCED CONCRETE PIPE

This line is 15.5 miles long, consisting of 1 mile of 100-inch and 5½ miles of 84-inch, one mile of which was laid in an existing 12-foot circular brick tunnel. Head 80 feet.
"LOCK JOINT" REINFORCED CONCRETE PIPE

A CURVE IN A 9-FOOT LINE

84 AND 108-INCH PIPE, BALTIMORE
(See pages 60 and 61 for details of laying)
66-INCH SYPHON AT PHILADELPHIA. A STREET HAS BEEN BUILT ON TOP OF THIS PIPE

MANUFACTURING YARD AT PHILADELPHIA
VIEWS ALONG THE SOKE LAKE AQUEDUCT AT VICTORIA, BRITISH COLUMBIA. THIS LINE IS 27½ MILES LONG AND MORE THAN HALF OF IT IS LAID ON CURVES. SIZE OF PIPE 42 INCHES.

THE PIPE IS LAID ON THE HYDRAULIC GRADE, EXCEPT FOR SEVERAL INVERTED SYPHONS, RANGING IN DEPTH TO 92 FEET.

(See Front Cover)
"LOCK JOINT" REINFORCED CONCRETE PIPE

SOME MORE VIEWS ON THE VICTORIA LINE
We are prepared to undertake the construction of reinforced concrete pressure lines of any length in sizes from 8 to 108 inches in diameter, under heads according to size, up to 200 feet, giving guarantees as to amount of leakage, etc., and will gladly estimate on the requirements of cities, corporations or individuals.

On the preceding pages are shown photographs and some details of pressure lines constructed by the Lock Joint Pipe Company or Associated Companies.

"Lock Joint" Pipe in Sewer Construction

With the general recognition of the value of concrete for building purposes has come a fuller appreciation of its possibilities in sewer construction. Concrete is acknowledged today as the most indestructible of all materials used for that purpose and, as a result, has been adopted for general use by all large cities. Plain monolithic concrete was first used, only to be almost entirely superseded by reinforced concrete on account of the greater strength and increased economy which the reinforced construction gives.

There are certain serious objections to the construction of reinforced concrete sewers in the trench. The position of the reinforcing metal is bound to be more or less uncertain, thereby vitally affecting the strength of the structure. The very fact that the sewer is built in the trench makes it impossible to assure the proper inspection which will bring to light defects in the concrete itself. Their presence, undetected at first, may lead to serious results. Another obstacle has been the difficulty of successfully building a sewer by this method through ground of a soft or treacherous nature.

To overcome these varied obstacles, there has developed the method of building the sewer in short sections above ground, each properly reinforced, and uniting them together after they are placed in the trench. This method has been proven more economical and permits of the laying of the conduit more rapidly than by any other type of sewer construction. It also possesses the advantage of superior lasting qualities.

In building a sewer by this method there are certain possible dangers to be guarded against. Naturally the weakest spot is the joint. Each section can be carefully inspected inside and out before it is lowered into the trench, but not so with the joint. Then there is a break in the reinforcing metal which must be suitably united.

The "Lock Joint" Reinforced Concrete Pipe overcomes these dangers successfully and in a very simple manner, thereby giving it an advantage over all other designs of reinforced concrete pipe.
"LOCK JOINT" REINFORCED CONCRETE PIPE
**Construction**

PLAIN and reinforced monolithic concrete sewers are built in the trench. The "Lock Joint" provides for the manufacture of the pipe in close proximity to the trench, making the proper inspection possible and still insuring prompt and certain delivery. By the manufacture of the pipe in the city where it is to be used, the city derives the benefit from its manufacture, the materials being purchased locally and local labor employed wherever possible. It is an easy matter, after the pipe has been cast and is lifted from the moulds, to roll it to a place where it can be lowered into the trench. All the moulds and appliances for handling the pipe are designed with the idea of efficiency and true dimensions. Good workmanship is recognized as of prime importance and receives first consideration. The handling devices are constructed so as to throw the least possible strain on the pipe while the concrete is in a comparatively green state.

"Lock Joint" Sewer Pipe is manufactured in sizes ranging from 24 to 96 inches in diameter and in 4-foot lengths. This length is the most economical to handle and requires a minimum number of joints to be made.

**Proper Design**

UNDER the "Lock Joint," the standard design of pipe has a circular section. The reinforcing metal is placed concentric with the circumference of the pipe and toward the interior of the section where the wall thickness is less than 5 inches; where greater than 5 inches, two rings of reinforcement are used, one toward the interior and one toward the exterior of the wall. A double ring of reinforcement will take up the tension from whatever quarter it comes. On pipes with thin walls tests have shown that a single ring placed concentric gives all the strength which is figured for elliptical reinforcement. Each section is cast with a bell and a spigot end, but unlike the usual pipe design the bell does not project beyond the circumference of the pipe but is flush with it.

Either T or Y connection openings are made in the pipes without extra cost, and by inserting a straight pipe or a slant in the openings Ts and Ys are formed as shown in the illustrations on page 56.

Most distinctive of the many advantages of the "Lock Joint" are the joints. A weak or defective joint means failure. Our joints are equally as strong as the pipe itself, and water-tight. This is insured by its peculiar construction. The reinforcing metal extends throughout the length of the section and projects both into the bell end and out of the spigot end for several inches. The spigot is shorter than the bell, so that when two sections of the pipe are placed together the reinforcing metal from one section overlaps the reinforcement of the other.
"LOCK JOINT" REINFORCED CONCRETE PIPE

TWO YARDS MANUFACTURING 24 TO 66-INCH FOR ALBANY, N. Y.; INTERCEPTING SEWER
section in an internal recess. The illustration on page 56 shows a sectional view of the joint. The recess in this joint is filled with cement mortar, thus locking the section together and sealing the joint at one operation. The joints are made from the outside through openings in the crown portion of the bells.

Ease of Inspection

Lack of proper inspection has heretofore been an important argument against a concrete sewer. Under our method all pipe is manufactured above ground, where every part of the concrete can be inspected before being placed in the trench. This guarantees a uniform quality, which cannot be obtained in monolithic concrete construction. There is no chance of faulty joints, as the entire joint on all sizes of pipe is visible from the interior of the pipe line and easily inspected. Should any joint be defective it can be immediately detected and remade. Such an inspection would be impossible if the joints were made from the outside of the pipe.

Advantages

CERTAINTY OF QUALITY.—Manufactured by experienced men. Inspection easy for every square foot.

STRENGTH.—Practically any strength desired can be obtained.

TIGHTNESS.—No leaking out and no filtering in.

SPEED OF CONSTRUCTION.—Lay the pipe as fast as you can get bottom. Put in one piece of pipe and you have built 4 feet of sewer.

ECONOMY.—Low in initial cost. Upkeep negligible. Easy and cheap to lay. No bell holes to dig. No calking necessary.

CUTS EXCAVATION COSTS.—Keep your pipe laid right up to your excavation and throw a great deal of dirt right back on the pipe. Don’t take it out of the trench. Pumping kept down to a minimum.

SAVE LUMBER.—Save lumber used by backfilling right away and pulling your lumber. You don’t have to keep the trench open because the pipe has already “set” and you don’t have to wait for it to get strong.

SAFETY.—There is nothing to wash out if the trench is flooded. Nothing to collapse if your banks slide.

Every contractor knows the advantage of this and every contractor knows he has a mighty good chance for a profit when he can go home with the day’s work finished and not leave open trenches over night.

And every engineer knows the advantages of having specialists do his concrete work for him and of having a company with a reputation for good work and one who is anxious to sustain it.
"LOCK JOINT" REINFORCED CONCRETE PIPE

72-INCH SEWER PIPE, OSWEGO, N. Y.

96-INCH SEWER PIPE, BRIDGEPORT, CONN.
"LOCK JOINT" REINFORCED CONCRETE PIPE

75-INCH, BROOKLYN, N.Y.

54-INCH, NEW YORK BARGE CANAL, BROOKLYN, N.Y.
This pipe laid on pile foundations, and had to be laid between tides. [Pipe entirely submerged at high tide.]
"LOCK JOINT" REINFORCED CONCRETE PIPE

A SEVERE TEST FOR THE JOINTS

60-INCH "LOCK JOINT" PIPE FOR HIGH LEVEL INTERCEPTOR SEWER, TORONTO, ONTARIO
"LOCK JOINT" REINFORCED CONCRETE PIPE

DELIVERING PIPE ON SLEIGHS DURING THE WINTER

30-INCH YARD

INLET OPENINGS FOR BRANCH CONNECTIONS

REGINA, SASKATCHEWAN
LAYING 60-INCH "LOCK JOINT" PIPE FOR THE HIGH LEVEL INTERCEPTOR, TORONTO, ONTARIO, CANADA

42-INCH PIPE IN NEWBURGH, OHIO
“LOCK JOINT” REINFORCED CONCRETE PIPE

LAYING 60-INCH PIPE, EAST ORANGE, N. J.

45-INCH PIPE OF THE COLLEGE HILL SEWER, WICHITA, KANSAS, BEING LAID UNDER THE MAIN LINE OF THE SANTA FE RAILROAD
"LOCK JOINT" REINFORCED CONCRETE PIPE

McGILL UNIVERSITY \& \ ASSOCIATES

SAKATCHEWAN, CANADA
Note how closely pipe laying follows excavator

WENHAM, MASS.

MONTREAL
CANADA
THREE SECTIONS OF PIPES WITH JOINTS UNSUPPORTED — LOAD ON CENTER PIPE 10,500 POUNDS

A PRACTICAL DEMONSTRATION OF THE STRENGTH OF "LOCK JOINT"
"LOCK JOINT" REINFORCED CONCRETE PIPE

36-INCH AND 48-INCH "LOCK JOINT" PIPE USED IN SEWAGE DISPOSAL PLANT AT AKRON, OHIO

66-INCH SEWER AT PENSACOLA, FLA.
"LOCK JOINT" REINFORCED CONCRETE PIPE

LOWERING 60-INCH "LOCK JOINT" PIPE IN TRENCH ON O'REILLY STREET, HAVANA SEWERING AND PAVING CONTRACT

LOCK JOINT PIPE WAS USED ON ALL SEWERS FROM 24 TO 84-INCH ON THE HAVANA SEWERAGE CONTRACT. THIS IMPORTANT PIECE OF WORK REQUIRED ABOUT 25 MILES OF LARGE PIPE.

84-INCH MAIN SANITARY OUTFALL
HAVANA, CUBA
"LOCK JOINT" REINFORCED CONCRETE PIPE

NEW YORK

MANUFACTURING 90-INCH PIPE, BORO OF QUEENS, NEW YORK CITY

MOUNT VERNON, N. Y.
SUBAQUEOUS PIPE

"LOCK JOINT" Reinforced Concrete Subaqueous Pipe has been used very extensively for submerged intakes and discharge pipes and has met with a great deal of favor among engineers and contractors.

Monolithic concrete for submerged work is prohibitive on account of the excessive cost of cofferdams. Precast concrete pipe is only latterly available for this work on account of our having developed suitable and satisfactory joints which can be made under water by divers.

Subaqueous Pipe is made in lengths of 12 to 20 feet.

There are different types of joints to meet different conditions. The rigid type comprises iron flanges moulded in the ends of the pipe, with bolt holes in the flanges so that the pipes can be bolted together by divers under water. Another rigid type is made with reinforced concrete collars to form the flanges.

The flexible type is made both with and without cast iron ends. Where the iron ends are used, they are so constructed as to give the effect of a ball and socket joint. In this type a gasket of lead pipe is used. The pipes are joined together by means of two bolts, one on each side of the pipe at the spring line. If the iron ends are not used, the concrete ends of the pipe are moulded on carefully machined forms to give a perfectly true ball and socket, and will allow for considerable settlement without opening at the joints. These pipes are also joined together by means of two bolts, one on each side at the spring line. This type of pipe has proven to be very successful.

Work of this character which involves the making of pipes 20 feet long and weighing up to 60,000 pounds each, naturally calls for the utmost ability in the manipulation of the materials and in the handling of the pipes. Things which may seem trivial often mean failure when not properly taken care of. The lifting and turning of these pipes when the proper apparatus is used by skilled hands, is a fine example of rigging and handling of heavy tubular bodies.

The following photographs, showing some of our work of this character, we think are sufficient to warrant you in believing that when you entrust your contracts with us they will be in the hands of an organization beyond the experimental stage.

It has been our aim to design these pipes with a view of efficiency from an engineering standpoint and ease of laying for the contractor.

We will be glad to submit more detailed designs and estimates upon request.
BUILDING 84-INCH CONCRETE BALL JOINT PIPE AT CLEVELAND, OHIO, FOR E. 140TH STREET OUTFALL SEWER
"LOCK JOINT" REINFORCED CONCRETE PIPE

PART OF 5400 FEET OF 84-INCH SUBAQUEOUS AT CLEVELAND

TURNING PIPE—WEIGHT 50,000 POUNDS
"LOCK JOINT" REINFORCED CONCRETE PIPE

72-INCH RIGID TYPE WITH IRON FLANGE ENDS, CLEVELAND, 72ND STREET

108-INCH FIFTEEN-FOOT LENGTHS, CONSOLIDATED GAS ELECTRIC LIGHT AND POWER CO., BALTIMORE, MD.
"LOCK JOINT" REINFORCED CONCRETE PIPE

A GROUP OF 108-INCH, EACH WEIGHING 55,000 POUNDS

Subaqueous "Lock Joint" Pipe in place for submerging with cradle attached.
54-inch for Public Service Corp. of New Jersey.
FORMULA

\[ v = \frac{10.1 + 10.1 + 29.20}{1 + (4.16 + 8.2920)} \text{ ft. per sec.} \]

WHERE

\[ v = \text{velocity of flow, ft. per sec.} \]

\[ s = \text{slope or grade} \]

\[ R = \text{hydraulic radius} \]

\[ n = \text{coefficient of roughness} \]

OBSERVATIONS AT SOOKE LAKE

ARER = 2.3462. 50 FT.
QUANTITY = 0.3500 C.F.S.
VELOCITY = 3.1102 F.S.
HYDR. R = 6.805
COEF. N = 0.0177

ARER = 4.5167 30 FT.
QUANTITY = 16.9379 C.F.S.
VELOCITY = 3.7454
HYDR. R = 6.852
COEF. N = 0.0177

ARER = 6.2544 30 FT.
QUANTITY = 26.0435 C.F.S.
VELOCITY = 4.1874 F.S.
HYDR. R = 0.907
COEF. N = 0.0165

ARER = 6.336 30 FT.
QUANTITY = 26.327 C.F.S.
VELOCITY = 4.1724 F.S.
HYDR. R = 0.944
COEF. N = 0.0163

ARER = 6.3733 30 FT.
QUANTITY = 28.710 C.F.S.
VELOCITY = 4.3592 F.S.
HYDR. R = 0.942
COEF. N = 0.0177

OBSERVATIONS AT HUMPBACK RESERVOIR

FORMULA

\[ v = \frac{10.1 + 10.1 + 29.20}{1 + (4.16 + 8.2920)} \text{ ft. per sec.} \]

WHERE

\[ v = \text{velocity of flow, ft. per sec.} \]

\[ s = \text{slope or grade} \]

\[ R = \text{hydraulic radius} \]

\[ n = \text{coefficient of roughness} \]

OBSERVATIONS AND TESTS OF FLOW IN CONCRETE FLOW LINE FROM SOOKE LAKE TO HUMPBACK RESERVOIR

OWNER: CITY OF VICTORIA, B.C.
ENGINEERS: MERRITT & SANDERSON AND PORTER
NEW YORK & SAN FRANCISCO
DESIGN OF PIPE: LENGTH IN MILES PERCENTAGE OF CURVE = 42%
KIND OF PIPE: LOCK JACKET REINFORCED CONCRETE PIPE
MANUFACTURER AND ERECTOR: PACIFIC LOCK JACKET PIPE COMPANY: 3528 NORTH 10TH STREET, PHILADELPHIA, PA.

PRINTED:
LOCK JACKET PIPE COMPANY.
HARRISBURG, PENNSYLVANIA.

49
LONGITUDINAL SECTION OF
TYPICAL PRESSURE PIPE
3 SIZES 36" TO 100"
SHOWING COPPER EXPANSION JOINT

PATENTED
LOCK JOINT PIPE COMPANY
AMPERE NEW JERSEY
Pressure Pipe With Copper Expansion Joint

Standard length of sections 8' ft.

For sizes 36 to 100

Standard thickness of shell in inches is approximately 1/8" thick.

Reinforcement figured so that stress in steel will not exceed

10,000 to 12,500 pounds per sq. in.

Patented

Lock Joint Pipe Company

Ripper, New Jersey
TYPICAL PRESSURE PIPE
LEAD EXPANSION JOINT
SIZES 6"-48" STANDARD
LENGTH = 12 FEET

PATENTED
LOCK JOINT PIPE COMPANY
AMPERE NEW JERSEY
Longitudinal Section Through Pipe at B-B.

Section Through Joint at C-C.

Section Through Joint at D-D.

Section Through Joint at A-A.

Subaqueous Pipe Flexible Type
With Cast Iron End Connections
PATENTED

Lock Joint Pipe Company
Ampere, N.J.
Subaqueous Pipe
Flexible Concrete Ball Joint
Patented
Lock Joint Pipe Company
Ampere, N.J.

Subaqueous Pipe Rigid Type
With Cast Iron Connections
Patented
Lock Joint Pipe Company
Ampere, N.J.
Typical "Lock Joint" Sewer Pipe

NOTE:
- Sizes 24 to 108 inches standard length 4 ft.
- Thickness in inches equals approximately 1/8 diameter of pipe in inches. Reinforcement variable according to diameter and loading.
- See detail drawings for specifications.

Patented
Lock Joint Pipe Company
Amperes, New Jersey
"LOCK JOINT" REINFORCED CONCRETE PIPE

24-30 AND 36-INCH FLEXIBLE TYPE IRON FLANGE ENDS, LAKEWOOD, OHIO
"LOCK JOINT" REINFORCED CONCRETE PIPE

LAYING SUBAQUEOUS PIPE
Placing "Lock Joint" Pressure Pipe in an Existing Brick Tunnel in Baltimore

The improvement of the Gun Powder Water Supply for the City of Baltimore, Md., made necessary the lining of a 12-foot brick tunnel with 3,800 feet of 9-foot and 1,200 feet of 7-foot "Lock Joint" pressure pipe. The foundations and backfill for this pipe are shown in Figure 1. The problem of placing this heavy pipe inside the brick tunnel was solved in the manner shown herewith.

Figure 3 shows the tunnel truck used for this purpose. This truck carried a 4-wheeled rear section with a 4 H.P. gasoline driving engine, and an A-frame standard, on which one end of a longitudinal eye-beam rested. A saddle was mounted on top of the eye-beam by means of a ball and socket connection. Forward of this 4-wheeled truck was a 2-wheeled independent truck, carrying a jack. This forward truck was used for supporting the forward end of the eye-beam upon which the pipe rested, and also could be jacked up off the tracks and gotten out of the way when the pipes were being placed, the process being as follows:

The pipe was lowered to the bottom of the shaft in front of the truck, the forward 2-wheeled truck having been previously raised and run back on the eye-beam. The whole truck was then moved forward, the eye-beam passing through the pipe. This eye-beam was then raised by means of a chain block at its rear end, until the saddle on its top came in contact with the pipe. The front truck was then carried forward and jacked down to the track. This jacking was continued until the pipe was raised about 2 inches off the ground. The front truck was tied to the rear truck with detachable but rigid bars. The truck with the pipe supported on it is then run forward to a point where it is to be laid.

It will be noticed that in the end of the completed pipe line there is a mounted jack. This jack has a roller in its top. The eye-beam of the truck engages this jack and the load is transferred to it, and the front truck is then jacked up and run back into the pipe, so that the pipe to be placed is free to go forward. All adjustments to line and grade were made while the pipe still hung on the truck.

Narrow gauge tracks were used in the tunnel and it was necessary to cut these tracks in 6-foot lengths, and take them up as the pipe laying progressed.

The loaded truck travelled at a speed of 150 feet per minute.

The distance from shaft to shaft was 4,000 feet. The average haul in the tunnel was 1,000 feet. The average time for hauling and setting each pipe was one hour.

The accompanying cuts and photographs will fully show the details of the operation.

This pipe line operates under a head of 80 feet.
"LOCK JOINT" REINFORCED CONCRETE PIPE

Figure 3.—Photograph of tunnel truck operated by a 4 H.P. engine

Figure 4.—Showing tunnel truck loaded and ready to proceed with pipe

Figure 5.—Wheels of front truck before being raised

Figure 6.—Wheels raised and load transferred to jack in pipe already laid

Figure 7.—Showing pipe set and truck released
"LOCK JOINT" REINFORCED CONCRETE PIPE

Salem, Ore.—30-Inch

Several miles egg shape, 18 inches by 27 inches to 28 inches by 42 inches, were made for Philadelphia.
"LOCK JOINT" REINFORCED CONCRETE PIPE

MANUFACTURING YARD AT SALT LAKE CITY, UTAH

A BIG JOB IN SALT LAKE CITY WHERE THE BEST OF EVERYTHING WAS USED
Estimates

We will gladly furnish estimates to those desiring them. Inasmuch as we manufacture the pipes in your own city whenever the quantity is sufficiently large, it is necessary for us to have certain data upon which to base a reliable estimate. Therefore wherever possible give us:

- Size of pipe required.
- Quantity of each size.
- State whether pressure pipe or not.
- If pressure, give different heads and send profile of line, if possible.
- Cost of sand F. O. B. or on ground.
- Cost of broken stone or gravel (3/4-inch). F. O. B. or on ground; whether on cars or delivered by trucks.
- Cost of cement, including sacks.
- Rate of wages, work 8 or 10 hours.
- Character of country pipe line runs through.
- Distance of work from railroad siding.
- Is there a piece of ground available nearby for a manufacturing yard?
- Has it siding? Is water available at manufacturing yard?