













# CAST IRON PIPE

SOME NOTES AND TABLES

# Standard Specifications Dimensions and Weights

of CAST IRON BELL AND SPIGOT PIPE AND SPECIAL CASTINGS for WATER, GAS, SEWAGE, CULVERTS, DRAINS, ETC. IN ALL REGULAR SIZES, 3-INCH TO 84-INCH, FLANGE PIPE AND SPECIAL CASTINGS. FLEXIBLE JOINT PIPE, LOAM CASTINGS HEAVY SPECIAL CASTINGS



1906

MANUFACTURED BY

# United States Cast Iron Pipe & Foundry Co.

NEW YORK CHICAGO

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## United States Cast Iron Pipe & Foundry Co.

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5





### Introduction

HIS book has been prepared in the hope that it will prove helpful to users of cast iron pipe. The tables cover full lines of standard pipe and special castings, which may be incorporated in plans for new works or extensions to existing plants, thus facilitating the making of estimates, the answering of inquiries and the filling of orders. Attention is directed to the coding for use in telegraphing. Some notes are given on cast iron pipe, forms of joints, main leakage in water and gas works, and regarding high pressure fire lines and other data, as of possible interest to those considering the use of pipe, and some tables have been added which will be helpful in determining pipe sizes and capacities. While we will cheerfully answer inquiries, and there are numerous books on water and gas construction available to those contemplating the building of a new water or gas works, we strongly urge that any important pipe installation should be laid down under the direction of a competent engineer.

UNITED STATES CAST IRON PIPE AND FOUNDRY CO. July, 1906

7



# Cast Iron Pipe

Iron and other metals were known to man in prehistoric times. Numerous references in tomb records show early knowledge of gold, silver, copper and lead, if not of iron, used in Egypt to a limited extent even in the predynastic age. Probably one of the earliest references to iron is in the record of "Tubal-Cain, an instructor of every artificer in brass and iron," (3874 B. C.)\* and whose name, by the way, is a bit suggestive to a maker of pipe. As the world progressed, iron is more frequently mentioned; for instance, as tribute received by the Chinese, and as used by the Israelites 2000 to 1500 B. C., and later, in the centuries preceding the Christian era, by the Phœnicians, Greeks and Romans. A fable tells us that Juno was hung from the sky, with iron anvils fastened to her feet, and that Vulcan "fell all day to Lemnos," we do not know how many ages ago. Archæologists have uncovered much to show that the early Egyptians and Assyrians were skilled metal workers, but not as makers of iron pipe.

**Earliest Pipe.** In the excavations of the Temple of Bel, at Nippur, Babylonia, Prof. Hilprecht found clay pipe, † which from their location must date from more than four thousand years B. C. He tells us "directly beneath the ancient inclosing wall opened a vault about r m. high, built in the form of an arch. It belongs without doubt to the fifth millennium. \* \* \* In the 'Kingdom of Nimrod' it was not necessary to tear up the pavements whenever an underground pipe burst, for this structure is not a mere subterranean canal for drainage, but an arched passage, in the bottom of which are imbedded in cement, \* \* \* two clay pipes of about 15 c. m. diameter, alongside each other. If one of them burst, a workman crept into the vault and repaired the damage without further difficulty. \* \* \* About 500 knee and T joints found in the vicinity show us that even at that early time they understood how to unite pipe meeting at right angles." Here we have reference to the earliest known Babylonian arch, and undoubtedly to the earliest pipe and specials known to us to-day. From the fact that such pipe and specials were used at that time, it would seem probable that the expert metal workers of those early days soon supplemented

> clay pipe with pipe of lead, and even of copper or brass for important services. We read of "cast pillars of brass" and "molten brass,"‡ as early as 1000 B. C. We know that the Greeks and Romans used lead pipe extensively, but the knowledge of how to make such pipe probably came down to them from the Phœnicians

> > or Egyptians of earlier times. The Delhi Lâht, or huge iron pillar, and iron beams used in the construction of temples and palaces in India, and massive iron girders found in ruins at Rome, testify to the existence, several centuries B. C., (though the Lâht may be of a later period) of great iron works in India and in Spain. Their product seems to have been entirely of wrought iron and steel, but apparently did not include pipe. Among the bloomeries of early times we do not find any with a pipe foundry annex. Iron

Knee and T Joints Made about 4,000 B. C. Found in the excavations of the Temple of Bel, at Nippur, Babylonia

\*Gen. iv, 22. +Hilprecht, in the Temple of Bel, at Nippur. \$I Kings, vii, 15-16.



castings, or rather "fused iron forms," Aristotle (359 B. C.) tells us, were not then commercially made, and indeed until five or six centuries ago were apparently scarcely known at all. In these days of iron and steel, with all our hurry and pressing demands, we seldom stop to think of the wonders wrought two, three and even four thousand years before Christ, or to credit the civilization and culture of the people of those far away days, with certain influences felt to-day.

Water Supply Conduits. Probably the earliest artificial conduits were the canals and other surface waterways of comparatively level ancient Egypt and Babylonia. Some of them were farge undertakings, but especially in Egypt were constructed with a view mainly to irrigation and also for navigation, rather than as conduits of water for domestic supply. The early Egyptians were famous for their dams, dikes and canals, and for their ingenious though primitive methods of raising water. They made brick and built treasure cities, and, as suggested, probably made pipe of baked clay, but we read of wells and water jars rather than of pipe. Memphis and Thebes had the Nile, but what of the distribution of their domestic water supply? Glancing farther east, on the site of old Jericho may be traced several conduits and a reservoir. Damascus, that city without a known date, early had its conduits. At Jerusalem, about 1000 B. C., King Solomon built aqueducts. We also read that the good King Hezekiah, 717 B. C., "made a pool and a conduit and brought water into the city."\* According to Dr. Bertholet of the University of Basle, this is now confirmed by an old manuscript of that period, recently discovered, which translated, reads: "Hezekiah fortified his city by bringing water thereto, and he bored through the solid rock by means of bronze, and he collected the water in a reservoir;" no mention is made of pipe. Within the past few years the tunnel has been identified, and pick marks indicate it was bored from both



An Old Roman Aqueduct

ends-an interesting bit of early engineering. Babylon (about 580 B. C.) had its great reservoir, canals and hanging gardens, but we find little to indicate how the water was distributed. Probably even earlier was built the great aqueduct at Carthage, some fifty miles in length. Its route may be partly traced to-day but the history of Carthage, | like that of most cities of the time, lacks definiteness as to water supply distribution. Water brought by these conduits to these ancient cities must have been more or less distributed to public pools and fountains, and probably to important buildings, palaces and temples, and as the world progressed, clay and lead pipe were more freely availed of. Thus we read that about 600 B. C. the Greeks were building waterworks, using for distribution clay and lead pipe.

The Romans, too, had famous aqueducts; Rome some fourteen of them, aggregating about 359 miles in length, of which 304 were underground conduits, and 55 above ground. The Aqua Appia dates from the time of the Censor Appius Cœcus Claudius (312-304 B. C.). The others seem to have been constructed in the intervening period up to around the beginning of the Christian era. The two largest, Claudia and Anio Novus, 45 and 62 miles in length respectively, were built in 38 to 48 A. D. Their routes joined about six miles from Rome and thence \*II Kings, xx, 20. +850-150 B.C.

10

there were two separate channels, one above the other, supported on arches, which at one point rise 109 feet in height.

Lead Pipe. Of the Aqua Virgo it is recorded, "the water was conveyed in pipe, partly under and partly above ground, on a solid substructure or on arches." This reference to pipe is probably to lead pipe, which were evidently preferred for lines under more or less pressure, for lead pipe were used "in crossing valleys," "laid according to the slope of the hill," down to "a long level, then up," with intermediate standpipe or According to Vitruvius\* (about 25 B. C.), such lead pipe were made "in venters. lengths of not less than 10 feet," and "take the names of their sizes from the quantity of the inches in the width of the sheets before they are bent round; thus, if the sheet be 50 inches wide before bending into a pipe, it is called a 50-inch pipe; and so of the rest." Vitruvius gives a list of ten sizes ranging from 100 inches, weighing 1,200 pounds, to 5 inches wide weighing 60 pounds per length. The pipe were probably soldered with an alloy of lead and tin. Lead pipe were also used for distribution, as to some extent were elay pipe "tongued at one end." The aqueducts supplied the baths and numerous large public fountains, from which last the people obtained their water, except such as could afford to pay for a separate pipe to their houses, and these latter were a source of considerable revenue. Vitruvius also notes injurious results from the use of lead pipe, adding "water should therefore on no account be conducted in lead pipe, if we are desirous that it should be wholesome." The excavations at Pompeii, which was destroyed by the great eruption of Vesuvius, 79 A. D., have revealed numerous fountains, and two thermæ or public baths which were supplied with water through lead pipe from reservoirs much as were the famous baths of Caracalla and other therma in Rome. Lead pipe as used by the Greeks and Romans were common enough in those days and probably for several centuries preceding the Christian era but we find no mention of iron pipe.

Aqueducts. The term "aqueduet" was applied to the conduit as a whole, comparatively a small portion of which was carried on the arched masonry structures we are prone to think of as aqueducts, and it is interesting to note how at that early period these waterways were built so much of their length underground. Their grades (Vitruvius suggests "a fall of not less than one half a foot to a length of one hundred") were so adjusted that the water flowed by gravity without undue velocity, as much in vented tunnels or conduits as possible, and thus often wide detours were made. For instance, the Aqua Claudia starts at a point thirty-five miles from Rome, and winds its way, a distance of forty-five miles, to the city. The conduits were lined with some material impervious to water, and in section varied with location. Tunnels were ventilated by vertical shafts, and usually the valleys were crossed with arched structures. To some extent the Romans may have copied the Greeks, who apparently did not use the arched masonry aqueduct, at least until much later, but carried their vented conduits through hills into valleys under streams and, to supply Syracuse, even under the sea. Considering the material available these underground conduits are remarkable, and as some must have been under considerable pressure it is probable early Greek engineers had "troubles of their own" causing the Romans to adopt the arched masonry aqueduct. On the other hand, possibly Greek engineers were not then well versed in arch building. Be this as it may, it is hard to realize that anything with which we are so familiar as the arch, or water works, or even east iron pipe, were at any time novelties and really had their day of invention and introduction. There is no telling what early Greek and Roman engineers would have done could they have had cast iron pipe as we have them.

• The Architecture of Marcus Vitruvius Pollio. Trans. Guilt. Specimens of ancient lead pipe are to be found in most museums.

11

That in those far off days they were able to accomplish so much is surprising, and it must have cost much in labor and patience. Think of driving a tunnel through rock without the appliances we have available to-day; and yet the water supply of Athens\* was obtained through three underground conduits mainly cut through rock, two of them passing under the bed of the river Illissus. These brought water to a reservoir outside the city from which it was distributed in underground channels of various forms and partly through pipe of baked clay and through lead pipe. Thus Athens early enjoyed its baths, fountains and public water supply, but the quite wonderful aqueducts of the Romans, and those later built in France and other countries, are the most notable monuments to early water works engineers. One of the most beautiful later structures, dating from the seventh or eighth century, is the aqueduct Delle Torré, near Spoleto, Italy, with its ten graceful pointed arches of 66 feet span, and nearly 300 feet in height, and which, restored, is in use to-day. Paris, London and Vienna, reaching back into the Roman period, and Berlin and other cities of more recent date, have each included in their development various water supply problems. Aqueducts, conduits, cisterns, reservoirs and fountains, with clay and lead pipe, (and later bored logs) seem to have been in general use, and in the early days of Athens and of Rome we read of much that is interesting and curious, but we must pass over these



Croton Dam Nearing Completion, 1905 +

intervening centuries to the time we first hear of cast iron pipe.

Castings of Iron. Not until the fourteenth or the fifteenth and sixteenth centuries are castings of iron really mentioned. In the latter, cast iron cannon were made. Naturally not long afterward cast iron pipe were produced and we hear of them early in the seventeenth century. In 1720 it was said "there is not a street in London but water runs through it in pipe, conveyed underground," and while the kind of pipe is not specified, they were probably, in part, of cast iron, as such pipe had been used in France in the preceding century. Since 1700 we find their use constantly increasing and in the last century they play an important part in the makeup of most conduits and aqueducts, to say nothing of mains for distribution.

Modern Conduits and Reservoirs with Cast Iron Pipe. The canal, with its forty-five tunnels and numerous aqueducts, which brings water some sixty miles to supply

<sup>\* 560</sup> B. C.

<sup>+</sup> Photograph by Pullis, New York, 1905.

Marseilles, and the old Croton Aqueduct, with its conduits, tunnels and splendid stone arched bridge carrying cast iron pipe over the Harlem River, and which conveys water some thirty-four miles to New York,

are examples of comparatively modern aqueducts, both having been completed about 1842. Since then the development of the Croton water supply has gone on apace, with its well-known reservoirs, conduits and piping; one set of the latter comprises eight lines of 48-inch cast iron bell and spigot pipe laid in one trench, which lead from the 135th Street Gate House. Here also terminates the new Croton Aqueduct. completed in 1890, which is nearly thirty-one miles long, almost entirely in deep rock tunnels, only a little over a mile being in trench or on embankment. The new Croton dam, now about completed, is the



Gate House and Reservoir Connections

highest and largest reservoir dam in the world, and contains 850,000 cubic yards of masonry. The new Croton reservoir is nearly twenty miles long, and there are nearly seventy-five miles of stone walls surrounding the land required for it. When full, the old Croton dam about three miles above will be submerged to a depth of 34 feet, and the reservoir will contain about 38 billion gallons. This, with the other reservoirs of the Croton watershed, will afford an available capacity of 72 billion gallons, which is barely sufficient for present needs. The proposed new supply for Greater New York, recently authorized, (1905) will probably be taken from Esopus Creek in Ulster County, New York, about ninety miles north of the city, requiring the crossing of the Hudson River by the proposed 500 million gallon tunnel and trench aqueduct. The works will include a



Wachusett Reservoir Dam, 217 Feet High

66 billion gallon reservoir with a masonry dam 1,280 feet long and 175 feet high from creek bed.

As we look over the more recent undertakings we find cast iron pipe becoming more and more of a factor, as used for gate houses, reservoir connections, for siphons in crossing valleys, and for supply mains. The new water supply at Manchester, England,

for instance, comes largely from the beautiful Lake Thirlmere, a distance of some ninety-six miles, through a modern conduit partly in tunnels and cut and cover channels, while it



Masonry Aqueduct on line from Wachusett Reservoir

duct, with six siphons each of several lines of 36-inch to 27-inch cast iron pipe, in all 13 miles of line in piping, and the new plant includes a reservoir which when full will contain more than  $2\frac{1}{2}$  billion gallons.

Perhaps the most notable of recent water supply undertakings in the United States is that of the Metropolitan Water and Sewerage Board of Massachusetts, at. Boston. This comprises the great Wachusett Reservoir, now finished, covering 7,200 acres, with a capacity of 63 billion gallons, with its massive dam 217 feet in height, containing 280,000 cubic yards of masonry and which, with the Lake Cochituate and eight reservoirs on the Sudbury River, is calculated to be capable of supplying 173,000,000 gallons per day to the nineteen municipalities comprising the Metropolitan Water District. Water is conveyed from the reservoirs to this district, distances of from fifteen to thirty miles, through the Cochituate, Sudbury, Wachusett and Weston Aqueducts the two latter having each a daily capacity of 3 million gallons. These aqueducts are, in general,

dips into valleys and under streams by means of inverted siphons of several lines of 48-inch, 42-inch and 36-inch cast iron pipe some of them subject to a pressure due to more than 400 feet head. Another recent achievement in Scotland is the completion, in September 1905, of the new water supply for Edinburgh. The water is brought some thirty-six miles from Talla in the parish of Tweedsmuir, Peebleshire. The conduit is composed of 23 miles of built tunnel, cut and cover aque-





Double 60-inch Line to Reservoir Metropolitan Water District, Spot Pond

constructed of masonry covered by

65-inch Rosemary Siphon, Wellesley, Mass.

earth embankments, but there are 6.6 miles of tunnels, and in several instances the aqueducts cross valleys on masonry arches or by means of pipe siphons.\* Water delivered by the aqueducts is distributed to the several cities and towns comprising the Metropolitan Water District by means of 84 miles of cast iron pipe 34 miles of which are 48 inches and 60 inches in diameter.

Connected with the distribution system of the several municipalities, there are in addition 1,423 miles of cast iron pipe in sizes from 4 inches to 48 inches. Several of the pipe lines are carried under navigable

 $\ast$  For this purpose cast iron bell and spigot pipe in sizes up to 84 inches inclusive may now be had.

streams, requiring the use of pipe with flexible joints, the use of coffer dams, or other special methods of pipe laying.\*

The present consumption of water in the district supplied, is about 117 million gallons

per day, equivalent to 120 gallons per inhabitant. About 25 per cent. of this quantity is delivered by gravity, the remainder being pumped at pumping stations located at the Chestnut Hill Reservoir about five miles from the State House. These stations contain modern pumping engines of the highest efficiency, capable of pumping 171 million gallons of water per day.

Within the limits of the Metropolitan District, which in general includes the cities and towns within ten miles of the State House, there are several



Laying Three Lines of 60-inch Pipe Under Charles River, Boston. Using Coffer Dam

distributing reservoirs, the largest of which, Spot Pond, has a capacity of one billion eight hundred million gallons, and is 163 feet above Boston city base, which is substantially low water mark in Boston Harbor. The water supplied to each municipality is measured by means of Venturi meters placed on the connections between the Metropolitan pipe and the pipe of the several cities and towns, fifty-three meters being used for this purpose.



48-inch Line near Philadelphia, laid before New Street fill

The board having charge of the Metropolitan Water Supply, also has charge of the Metropolitan Sewerage Works, and in connection with these works has recently completed the construction of new works for the disposal of a portion of the sewage of the district. In the portion of the system recently built, the sewage is discharged into the ocean through two lines of 60-inch cast iron pipe each extending about a mile from the shore.<sup>†</sup>

At Philadelphia, the recently completed Torresdale conduit or tunnel which con-

veys water from the Torresdale filter beds to the Lardner's Point pumping station, is worthy

\* Some of these are referred to on another page, under "Submerged Piping."

+ For method of laying these pipes, see page 32.

of mention. Here again 60-inch cast iron bell and spigot pipe play an important part in forming the force mains from these pumping stations to Frankford Creek, where the water is delivered to the distribution system, working against a 48-inch relief line to Oak Lane Reservoir. In a recent report by a board of expert engineers, it is suggested that the use of 60-inch cast iron pipe instead of the masonry conduit from filters to pumping station would have been cheaper and preferable. Four lines of 60-inch cast iron pipe lead



from the Lardner's Point pumping stations, and were put down after two lines of cast iron piping, 48-inch and 30-inch diameters, under water pressure, had been moved to one side. Some two blocks from the pumping station, three lines of the 60-inch cast iron force mains are led off toward Frankford Creek. The photograph\* shows a section of these 60-inch force mains as tested in the open trench, when they were subjected to a pressure of 200 pounds for five hours.

We have now had a hurried look at some of the waterways and works of earlier

Four Lines of 60-inch Cast Iron Pipe. One 48-inch and one 30-inch Shifted to Left

times and a closer view of some modern plants. Thus we see engineers using and depending more and more on cast iron pipe, and they are to-day a most important factor in the development of modern water supply. Cast iron pipe have completely changed earlier methods, and made possible the widely extended distribution of water, to say nothing of their use for gas and other well known purposes.

Life. In these days, in selecting pipe for underground service, the engineer naturally

turns to cast iron pipe as the most durable. While we do not know when pipe were first cast, there are well authenticated instances of cast iron mains in service to-day, which were laid more than two hundred years ago, and such pipe have now been in general use more than one hundred years. In 1901 at Versailles, France, an officer of this Company saw repairs being made to a line of cast iron pipe leading to one of the palace fountains, which probably had been laid more than two hundred years. It is said that these pipes were put down in 1685. The fracture, due to subsidence, showed inside a clean pipe of good gray iron, but little rusted outside; the natural result with good water and subsoil conditions. In London, the first cast iron pipe we know of for water were put down about the year 1800. The eight London undertakings -the great water companies-are now vested in the "Metropolitan Water Board," and in a recent letter the Chief Engineer, \* Page 17.



"Log Pipe." Bored Logs Laid in Philadelphia before 1820

William B. Bryan, Esq., writes: "As chief engineer, for many years, of the late East London Company, I have had numerous opportunities of seeing old mains that had been in use for ninety years, and which, when taken up, were in perfect condition." In this country cast iron pipe have been used for fully one hundred years. Some of the earlier pipe were imported, but the making of cast iron pipe received early attention, and the industry has now grown to large proportions. In Philadelphia, following the use of bored

logs, cast iron pipe were first used about the year 1804, and since 1820 have been exclusively used by the water department. Numerous instances might be cited of pipe in use to-day which were laid more than a century ago, all tending to prove the long life of cast iron underground. Thus, cast iron as a material has long been accepted as the standard for underground mains, and it is not surprising therefore to find east iron water and gas mains used almost exclusively in the cities and towns of this country and Europe.

Length. In the early stages of the cast iron pipe industry, short length pipe were made; in France, about 1 meter in length, in England, about 30 inches; then came



Three Lines of 60-inch Cast Iron Pipe

longer lengths, 6 and 9 feet. The earlier joints were usually flanged, and these being found to be too rigid, were shortly followed by other forms, from some of which were evolved the turned and bored socket and spigot, similar to those to some extent to-day used abroad, and these in turn have been largely superseded by the standard bell and spigot joint calked with lead. Thus experience gained from the earliest days in the making and use of pipe has developed our present lines, as indicated by Standard Specifications herein, which cover pipe cast vertically in dry sand, in lengths to lay 12 feet, with standard forms of bell and spigot.

Dry vs. Green Sand Pipe. In casting pipe vertically in dry sand, the use of core chaplets is avoided, and the 12-foot length insures a much smaller number of joints in the main as compared with short length green sand pipe which are cast on the side, "on the bank," in 9 and 6 feet and even shorter lengths. Aside from the greater number of joints resulting from their use, these green sand pipe are liable to be of uneven thickness, and also to leak through imperfections in the pipe shell, which are due to the process, such as blow holes, or which result from the use of anchors to support the cores in casting on the side. These anchor spots are sometimes concealed by bosses or knobs, which form but a thin covering; thus, covered up, these defects are hard to discover,

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and often withstand the pressure test, but when buried in the ground will sooner or later develop leaks, or even cause the pipe to break. Such pipe, also, are usually of light weight with thin walls, are illy adapted to permanent mains, and form anything but substantial construction. The thin pipe shell will easily break under shock or subsidence, and the metal in the pipe, because of the process, has a tendency to hardness and brittleness. It is because pipe cast vertically in dry sand are so markedly superior, that this Company long since abandoned the manufacture of green sand pipe.

Joints. In the operation of water and gas works, engineers are now more concerned with the question of leakage, and to reduce it, one or another form of joint has been tried,



Standard Bored Bell and Turned Spigot. (See Table No. 1)

the bell and spigot being that now most generally used. This is because the bell and spigot joint, when well made, is the most flexible, allowing for expansion and contraction without affecting its tightness. Such joints are safely used in high pressure fire line pipe and other hydraulic pressure mains. We also show another type of bell and plain end pipe joint which is made up and calked with lead in the usual way. This design is used abroad and is substantially the same as is required by the Public Works Department of the Netherlands, at The Hague. It is claimed the plain end is more easily centered in the beveled bottom to the bell than is the ordinary spigot, and that the bevel in the bell more satisfactorily makes up with cut pipe. As to the turned spigot and bored bell joint, it is claimed that in being practically a metallic joint it does not leak unless it is

broken through subsidence of the ground, or through accident. To allow for expansion and contraction, some engineers for every tenth joint use a socket and spigot calked with lead, while others claim to have no trouble on this account, no doubt because of location. For underground service, a bolted joint whether flange or of other form, should be avoided as too rigid, and because the bolts are liable to rust. An iron to iron joint, whether of conical or ball type, is in no sense a flexible joint, but is liable to rust fast in whatever position it may be laid. There is nothing new in such joints, as certain old French and

other patents will testify. If an iron to iron joint is preferred, it should be of the turned and bored type, without bolts.

Making Joints, Bell and Spigot. In laying cast iron pipe having bell and spigot joints calked with lead, care should be taken in making the joint to wrap sufficient yarn



Pouring a Lead Joint

around the spigot before entering the bell, then to pack it in with calking tools before running the lead, which should then be well calked up against the yarn. On *well laid* water mains of cast iron, a leaky bell and spigot joint is extremely rare. Some of our friends claim that they do not have any, and recently, an engineer in a prominent Eastern city, advised of having uncovered last year several miles of cast iron bell and spigot water mains without finding a single leaky joint; evidently these lead joints were well made. Note the photograph of a 48-inch cast iron bell and spigot main near Lardner's Point, Philadelphia, as under

pressure it was being shifted to one side, and afterward raised onto the ledge. To do this was a severe test of the bell and spigot joint, as to flexibleness and tightness.

Bell and Spigot Joints, in which, instead of lead, the socket in the bottom and annular space surrounding the spigot is filled with wood and carefully calked, have proven tight,

and are thought to so insulate the joint as to materially lessen, if not prevent electrolysis. It is too soon to speak of this assuredly but encouraging results are said to have been obtained within the past year with joints so made.

Turned and Bored Joints for water or gas pipe, as used abroad, are rapidly laid and are perhaps more extensively used for water than for gas. This general type of joint is still exclusively used in many prominent foreign plants, while it is scarcely used at all in the United States. We again quote from another recent letter from William B. Bryan, Esq., Chief Engineer, Metropolitan Water Board, London: "In my own practice I have used immense quantities of turned and bored pipe, and I certainly think that these pipe, where streets are straight and there are no obstructions to cause deviations, have very



48-inch Cast Iron Main moved while under Pressure See also Cut on Page 16, showing Pipe after Shifting

great advantages. The greasing of the joints and placing them gently into the sockets of the next pipe, and centering them perfectly, makes a joint which is practically water tight of itself, but in all cases the socket is run with molten lead and set up in the usual manner." In making joints for gas, red lead or sal ammoniac is used and the pipe driven

together, in some instances, without running in the lead and calking; but where this is done the joint is so designed, that in case of a leak it may readily be calked with lead or made good with cement. With turned and bored pipe we supply special castings of our standard dimensions, with bored bells all around. While without the use of special curves the turned and bored joint pipe may only be laid in straight lines, very often long or easy curves are made in lines of full length bell and spigot pipe. An instance of this is shown in the photograph. A slight adjustment in the bell when laying is possible in the standard bell and spigot joint.

Leakage. Excessive leakage is often wrongly charged to the bell and spigot joint. In a widely quoted "Report on the Measurement, Consumption and Waste of Water Supplied



A Long, Easy Curve with Full Length Pipe

to the Metropolitan Water District, " (1904) by Dexter Brackett, Esq., Engineer of the Distribution Department, Metropolitan Water Works, Boston, the causes of waste are clearly set forth, but nowhere therein is, the bell and spigot joint complained of. It is stated: "Water is wasted, either negligently or wilfully, from mains and service pipe in the public streets, or from pipe and fixtures on the premises of the water takers;" and it is pointed out that the amount of such waste from street mains and service pipe is a much larger percentage of the total consumption than is generally estimated. In this report it is further stated: "In the Metropolitan Water District there are 1,457 miles of pipe, on which

there are 750,000 leaded joints, from which leakage may occur." With reference to this leakage, Mr. Brackett writes: "Under the heading of 'Waste from Street Mains and Services,' the report gives figures which show that there is a large underground leakage from the street mains and service pipe, as distinct from the waste and leakage on the premises of the water takers. In each example given, the street mains and service pipe are considered jointly. No mention whatever is made of the leaded joints as a source of waste. The underground leakage occurs from broken mains and services, from broken connections between mains and services, also services abandoned and left running, and from defects in the leaded joints." Defects in the leaded joints are usually due to outside influences, and otherwise, it may be repeated, are not likely, if due care is exercised in putting down the pipe. It will be noted the report does not hold the leaded joints responsible for waste, but clearly shows how excessive leakage is rather very largely due to broken mains and services which often remain long undiscovered, the water escaping into sewers, into the ground, or into some stream. As an example of this we quote again from the report: "A very forcible illustration of this source of waste has been furnished in the town of Stoneham. During the first six months

of the year 1902, about 800,000 gallons per day were supplied to the town. As this quantity appeared larger than was needed for legitimate use, an investigation was instituted for the purpose of learning where the water was used, with the result that four leaks in the street mains were found, which gave no surface indications. After these were repaired the consumption of water fell to 330,000 gallons per day, indicating that 470,000 gallons per day had been wasting from a few unseen defective pipe." In considering this report, it should be borne in mind that many of the mains which were tested form parts of water works systems installed many years ago, when perhaps not so much care was taken in the laying of pipe as is now generally the case, and in all these years, therefore, it is not surprising that because of settlement and inattention, broken mains and services developed and were overlooked. All of this goes to show that nowadays the problem is hardly that of the leaky joint, for this report is rather



Cast Iron Main Before Test in Open Trench. Also Showing Curve with Straight Pipe Beyond Bend

an argument for heavier and more permanent mains, carefully laid, and for that "eternal vigilance" in caring for them which will go a long way to insure minimum leakage. On the other hand, a moment's reflection will show that for permanent underground mains, if maximum efficiency and a minimum leakage are to be secured, short length light weight pipe, especially those with bolted joints, are to be avoided.

Standard Cast Iron Pipe and Specials for Gas are made under our own Standard Specifications (so far as they apply to pipe for gas) and cast to dimensions and weights as shown in the tables, (pages 105 to 118) which have been carefully prepared with the advice and assistance of several gas engineers who are to-day identified with some of the largest gas interests in the United States, and are among the largest users of cast iron pipe for gas. In October, 1905, the tables of dimensions and weights were adopted as the standard of the



American Gas Light Association. These tables may be said, therefore, to represent the most approved practice, and are here presented with confidence that they will cover every reasonable requirement. It should be noted that all gas pipe are also cast vertically in lengths to lay 12 feet, insuring a minimum number of joints and consequent reduction in leakage. This question of gas leakage receives constant attention, and we are not infrequently asked to specify the best form of joint, though

possible leaky joints are seldom responsible for more than a small percentage of gas main leakage. Selection is governed by local conditions; thus it not infrequently happens that pipe having bells calked with lead are found in the same system if not in the same line with pipe having joints made with cement.

Gas Mains with Lead Joints.



Lead Joints

In the built-up sections of cities, where streets are crowded underground with other structures, and surface traffic is heavy, the tendency seems to be to increase the thickness of the metal, and to use exclusively pipe having bells calked with lead, as securing the most flexible joint. Such pipe with lead joints are also preferable where conditions of sub-soil, as in newly made ground, indicate possible subsidence. In any location, these heavier pipe with joints well calked with lead or made with cement, afford the most permanent and safe conduit, naturally costing more than lighter pipe, but when well laid under a paved street will repay such increased cost in requiring fewer disturbances of surface and consequent extra outlays for repaving. To insure good results the lead joint

must be well made; some engineers now twice calk each joint, but care should be taken to properly yarn each spigot, otherwise trouble will result. In looking for the cause of leaky lead joints in a gas main laid near one of our plants, a number of pipe were broken out of the line. On machine cutting lengthwise through the bells of joints which did *not* leak, it was found that ample yarn had been used and the lead well calked in against it. On the contrary, in cutting through several leaky joints, they were found to have been carelessly made, with the yarn put in loosely, and in some instances so little of it used it might as well have been omitted altogether. No matter whether the pipe be put down with lead or cement, the joints in the trench should be carefully made and tested, preferably before back-filling. This is perhaps more essential in gas than in water mains, and test in the open trench is now the usual practice of leading gas engineers. In gas mains, as with water, the bell and spigot joint is not the only source of leakage. Here again "eternal vigilance," in watching over the distribution mains, services and meters, aids materially to insure a minimum leakage.

Gas Mains with Cement Joints. The results obtained with cement joints have been quite remarkable, and account for the growing use of pipe so laid in residence and other sections of cities and towns where the street traffic is comparatively light, as well as in the open country. One of our friends writes that from early in the year 1899, when he began using cement, to early in the year 1905, he has made joints of the following numbers:

Miles of Pipe Laid	Size	Number of Feet	Number of Leaks which developed after mains were <i>covered</i> , 1899 to 1905
9 miles 5,020 feet 111 miles 2,042 feet 6 miles 5,133 feet 4 miles 5,158 feet 2 miles 5,022 feet 3 miles 2,000 feet 2 miles 2,693 feet 142 miles 2,548 feet	4 inches 6 inches 8 inches 12 inches 16 inches 20 inches 30 inches	52,540 580,022 36,893 26,278 15,582 18,740 <u>13,253</u> 752,308	4 2 1 4 8 10 23 52 leaky joints

out of approximately 80,000 joints of pipe and specials.



In the foregoing piping all joints are of cement; no lead or expansion joints were used, and the figures seem to establish the cement joint as highly satisfactory. It will be noted, however, that the number of leaky joints of 20 inches and 30 inches diameter is relatively greater. This is attributed to the fact that they were laid when the men who put them down had little experience in making cement joints of these larger sizes, and

before they "appreciated the immense importance of maintaining a nearly constant temperature of joint and contiguous pipe, from the time the joint is made until it has had time to thoroughly set." Another engineer writes of an experience with cement joints extending over thirty-six years. The works now under his charge have about 122 miles of cast iron street mains, 3 inches to 36 inches. In this system, located in New England, no lead joints are used, all pipe and specials are put down with cement, and no trouble is experienced owing to expansion. While some of the mains are in



Cement Joints

paved business streets carrying comparatively heavy traffic, they are well laid in comparatively deep trenches and a leaky joint is very rare indeed, and then nearly aways due to outside influence such as excavations for other mains or structures.

The limit of size of pipe with cement joints seems to vary with different engineers. One uses cement up to 16 inches; another, "up to 12 inches inclusive, and on larger sizes lead joints only, as a leaky joint is not so likely to prove dangerous to the men making repairs." Others again use cement joints up to 24 inches on comparatively long mains, while there are cement joint 30-inch and 36-inch mains of shorter lengths. In the earlier development of cement joints, bells 5 inches deep on smaller sizes, and 6 or



30-inch Cement Joints

even 7 inches deep on larger sizes, have been used, but the results have not been such as to warrant the extra expense. The good results shown in table, page 22, were obtained, with slight exceptions, with pipe having bells of the standard dimensions.

**Cement Joint Bells and Spigots** are often made without grooves in the bell, and generally with somewhat greater joint room than for the lead joint. In making cement joints, the pipe should be supported by blocks in the usual manner and after starting a joint it should be completed promptly. In hot weather it is most impor-

tant to keep the pipe cool and at a uniform temperature until the joint is set—about twentyfour hours. This may be done by covering the pipes with boards and hay, or with about 6 inches of earth kept constantly wet while the sun is on the pipe. During warm weather, as far as practicable, it is better to make the joints in the early morning, protecting them during the day, and after testing the following morning, back-fill the trench. If it is necessary

to make cement joints in freezing weather, care should be taken to warm the joints and avoid exposure to a freezing temperature until set. This involves some extra trouble and expense to provide sheet iron hoods and torches, and to more thoroughly protect the pipe in the open trench. The men handling cement should wear rubber gloves, and be trained to this work. Before entering the bells, the spigot ends of the pipe should be carefully yarned with untarred jute yarn twisted into a rope of about the same diameter as the joint space, and thoroughly grouted with neat cement mixed with water to the consistency of cream; this yarn should then be well driven against the back of the bell. The



A Freshly Made Cement Joint

cement should be of the best quality, mixed by hand in very small quantities, in the proportion of three-fourths cement to one-fourth water by volume, and thoroughly kneaded. The cement should then be pushed into the socket with a hard wood or steel stuffing tool, then a second piece of yarn as before, twisted around the pipe and driven into the cement with calking tools, after which the joint should be faced by hand with neat cement mixed as above, finishing with a neat fillet around the end of the bell.

Cement Joints made in Winter. Good results in laying pipe with cement joints in winter are difficult to obtain. They can be secured, however, and the experience of one of our friends in putting down a main  $8\frac{1}{2}$  miles in length, partly of 16-inch and partly of 20-inch cast iron bell and spigot pipe, is of interest. This line runs in part through open country. He writes: "A large part of the work was done during the winter of 1903–1904, which was an unusually severe one, the thermometer a number

of times during January and February going below zero. The thermometer averaged below freezing from the middle of December until some time in March, so that there was scarcely any weather which would have been considered suitable for making cement joints. In laying this line, the joints were tested under three pounds pressure between thirty-six and forty-eight hours after they were made. Between October 30th and December 14th, of the 1,289 joints that were made, 30 were found leaking and were remade. Between December 15th and March 8th, 2,352 joints were made, and out of these 225 were found leaking. There were 3,641 joints on the line, and the total number remade was 255. We have been over the line this year and have found it in almost perfect condition." As this was the first pipe put down with cement joints at this plant, it was necessary at the same time to train the men. Hence the loss in joints between October 30th and December 14th mainly resulted from the fact that the men were learning. The loss between December 15th and March 8th was largely due to freezing. Had the line been laid in seasonable weather, comparatively few leaks would have developed. The freezing of the joints occurred in spite of every effort to keep them covered and warm until set, but as the pipe were tested in the open trench, the leaks were easily located and remade, and the line is now most satisfactory.

High vs. Low Pressure Gas Mains. Within recent years, some engineers have

sought economy in using comparatively small diameter wrought iron or steel mains under relatively high pressure, for carrying gas from works to a center of distribution at some distance. These mains will not prove as durable as cast iron pipe, and it is a serious question whether a larger diameter cast iron main under low pressure will not in the long run prove the less costly. While the low pressure main may involve a greater first cost, the high pressure line usually carries a heavy daily charge for pumping and maintenance, added to which is often a material loss in candle power. These are factors which it is our impression have not been as carefully estimated as their importance warranted.

Gas Mains with Turned and Bored Joints. The foregoing may be said to outline general practice for lead and cement joint east iron gas mains in the United States. Abroad, however, the practice varies, and many prominent users prefer the turned and bored joint. One prominent gas engineer in London writes: "We continue the use of gas pipe with turned and bored joints." Another, "We do not use turned and bored joints; we prefer the ordinary spigot and socket joint made with lead rings run into the socket, as being a more flexible connection, and one which can be more easily made sound by setting up, should any subsidence occur, which has tended in any way to loosen the joint." Evidently "doctors disagree." It is nevertheless true that the turned and bored joint has been adopted with satisfaction in many important gas plants in England and other countries, while we may say it is not used at all in the United States. Our

inquiries as to gas leakage in cast iron pipe having turned and bored joints, have failed to bring definite response in figures or percentages, the usual statement being that the joint leakage is very small. For those who prefer an iron to iron joint, the turned and bored pipe are offered as being of the most commonly used and simplest type, avoiding use of bolts. These pipe are also east vertically in dry sand and finished in lengths to lay 12 feet, our Standard Specifications being followed as far as they apply to pipe of this design. All bells and spigots are machined to template, insuring close fitting iron to iron joints easily laid. The turned and bored joints for gas mains should only be used in districts where streets are straight and the soil is very good and firm, as any subsidence or movement may lead to fracture and consequent large and perhaps dangerous leakage. There may be reasons for adopting the turned and bored joint of which we are not advised. but considering the excellent results obtained with the bell and spigot joint in the United States and apparently abroad, we agree with still another London engineer who writes: "I do not consider that the turned and bored joint offers



Low Pressure Gas Main

any advantage over the lead joint generally used for gas mains, unless it be in the speed and facility with which they may be laid." With turned and bored pipe, special castings with bells all around are usually supplied, and into these bells a cut pipe is perhaps as often inserted as is the turned spigot.

**Cast Iron vs. Riveted Steel Pipe.** We are often asked regarding the life of cast iron as compared with wrought iron or steel riveted pipe. On page 16 are some notes as to the life of cast iron pipe, which may readily be confirmed, and in like manner it

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will be easy to obtain reports concerning the life of riveted steel pipe that have been laid a few years, and we are confident that careful inquiry will prove beyond question that cast iron pipe is the best material.

Recently, at Portland, Oregon, we were awarded the contract for cast iron pipe at a very marked increase in the total cost, as compared with tenders for steel. Owing to the distance, the cost of freighting became a most important factor, because of the great difference in weight which naturally favored the lighter or steel pipe. This award to us of the contract for cast iron pipe, was not made until after a very careful investigation on the part of the engineer, D. D. Clarke, Esq., who, during the fall of 1905, visited some fifteen cities to confer with the officials in charge of water supply, as to their experience with riveted steel mains and to ascertain for himself what he could as to their condition.

During 1893 and 1894, the city of Rochester, N. Y., put down a 38-inch steel pipe conduit made up of steel plates, 1/2-inch and 3/2-inch metal. This line runs from their Overflow No. 1, about two and one-quarter miles north of Hemlock Lake to Mount Hope Reservoir, a distance of twenty-six miles. The annual report of the city of Rochester for the year 1901 shows that as early as the year 1900 leaks in the line were discovered, and found due to corrosion of the steel plates, and that in January, 1901, other leaks began to develop. Later reports show that during the year, in seven separate excavations, fifteen holes, 1 inch to 34 inch in diameter, were found, due to corrosion, and that more or less tuberculation was present along the joints and around the rivet heads. One sheet alone was found to contain more than five hundred pits about 1/8 inch in diameter by  $\frac{1}{16}$  inch deep. A careful examination of the interior of this steel pipe indicated that the cause of the corrosion was not confined to the presence of certain active elements in the soil. Later reports indicate that during 1902 further investigation showed that a great many more leaks had developed. The reports of the city of Rochester for the years 1901 and 1902 contain interesting notes regarding the investigations made by eminent engineers. Attention is particularly directed to the report of Professor F. L. Kortright, of West Virginia University.

As a general proposition, it seems to be now conceded that on an average steel rusts at least 25 per cent. more rapidly than cast iron; and when the relative thicknesses of riveted steel and cast iron pipe are considered, it is readily seen that cast iron pipe will prove by far the more permanent. Then, again, the increased friction in riveted steel pipe reduces by 10 to 20 per cent. the flow of water, as compared with cast iron pipe of the same diameter.

# Independent High Pressure Fire Systems

In the United States, during the last fifteen "years high pressure fire lines have been a most important development. Among the earliest of these were the so-called "empty mains" leading from the rivers back into the business sections of Cleveland, Detroit, Milwaukee and other lake cities. At Cleveland, for instance, some 16,500 feet of 6-inch,

8-inch and 10-inch east iron pipe have been put down since early in 1891, affording additional protection partly in the business section and partly in the lumber district. When a large fire occurs in the protected area, the harbor fire boats, one of 7,000 and the other of 4,000 gallons eapacity per minute, connect with these mains and effectively assist the city fire department. While kept full in summer, as these mains were not laid below frost line they are drained in winter; but the fire boats fill them quickly and provide a pressure of about 100 to 150 pounds at the hydrants in business streets well above the river. These mains at



Fire Boat Connection

Cleveland have proven so effective that plans are now under consideration for large extensions, including perhaps an independent pumping station. At Detroit there are about 26,000 feet of 8-inch and 10-inch pipe, chiefly in separate 8-inch lines of various lengths, in business streets running back from the river, and served by fire boats. Two of these 8-inch lines are connected through 10-inch line laid in the business center. At Milwaukee, there are about 46,000 feet of similar 8-inch and 10-inch pipe in streets running back from the rivers and canals. At Buffalo, since the fall of 1897, about 8,800 feet of independent mains have been installed. The first of these mains were of steel and the latter of cast iron, this change being necessary on account of the deterioration of the steel pipe.



Six Lines from High Pressure Hydrant. See Next Photo-plate

They are kept full in summer, and empty during extreme cold weather. One or two fire boats are used, as necessity requires, and at the farthest hydrant a pressure of 275 pounds has been obtained and maintained, and on one test the two boats gave a pressure of 350 pounds at a distance of 2,500 feet with one line from the hydrant. In practice, the pressure of course varies with the number of lines in use at a fire, and we understand that it rarely exceeds 200 pounds at the hydrant. One objection to these independent fire boat mains is that the fire boats may be prevented, by shipping, the

blocking of slips by vessels, and in winter because of ice, from promptly reaching the bulkhead line for connection to mains. It is claimed that the fact that the pipes are empty in winter does not delay the supply, as the time occupied by fire boats in filling the mains about equals the time used by the fire company in proceeding from quarters and connecting hose to hydrant. On the other hand, some engineers claim that these fire mains should be laid below frost line and kept full, always ready, and where practicable, connected up to sprinkler systems and to a standpipe in all large buildings, the high pressure to be turned in from street when necessary. These connections should prove a source of

revenue, or at least cover their cost and maintenance. Probably the first complete system of independent fire mains is that at Providence, R. I., which was put down in 1897, and consists of some 29,400 feet of 12-inch, 16-inch and 24-inch cast iron pipe, supplied by gravity, which affords about 100 pounds pressure at the hydrants. The system is so designed, however, as to admit of adding pumps to bring the pressure up to about 150 pounds at the hydrant.

Later developments in the separate fire main systems are those at Philadelphia and



Six High Pressure Streams from One Hydrant

Brooklyn, the latter as yet hardly complete. They are independent high pressure plants, ready for instant use. The mains laid below frost line are kept full under moderate pressure the year around, provision being made for circulation and draining, and they are connected with independent stations in which are installed high pressure power pumps, which on signal bring the pressure almost immediately up to 200 pounds or more at the hydrant.

In Philadelphia the present system, which comprises some 34,000 feet of pipe, is an added protection to the congested area, which is about 6,500 feet long, running back from the Delaware River to Broad Street, by about 2,500 feet wide, between Walnut and Race Streets. The water supply is taken from the river. The pump house is on the water front, and is connected with numerous telephone stations throughout the district, and with the regular fire alarm system. There are also several fire boat connections for emergencies. The pump house contains seven units, with a combined capacity of about 10,400 gallons per minute. These are triplex, double-

acting, geared plunger pumps, driven by gas engines. They supply a 20-inch discharge main, which, a short distance from the station, branches into 16-inch mains. There are three 12-inch mains and one 16-inch main leading from the river front to Broad Street, with cross connections of 8-inch mains at intervals of about every three blocks. These diameters are nominal, being reduced more or less by the thickness of metal in the pipe used. The mains, normally under about 75 pounds pressure, are kept filled through check valve connections with certain of the city water mains. In case of fire, within a minute the pressure at any hydrant may be brought up to 200 pounds or more if necessary. The pipe are all of cast iron, but in this Philadelphia system, flange pipe were used, and after completion, lead expansion joints were inserted to overcome the difficulty experienced with the flanged joints owing to expansion and contraction. For the earlier installations, including the fire line at Boston, the new systems at Brooklyn, and for the Manhattan district, New York, cast iron bell and spigot pipe were adopted. At Philadelphia, the

hydrants are of the gate type, the pressure tending to force the valve off the seat, while those at Brooklyn are of the compression type, the tendency of the water pressure being to close the valve. While the New York and Brooklyn systems are naturally expected to be a marked improvement upon the earlier Philadelphia system, the latter has so far given excellent service, and in the congested section covered, the Board of Fire Underwriters have reduced the insurance rates 25 cents per \$100, which represents a large annual saving in the cost of insurance in the protected district. In Brooklyn, it is estimated a similar reduction in the cost of insurance would result in a "saving of about \$550,000 a year, which represents about 7.7 times the total estimated cost of maintenance and operation, plus interest and sinking fund charges for the high pressure fire system." The credit in Philadelphia, however, was in part due to the removal of a penalty for deficient water supply.

In the general scheme of a proposed new installation of high pressure fire mains in New York, two independent pumping stations on the water front are proposed, each to have a present capacity of 15,000 gallons per minute, the pumps to be of the centrifugal type, multi-stage, direct connected to electric motors, which in starting will insure service at full pressure





High Pressure Fire Stream

in about one minute. The pumps are designed to readily give 300 pounds pressure at the pump house, which, allowing for frictional loss in the mains, will give a pressure at the base of all hydrants of about 250 pounds per square inch. In each station the intake and discharge lines to the distribution mains will be duplicated, and at each station the pumping plant will be divided into so many units that it will be practically impossible for any station to completely break down or entirely cripple the high pressure system. The distribution mains will be of the cast iron bell and spigot type, having deep double lead grooves in both bell and spigot ends of the pipe. The special castings will be of cast iron, with the exception of the larger tees and crosses, which, weakened by the area cut out for the branches, will be made of steel. The pipe will be of 178-inch metal for 24-inch size, 11/2-inch metal for 20-inch size, 11/4inch metal for 16-inch size, 1-inch metal for 12-inch size, and 1/8-inch metal for 8-inch size, (the latter for hydrant connections only) and tested at the foundry

to a pressure of 650 pounds per square inch. These pipe are similar to those used in the Brooklyn system, in which 20-inch is now the largest diameter, and it will be noted that these cast iron pipe to work under 250 pounds pressure at the hydrant, are of the bell and spigot type, calked with lead in the ordinary way. Such joints have been tested to 750 pounds pressure, while 250 pounds is usually considered ample for these high pressure fire mains. The use of such mains is steadily finding favor, and must increase as their value and the lessened cost of insurance becomes apparent. Chicago, Baltimore, Toronto and other cities have under consideration important independent fire main installations. Not only for large cities and towns are these mains practicable, but also in comparatively small towns, and for important isolated manufacturing plants will they find favor. Many of the latter have their own electric power, which in case of fire could readily be diverted to electric motors direct connected to the centrifugal or other power pumps of an independent fire system, which in some instances can be combined with village or town protection. The effect on insurance rates will often justify the protected property owners in assuming alone the cost of installation and maintenance.

Hydraulic Power Mains. For pressures up to 750 pounds, the smaller sizes of cast iron bell and spigot pipe may be used around manufacturing plants for underground mains, the form of socket being altered somewhat for pressures above 250 pounds. Such piping is made to order only. While hydraulic power is largely used by steel works and other manufacturing plants in this country, we have no installation for public supply corresponding to the well known plant of the London Hydraulic Power Company, which has now been in successful operation for more than twenty years, and supplies motive power from over 150 miles of mains, to which in 1905 were connected 5,597 machines. The power is available day and night the year around, operating direct-acting hydraulic lifts and motors, and is also used for injector fire hydrants, affording special fire protection, and for ejectors, the latter being extensively used for raising water. The first of these independent hydraulic power works was put down in 1877 at Hull. The plant in London was commenced seven years later, and such works have now been installed in Liverpool, Manchester, Glasgow



Handling Pipe with Moore's Patent Traveler

and other cities in England, and at Melbourne and Sydney in Australia. In London, the Company pumps its water from the Thames, while in Manchester, for instance, the supply is taken from the city mains, which saves much in pumping. In London, the working pressure is 700 pounds, while in Manchester it is 1,120 pounds. All of the mains are of cast iron. Hydraulic power has uses and advantages which even electricity cannot supplant, and it would seem that in congested districts similar power plants could be worked to advantage and economy for office building elevators and lifts, and presses in warehouses, releasing valuable space now occupied by pumps and extra boilers, to say nothing of its use for numerous other power purposes.

In London, the average charge for hydraulic power is much the same as the average charge for electric energy within the same area, and as compared with electric lifts, the hydraulic elevator

30

is certainly as good if not better, whether considered from the view point of safety, economy or convenience.

Sewers. There is a notable and very marked increase in the use of east iron pipe for sewers, not only for sewage force mains, but especially in locations liable to subsidence, such as in marshy ground, newly filled streets, or where the sub-soil conditions make desirable a more permanent construction than is secured by the ordinary brick sewer. Cast iron pipe are also used to advantage on hills, where the rush of water during storms is liable to wash out the ordinary brick or tile sewer which may have been disturbed by the action of frost. During the past year we have furnished for sewers, several lines of 30-inch to 60-inch cast iron pipe, and their increasing use for sewers has become an important factor. Except for force mains, usually pipe of our Class A dimensions and weights are specified, but there are often locations which necessitate the use of heavier pipe. The thickness of pipe to be used is a question for the engineer, and while the use of cast iron pipe naturally involves a larger initial cost, this difference is inconsiderable when compared with advantages secured through the more substantial and lasting construction.

Culverts and Drains. The very extensive use nowadays of cast iron pipe for railroad culverts and drains is well understood, as is also their adoption by township commissioners for drains under country roads. They are indeed an important factor in "good roads" devel-The largely increased demand is the natural result which has followed the opment. appreciation of the many advantages derived from the use of cast iron pipe for culverts. One length of cast iron pipe will lay 12 feet, and may be used instead of six 2-foot lengths of vitrified pipe, thus minimizing the risk of washout by markedly reducing the number of joints. As compared with a brick or stone culvert, the cast iron pipe culvert is less liable to be affected by the action of frost, while the smooth interior of the pipe is not easily obstructed and may readily be cleaned. Aside from this, cast iron pipe culverts are of relatively great strength and easily and cheaply put down, it being simply necessary to see that the pipe have an even bearing, that the joints are supported and that the material about the pipe is carefully tamped under and around them, at least up to their center line. They are often laid even without the setting in masonry of the upstream end. A brick or masonry facing, however, is desirable for permanent culverts, as tending to prevent undermining the pipe. Where roads cross streams which in times of freshet may be greatly enlarged, it is not unusual to provide several parallel lines of pipe to take care of the increased flow. We now make cast iron pipe up to \$4 inches inside diameter, as shown in Table No. 2. Where there is not space for the larger diameters, two or more parallel lines of smaller pipe may often be used to advantage. The following table shows the weight per cubic foot of embankment material. To determine the pressure per square foot of embankment upon the horizontal surface of pipe, multiply the weight per cubic foot by the height of the fill above the pipe. Thus it will be seen, for high embankments only heavy pipe should be used, and great care taken to so lay the pipe that they will not be subject to undue subsidence.

Material	Average Weight	Specific Gravity	Average Voids
Granite	166 pounds 120 pounds 116 pounds 110 pounds 125 pounds 62.5 pounds	2.666 1.925 1.861 1.765 1.440 1.000	.25 per cent. .30 per cent. .33 per cent. .12 per cent.

#### Embankment Materials-Weights per Cubic Foot

# Submerged Pipe



Laying 24-inch Flexible Joint Pipe Across Chelsea Creek, Boston

For river crossings or intake lines, cast iron pipe are used with flexible joints. Underwater conditions usually determine the type of joint and thickness of metal in the pipe selected. Submerged mains are generally so inaccessible and so seldom duplicated in a given location, that the risk of failure for any cause should be minimized by a due regard for outside influences. Care should be taken to so locate river crossings as to avoid injury to the pipe from passing boats, and in shallow waters, from ice, drift and snags. Where damage to

the main may result from these causes, that portion of the line liable to disturbance should if possible be laid in a trench dredged out for it. When necessary in laying to work from a barge or raft, current and tidal conditions should be noted, and provision made to hold the float directly in the line of crossing.

The photograph clearly indicates how a line of 24-inch flexible joint pipe, Type No. 2, was laid across Chelsea Creek, Boston, a distance of some 1,438 feet. As the pipe were jointed the barge was moved forward sufficiently to admit of placing the next length as shown.

At New Orleans, our Type No. 4 flexible joints with intermediate lengths of flange pipe were used to make up two 36-inch discharge lines for the river end of a 48-inch cast iron sewage force main. The photograph shows one of these 36-inch outlets just before lowering, the curved end piece to be turned down-stream. The river end section of the 48-inch main, carried on a trestle of creosoted timber, runs out under an old wharf at the head of Spain Street, slightly above the mean gulf level. Near the end of the wharf, flanged



Out-flow Pipe, with Type 4 Flexible Joints, as Used at New Orleans
connections divide the piping into the two 36-inch outlet lines which first have a vertical drop of some 18 or 20 feet and then curve out into the river. To clear the way for these pipe lines, old wharf piles were cut off by jetting alongside and using dynamite placed by a diver, and trenches for the pipe were eut out by a suction dredge.

In other flexible joint mains for river crossings and other deep waters, such a curve as is indicated in the photograph is sometimes necessary, where banks are steep and the bottom dips off abruptly, or, instead, one or two short lengths of flexible pipe may be used.

When it is necessary to carry an important supply across a river, to minimize the risk of failure in case of accident it is safer to put down two separate mains. The photograph shows the end of a 48-inch low service pipe line divided into two 36-inch lines across Mystic River, Boston. Valves are placed at each end of the 36-inch pipe so that when necessary the flow may be maintained through one line while repairs are made to



Two 36-inch Pipe Lines Across Mystic River, Boston

the other. As the river bottom was covered with mud for a depth of 10 feet or more, the pipe were laid on pile supports in bents 12 feet apart. For a distance of 100 feet under the channel, the pipe are about 10 feet below mean low water, rising gradually on either side. Here the shallow crossing permitted the use of a mixed line of three types of joints. They were first, pipe of the regular bell and spigot standard except that the bells were made with three grooves instead of one; second, were the same, with the spigots turned to a uniform slight taper so as to be interchangeable; and third, flexible joint pipe Type No. 2, which were used where there were vertical deflections or future subsidence was probable. The pipe were put together on shore, in sections generally of six pipe, much as described under taper joint pipe, page 34, then loaded on the pipelaying scow and moved out over the location. This scow was provided with two derricks,



Laying 36-inch Pipe Across Mystic River, Boston

from which hung a stiff truss about 75 feet in length, to which the pipe were attached and then swung clear and to one side of the scow, and when the latter had been adjusted to the proper position the pipe were lowered and the taper spigot of one end of the section inserted in the leaded bell of the preceding section. The two sections were then drawn together by hydraulic power, and the taper joint between them calked by a diver.

**Taper Joint Pipe** for submerged lines under moderate pressures, on comparatively level bottoms with easy off shore slopes, are usually ordered in sets of so many lengths having standard spigots and special bells, and a like number having standard bells and machined taper spigots, as shown in the cut, and usually, with twice as many lengths of



60-inch Pipe on Phillips' Patent Caisson, Ready for Lowering

a special pipe which will form the front or outward end of a section, and the lead space run full with lead but not calked. The taper spigot is then withdrawn to be used as the rear end of the following section. The leaded bell is then fitted with a temporary

collar, provided with guides to insure entry of spigot without injury to mold. The four lengths are then put together on the barge or float, the joints made in the ordinary way, and the float towed to the proper location for lowering, and once in line on the the bottom, the section is moved so that

taper spigot is drawn home into the leaded bell of the preceding section. This is usually done by ratchet jacks or hydraulic power controlled by divers, who then calk the taper joint. Various methods for handling and lowering have been adopted (see page 35), but



Bringing 60-inch Pipe into Position for Lowering

standard bell and spigot pipe, the latter often with two or three lead grooves, depending on the proposed location of the line. In laying, a taper joint thus comes between every two or three sets of the standard bell and spigot joints. If the line is put down in 48-foot sections, two of the special pipe and two standard pipe are required for each section. At the shore end, upon the wharf or barge, the taper spigot is temporarily inserted in the bell of



as shown in the accompanying cut, the Phillips' patent caisson affords many advantages. The cut indicates the manner in which the two 60-inch cast iron submerged outfall sewage lines of the Metropolitan Water and Sewerage Board were laid. They extend to a point something over a mile beyond low water, the bottom of the pipe being placed at an average depth of 9 feet below the bed of the harbor, and each pipe rests on two pile supports. To accomplish this, the trench was dredged out to

When

a width of 10 feet at the bottom and 30 feet at the top, and after they were laid, the pipe were covered in by material from

floated out over the line, the section of jointed pipe was secured to the caisson, and which, as used, was 6 feet square by 52

feet long, divid-

SCOWS.



30-inch Intake Line, Floated into Position Before Lowering

ed into nine compartments which could be separately flooded. When empty this caisson would support 24 tons, and when filled it would sink. Hence, when carrving the pipe to sink, it was only necessary to partially flood the compartments.

When the caisson was released from the lighter, it would turn over, and when sufficiently flooded would soon reach the bottom, where, still attached to it, the pipe were adjusted to line and grade, the special joint drawn home and calked, after which the caisson was cut loose, hauled up and pumped out.

Intake Lines, usually laid out into a lake or smaller stream, are not likely to be disturbed, except possibly by ice, and where the bottom is smooth, with a gradual slope, the main may thus be made up partly of flexible and partly of bell and spigot taper joint pipe, and in some locations the latter pipe of larger sizes, with bell and taper spigots alone, or interspersed with regular bell and spigot pipe, may be used. The accompanying views



30-inch Intake Line Floated Out into Stream Before Lowering



Placing 60-inch Outfall Pipe, Using Phillips' Patent Caisson. Metropolitan Water and Sewerage Board

and spigot pipe.

show a 30-inch intake main about 1,700 feet in length, laid about three years ago, which, as it was put together on the bank, was floated upstream into the desired position and then lowered on to the bottom 6 to 8 feet below the surface. Here the underwater condition and service admitted of using bell

# Standard Specifications

The standard specifications for cast iron pipe and special castings, will be found to be substantially those of the New England Water Works Association, modified to cover the four classes of pipe shown in our Table No. 2, instead of the ten classes listed in Table No. 2 of the New England Specifications, while many of the dimensions in our Table No. 1 are identical with those of the New England Table No. 1. Officers of this Company were members of the Foundries Committee which conferred with the Committee of the New England Water Works Association when that committee had in preparation the New England Specifications, and the tables of standard dimensions and weights here presented may be said to be the New England tables brought down to a merchantable basis. It will be noted that in Section 1, third paragraph, provision is made for intermediate weights, so that other weights than those we specify in Table No. 2 may be obtained, if essential. We have also added, as shown in Tables No. 3 and No. 4, four heavier classes for fire line and other high pressure service.

As to the specials, except in the larger tees and crosses, these will also be found to closely follow the New England tables, the line having been made somewhat more complete. On laying down the New England line of tees and crosses, we found it necessary to slightly lengthen the run on all tees and crosses 30 inches diameter on the run and larger, where the arm is 14 inches or larger, in order to secure additional metal in the corner section and avoid having the outside contour of the run bell cut into by the arm. The tees and crosses have also been thickened in corner sections and on the flats, and the design varied as increase in pressure required. The metal strains in the flats are so complex that they cannot be figured accurately, and it is essential, therefore, to avoid making the run too short, thereby reducing the metal in corner sections below a safe limit. The weights for all special castings are estimated, and some, therefore, may exceed somewhat the usual variation percentages.

### Standard Specifications for Cast Iron Pipe and Special Castings\*

#### Description of Pipe

SECTION 1. The pipe shall be made with hub and spigot joints, and shall accurately conform to the dimensions given in Tables No. 1 and No. 2. They shall be straight and shall be true circles in section, with their inner and outer surfaces concentric, and shall be of the specified dimensions in outside diameter. They shall be at least 12 feet in length, exclusive of socket. For pipe of each size from 4-inch to 24-inch inclusive, there shall be two standards of outside diameter, and for pipe from 30-inch to 60-inch inclusive, there shall be four standards of outside diameter, as shown by Table No. 1. The outside diameters to be cast on pipe above 4-inch.

All pipe having the same outside diameter shall have the same inside diameter at both ends. The inside diameter of the lighter pipes of each standard outside diameter, shall be gradually increased for a distance of about 6 inches from each end of the pipe so as to obtain the required standard thickness and weight for each size and class of pipe.

Pipe of standard thickness and weight, intermediate between the classes in Table No. 2, shall be made of the same outside diameter as the next heavier class. Pipe with

\*For dimensions and weights see table pages.

standard thickness and weight less than shown by Table No. 2, shall be made of the same outside diameter as the Class A pipe, and pipe with thickness and weight more than shown by Table No. 2, shall be made of the same outside diameter as the Class D pipe.

For pipe 4-inch to 12-inch inclusive, one class of special castings shall be furnished, made from Class D pattern. Those having spigot ends shall have outside diameters of spigot ends midway between the two standards of outside diameter, as shown by Table No. 1, and shall be tapered back for a distance of 6 inches. For pipe from 14-inch to 24-inch inclusive, two classes of special castings shall be furnished: Class B special castings with Classes A and B pipe, and Class D special castings with Classes C and D pipe; the former shall have cast on them the letters "A B" and the latter "C D." For pipe 30-inch to 60-inch inclusive, four classes of special castings shall be furnished, one for each class of pipe, and shall have cast on them the letter of the class to which they belong.

#### Allowable Variation in Diameter of Pipe and Sockets

SECTION 2. Especial care shall be taken to have the sockets of the required size. The sockets and spigots will be tested by circular gauges, and no pipe will be received which is defective in joint room from any cause. The diameters of the sockets and the outside diameters of the bead ends of the pipe, shall not vary from the standard dimensions by more than .o6 of an inch for pipe 16 inches or less in diameter, .o8 of an inch for 18-inch, 20-inch and 24-inch pipe, .10 of an inch for 30-inch, 36-inch and 42-inch pipe, .12 of an inch for 48-inch, and .15 of an inch for 54-inch and 60-inch pipe.

#### Allowable Variation in Thickness

SECTION 3. For pipe whose standard thickness is less than 1-inch, the thickness of metal in the body of the pipe shall not be more than .08 of an inch less than the standard thickness, and for pipe whose standard thickness is 1 inch or more, the variation shall not exceed .10 of an inch, except that for spaces not exceeding 8 inches in length in any direction, variations from the standard thickness of .02 of an inch in excess of the allowance above given shall be permitted.

For special castings of standard patterns a variation of 50 per cent. greater than allowed for straight pipe shall be permitted.

#### Defective Spigots may be Cut

SECTION 4. Defective spigot ends on pipe 12 inches or more in diameter may be cut off in a lathe and a half-round wrought-iron band shrunk into a groove cut in the end of the pipe. Not more than 12 per cent. of the total number of accepted pipe of each size shall be cut and banded, and no pipe shall be banded which is less than 11 feet in length, exclusive of the socket.

In case the length of a pipe differs from 12 feet, the standard weight of the pipe given in Table No. 2 shall be modified in accordance therewith.

#### Special Castings

SECTION 5. All special castings shall be made in accordance with the cuts and the dimensions given in the tables forming a part of these specifications.

The diameters of the sockets and the external diameters of the bead ends of the

UNITED STATES CAST IRON PIPE	AND FOUNDRY COMPANY
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special castings, shall not vary from the standard dimensions by more than .12 of an inch for castings 16 inches or less in diameter, .15 of an inch for 18-inch, 20-inch and 24-inch, .20 of an inch for 30-inch, 36-inch and 42-inch, and .24 of an inch for 48-inch, 54-inch and 60-inch. These variations apply only to special castings made from standard patterns.

The flanges on all manhole castings and manhole covers, shall be faced true and smooth and drilled to receive bolts of the sizes given in the tables. The manufacturer shall furnish and deliver all bolts for bolting on the manhole covers, the bolts to be of the sizes shown on plans, and made of the best quality of mild steel, with hexagonal heads and nuts and sound, well-fitting threads.

#### Marking

SECTION 6. Every pipe and special casting, shall have distinctly cast upon it the initials of the maker's name. When cast especially to order, each pipe larger than 4-inch may also have cast upon it figures showing the year in which it was cast and a number signifying the order, in point of time, in which it was cast, the figures denoting the year being above and the number below, thus:

1901	1901	1901
I	2	3

also any initials, not exceeding four, which may be required by the purchaser. The letters and figures shall be cast on the outside and shall not be less than 2 inches in length and  $\frac{1}{10}$  of an inch in relief, for pipe 8 inches in diameter and larger. For smaller sizes of pipe, the letters may be 1 inch in length. The weight and the class letter shall be conspicuously painted in white on the inside of each pipe and special casting after the coating has become hard.

#### Allowable Percentage of Variation in Weight

SECTION 7. No pipe shall be accepted the weight of which shall be less than the standard weight by more than 5 per cent. for pipe 16 inches or less in diameter, and 4 per cent. for pipe more than 16 inches in diameter, and no excess above the standard weight of more than the given percentage for the several sizes shall be paid for. The total weight to be paid for, shall not exceed for each size and class of pipe received the sum of the standard weights of the same number of pieces of the given size and class, by more than 2 per cent.

No special casting shall be accepted, the weight of which shall be less than the standard weight, by more than 10 per cent. for pipe 12 inches or less in diameter, and 8 per cent. for larger sizes, except that curves, Y pieces and breeches pipe may be 12 per cent. below the standard weight, and no excess above the standard weight of more than the above percentages for the several sizes, will be paid for. These variations apply only to castings made from the standard patterns.

#### Quality of Iron

SECTION 8. All pipe and special castings shall be made of cast iron of good quality and of such character as shall make the metal of the castings strong, tough and of even grain, and soft enough to satisfactorily admit of drilling and cutting. The metal shall

be made without any admixture of cinder iron or other inferior metal, and shall be remelted in a cupola or air furnace.

#### Tests of Material

\* SECTION 9. Specimen bars of the metal used, each being 26 inches long by 2 inches wide and 1 inch thick, shall be made without charge as often as the engineer may direct, and in default of definite instructions, the contractor shall make and test at least one bar from each heat or run of metal. The bars, when placed flatwise upon supports 24 inches apart, and loaded in the center, shall support a load of 1,800 pounds and show a deflection of not less than .30 of an inch before breaking; or, if preferred, tensile bars shall be made, which will show a breaking point of not less than 18,000 pounds per square inch. The contractor shall have the right to make and break three bars from each heat or run of metal, and the test shall be based upon the average results of the three bars. Should the dimensions of the bars differ from those above given, a proper allowance therefor shall be made in the results of the tests.

#### Casting of Pipe

SECTION 10. The straight pipe shall be cast in dry sand molds, in a vertical position. Pipe 16 inches or less in diameter shall be cast with the socket end up or down, as specified in the proposals. Pipe 18 inches or more in diameter shall be cast with the socket end down.

The pipe shall not be stripped or taken from the pit while showing color of heat, but shall be left in the flasks for a sufficient length of time to prevent unequal contraction due to subsequent exposure.

#### Quality of Castings

SECTION 11. The pipe and special castings shall be smooth, free from scales, lumps, blisters, sand holes and defects of every nature which unfit them for the use for which they are intended. No plugging or filling will be allowed.

#### Cleaning and Inspection

SECTION 12. All pipe and special castings shall be thoroughly cleaned and subjected to a careful hammer inspection. No casting shall be coated unless entirely clean and free from rust, and approved in these respects by the engineer, immediately before being dipped.

#### Coating

SECTION 13. Every pipe and special casting shall be coated inside and out with coal-tar pitch varnish. The varnish shall be made from coal tar. To this material sufficient oil shall be added to make a smooth coating, tough and tenacious when cold, and not brittle nor with any tendency to scale off.

Each casting shall be heated to a temperature of 300 degrees Fahrenheit immediately before it is dipped, and shall possess not less than this temperature at the time it is put in the vat. The ovens in which the pipe are heated shall be so arranged that all

<sup>\*</sup> This Company will make pipe under higher metal tests when desired.

UN	1	IТ	E	D	ST	Α	ΤE	S	C	A	S	Т	I	R	0	N		$\mathbf{P}$	ΙF	P E	0	A	Ν	D	H	7 (	)	U	Ν	D	R	Y		С	0	М	P	A	N	Y	
----	---	----	---	---	----	---	----	---	---	---	---	---	---	---	---	---	--	--------------	----	-----	---	---	---	---	---	-----	---	---	---	---	---	---	--	---	---	---	---	---	---	---	--

portions of the pipe shall be heated to an even temperature. Each casting shall remain in the bath at least five minutes.

The varnish shall be heated to a temperature of 300 degrees Fahrenheit (or less if the engineer shall so order), and shall be maintained at this temperature during the time the casting is immersed.

Fresh pitch and oil shall be added when necessary to keep the mixture at the proper consistency, and the vat shall be emptied of its contents and refilled with fresh pitch when deemed necessary by the engineer. After being coated the pipe shall be carefully drained of the surplus varnish. Any pipe or special casting that is to be recoated shall first be thoroughly scraped and cleaned.

#### Hydrostatic Test

SECTION 14. When the coating has become hard, the straight pipe shall be subjected to a proof by hydrostatic pressure and, if required by the engineer, they shall also be subjected to a hammer test under this pressure.

The pressure to which the different sizes and classes of pipe shall be subjected is as follows:

Class A Pipe   . <t< th=""><th></th><th></th><th></th><th></th><th></th><th></th><th>20-Inch Diameter and Larger Pounds per Square Inch</th><th>Less than 20-Inch Diameter Pounds per Square Inch</th></t<>							20-Inch Diameter and Larger Pounds per Square Inch	Less than 20-Inch Diameter Pounds per Square Inch
Class B Pipe     200     300       Class C Pipe     250     300	Class A Pipe						150	300
Class C Pipe	Class B Pipe						200	300
	Class C Pipe						250	300
Class D Pipe	Class D Pipe						300	300

#### Weighing

SECTION 15. The pipe and special castings shall be weighed for payment, under the supervision of the engineer, after the application of the coal-tar pitch varnish. If desired by the engineer, the pipe and special castings shall be weighed after their delivery, and the weights so ascertained shall be used in the final settlement, provided such weighing is done by a legalized weighmaster. Bids shall be submitted and a final settlement made upon the basis of a ton of 2,000 pounds.

#### Contractor to Furnish Men and Materials

SECTION 16. The contractor shall provide all tools, testing machines, materials and men necessary for the required testing, inspection and weighing at the foundry of the pipe and special castings; and, should the purchaser have no inspector at the works, the contractor shall, if required by the engineer, furnish a sworn statement that all of the tests have been made as specified, this statement to contain the results of the tests upon the test bars.

#### Power of Engineer to Inspect

SECTION 17. The engineer shall be at liberty at all times, to inspect the material at the foundry, and the molding, casting and coating of the pipe and special castings. The forms, sizes, uniformity and condition of all pipe and other castings herein referred to,

shall be subject to his inspection and approval, and he may reject, without proving, any pipe or other casting which is not in conformity with the specifications or drawings.

#### Inspector to Report

SECTION 18. The inspector at the foundry, shall report daily to the foundry office, all pipe and special castings rejected, with the causes for rejection.

#### Castings to be Delivered Sound and Perfect

SECTION 19. All the pipe and other castings must be delivered in all respects sound and conformable to these specifications. The inspection shall not relieve the contractor of any of his obligations in this respect, and any defective pipe or other castings which may have passed the engineer at the works or elsewhere, shall at all times be subject to rejection when discovered, until the final completion and adjustment of the contract; provided, however, that the contractor shall not be held liable for pipe or special castings found to be cracked after they have been accepted at the agreed point of delivery. Care shall be taken in handling the pipe, not to injure the coating, and no pipe or other material of any kind shall be placed in the pipe during transportation or at any time after they receive the coating.

#### Definition of the Word "Engineer"

SECTION 20. Wherever the word "engineer" is used herein it shall be understood to refer to the engineer or inspector acting for the purchaser, and to his properly authorized agents, limited by the particular duties intrusted to them.

# Standard Cast Iron Pipe and Special Castings



For water pipe, see pages 43 and 44, Tables 1 and 2. For high pressure pipe, see pages 45 and 46, Tables 3 and 4. For flexible joint pipe, see pages 47 and 48, Tables 5 and 6. For flange pipe for water, see pages 82 to 85, Tables 43 to 46. For gas pipe, see pages 105 and 106, Tables 79 and 80. For flange pipe for gas, see page 116, Table No. 104. All dimensions given are in inches. The following tables represent in a general way the standardization of the product of this Company, in conformity with the Standard Specifications on pages 36 to 41. The development of these lines has involved study extending over a long period, during which the requirements of engineers and other pipe users have had careful consideration, while the best foundry practice and elements affecting cost have not been lost sight of. Necessarily it will be some little time before our several works are fully equipped with patterns, fixtures, etc., to provide promptly all the standards listed, and unless,

therefore, these standards are specified on orders, the right is reserved to ship pipe and specials of corresponding sizes and metal thicknesses made from our nearest stock patterns.

We are now prepared to offer standard cast iron bell and spigot pipe made of the general dimensions and weights given in Tables No. 1 and No. 2, for water, sewage, culverts, drains, pneumatic service, etc., and much of our regular stock is now made accordingly. The metal thicknesses given in Table No. 2 have been carefully figured, with such added allowances in the smaller pipe as experience has proven essential to good foundry practice, and which are now required by most engineers. The larger sizes of Class A carry slight allowances for transportation and handling. When essential, lighter pipe or pipe of weights intermediate to any two of the several classes, will be furnished as provided in the third paragraph of Section 1 of the specifications.

Certain odd sizes, 5-inch, 7-inch, 9-inch, 15-inch, 22-inch and 40-inch, with specials, will be made to order when required, but are not carried in stock. Regular sizes, 4-inch to 84-inch, should be selected as far as practicable, in laying out work, thus delays and possible extra cost will be avoided.

Turned and Bored Pipe. While we are prepared to furnish pipe of this type, they are so little called for in the United States that they are necessarily special with us, and therefore are made only on order. This usually involves some delay in delivery, owing to machining, as compared with deliveries of regular sizes of bell and spigot pipe for lead joints. Our turned and bored pipe are made to the general dimensions given in Table No. 1, so far as they apply, and owing to extra metal in socket and spigot will run slightly heavier for corresponding sizes and classes.

Inquiries and orders should clearly indicate the approximate number of lengths or feet of pipe of each size and class required. Give the desired delivery point and time of shipment, with any particulars as to sizes required first, the service intended, etc.; this will facilitate prompt attention and avoid delays.

Standard short length bell and spigot pipe in lengths to lay 12 inches, varying by 6-inch steps up to lengths to lay 72 inches, are classed as special castings. In ordering these short length bell and spigot pieces, Table No. 45 may be used, with the following code stems as prefixes to terminals.

Class A—Stem	•				Acpe	Class C—Stem				Acri
Class B-Stem		•	•		Acra	Class D-Stem	•			Actu



ts	Sockets	Depth of	f Sockets	Diam. o	Actual		Nom-
cial A B ings hes	Special Castings Inches	Pipe Inches	Special Castings Inches	Pipe Inches	Outside Diameter Inches	Classes	inal Diam. Inches
50 1.25 1.20	3,50	3,50	4.66	4.60	3.80	A	3
50 1.25 1.30	3.50	3.50	4.66	4.76	3.96	B-C-D	3
00 1.5 1.30	4.00	3.50	5.70	5.60	4.80	A	4
00 1.5 1.30	4.00	3.50	5.70	5.80	5.00	B-C-D	4
00 1.5 1.40	4.00	3.50	7.80	7.70	6.90	A	6
00 1.5 1.40	4.00	3.50	7.80	7.90	7.10	B-C-D	6
00 1.5 1.50	4.00	4.00	10.00	9.85	9.05	A-B	8
00 1.5 1.50	4.00	4.00	10.00	10.10	9.30	C-D	8
00 1.5 1.50	4.00	4.00	12.10	11.90	II.IO	A-B	IO
00 1.5 1.60	4.00	4.00	12.10	12.20	II.40	C-D	IO
00 1.5 1.60	4.00	4.00	14.20	14.00	13.20	A-B	12
00 1.5 1.70	4.00	4.00	14.20	14.30	13.50	C-D	12
00 1.5 1.70	4.00	4.00	16.10	16.10	15.30	A-B	14
00 1.5 1.80	4.00	4.00	16.45	16.45	15.05	C-D	14
00 1.75 1.80	4.00	4.00	18.40	18.40	17.40	A-B	10
00 1.75 1.90	4.00	4.00	18.80	18.80	17.80	C-D	10
00 1.75 1.90	4.00	4.00	20.50	20.50	19.50	A-B C D	18
00 1.75 2.10	4.00	4.00	20.92	20.92	19.92	C-D	18
00 1.75 2.00	4.00	4.00	22.60	22,00	21.00	A-B	20
1.75 2.30	4.00	4.00	23,00	23.00	22,00	L-D A P	20
2.00 2.10	4.00	4.00	20.80	20,80	25.80	A-B C D	24
2.00 2.50	4.00	4.00	27.32	27.32	20.32		24
50 2.00 2.30	4.50	4.50	32.74	32.74	31.74	A	30
50 2.00 2.30	4.50	4.50	33.00	33.00	32.00	D. C	30
50 2.00 2.00	4.50	4.50	33.40	33.40	32.40	Ď	30
50 2.00 3.00	4.50	4.50	33-74	33-74	32.74	4	30
50 2.00 2.50	4.50	4.50	38.90	38.90	37.90	R	36
50 2.00 2.00	4.50	4.50	39.30	39.30	30.30	č	36
3.10	4.50	4,50	39.70	39.70	30.70	Ď	36
30 2.00 3.40	4.50	4.50	40.10	40.10	39.10	Ā	12
2.00 2.00	5.00	5.00	45.20	45.20	44.50	B	42
2.00 3.00	5.00	5.00	45.50	45.30	44.50	ĉ	42
2.00 3.40	5.00	5.00	46 58	46.58	45. 58	Ď	42
2.00 3.00	5.00	5.00	ET. 50	ET 50	\$0.50	A	48
2.00 2.20	5.00	5.00	51.80	51.80	50.80	В	48
2.00 2.80	5.00	5.00	52.40	52.40	51.40	C	48
2.00 4.20	5.00	5.00	52.08	52.08	51.08	D	48
50 2.25 3.20	5.50	5.50	\$7.66	57.66	\$6.66	A	54
50 2.25 3.60	5.50	5.50	58.10	58.10	57.10	В	54
50 2.25 4.00	5.50	5.50	58.80	58.80	57.80	C	54
50 2.25 4.40	5.50	5.50	59.40	59.40	58.40	D	54
50 2.25 3.40	5.50	5.50	63.80	63.80	62.80	A	60
50 2.25 3.70	5.50	5.50	64.40	64.40	63.40	В	60
50 2.25 4.20	5.50	5.50	65.20	65.20	64.20	C	60
50 2.25 4.70	5.50	5.50	65.82	65.82	64.82	D	60
50 2.25 3.80	5.50	5.50	76.34	76.34	75.34	A	72
50 2.25 4.20	5.50	5.50	77.00	77.00	76.00	В	72
50 2.25 4.60	5.50	5.50	77.88	77.88	76.88	C	72
50 2.50 4.10	5.50	5.50	88.54	88.54	87.54	A	84
		5.50	80.54	80.54	88.54	В	84





# Standard Thicknesses and Weights of Cast Iron Pipe Bell and Spigot Pipe. Turned and Bored Pipe TABLE No. 2. Classes A, B, C, D

de Words lameters	Diam., In.	B. an T. an	ode Wor d S. Pipe d B. Pipe	ds , Abac , Abed	C B. an T. an	ode Wor Id S. Pipe d B. Pipe	ds , Abif , Abog	C B. an T. an	ode Wor d S. Pipe d B. Pipe	ds , Abul , Acad	C B. au T. ar	ode Wor d S. Pipe d B. Pipe	rds e, Acef e, Acol	unds Lead t hick	nds Hcmp it	Diam., In.
for Co Pipe D	Inside I	100 43 Pc	Class A Foot H ounds Pre	ead essure	-86 Pc	Class B Foot H ounds Pro	ead essure	300 130 Pe	Class C Foot Ho ounds Pro	ead essure	401 173 P	Class D Foot H ounds Pr	ead ressure	ate Pou per Join iches T	ate Pou per Join	Inside .
minals licate	nînal	kness hes	Pound	s per	kness thes	Pound	s per	kness hes	Pound	s per	kness hes	Pound	ls per	oroxin 2 Ir	roxim	ninal
Teri Inc	Not	Thicl	Foot	Lengtb	Thic	Foot	Length	Thic	Foot	Length	Thic Inc	Foot	Length	Apr	App	NOI
aca . ame .	3	· 39 . 42	14.5 20.0	175	.42	16.2 21.7	194 260	·45	17.1	205 280	.48	18.0 25.0	216 300	6.00 7.50	.18	34
atore avel.	6 8	•44 •46	30.8 42.9	370 515	.48 .51	33.3	400 570	.51 .56	35.8	430 625	•55 .60	38.3 55.8	460 670	10.25 13.25	.31 .44	6 8
arca .	10	.50	57.1	685	.57	63.8	765	.62	70.8	850	.68	76.7	920	16.00	.53	10
abarls	12 14	·54 ·57	72.5 89.6	870 1075	.62	82.1 102.5	985 1230	.68	91.7 116.7	1100 1400	.75	100.0 129.2	1200 1550	19.00	.01	12 14
beram bell	16 18	.60	108.3 129.2	1300 1550	.70 .75	125.0 150.0	1500 1800	.80 .87	143.8 175.0	1725 2100	.89	158.3	1900 2300	30.00	.94 1.00	16 18
bril .	20	.67	150.0	1800	.80	175.0	2100	.92	208.3	2 500	1.03	229.2	2750	37.00	1.25	20
dicort	24	.76	204.2	2450	.89	233.3	2800	1.04	279.2	3350	1.16	306.7	3680	44.00	1.50	24 30
Iculo	36	.99	391.7	4700	1.15	454.2	5450	I.36	545.8	6550	1.58	625.0	7500	64.75	3.00	36
lieu .	42	I.IO I.26	512.5	6150	1.28	591.7	7100	1.54	716.7	8600	1.78	825.0	9900	75.25	3.02	42
cias .	40	1.20	000.7	0000	1.42	/50.0	9000	1./1	900.3	10000	1.90	1050.0	12000	03.30	4.37	40
ter .	54	1.35	800.0	9600	I.55	933.3	11200	1.90	1141.7	13700	2.23	1341.7	16100	97.60	6.25	54
ura	72	1.39 1.62	910.7	15400	1.07	1545.8	13250	2.30	1341.7	22850	2.30	1503.3	19000	128.00	12.50	72
une .	84	1.72	1633.4	19600	2.22	2104.2	25250				••••			147.00	15.00	84

All lengths to lay 12 feet. All weights are approximate; those per foot include allowance for bell; those per length include standard bells; proportionate allowance to be made for any variation from the standard length.

All pipe are tested by water pressure, as per Section 14 of Standard Specifications.

Turned and bored pipe made to order only.

In telegraphing, to indicate kind and size, combine code words with terminals in first column, thus: 12-inch, Class B bell and spigot pipe = Ablfaril.

# Cast Iron Pipe and Special Castings

For High Pressure Service

# TABLE No. 3 General Dimensions of Pipe. High Pressure Service. Classes E, F, G, H

Nominal Diameter Inches	Classes	Actual Outside Diameter Inches	Diameter of Sockets Pipe and Specials	Depth of Sockets Pipe and Specials	A	В	с	R	Nominal Diameter Inches
6	E-F	7.22	8.02	4.00	I.50	1.75	.75	I.10	6
6	G—H	7.38	8.18	4.00	1.50	1.85	.85	I.IO	6
8	E-F	9.42	10.22	4.00	1.50	1.85	.85	I.IO	8
8	G—H	9.60	10.40	4.00	I.50	1.95	.95	I.IO	8
IO	E-F	11.60	12.40	4.50	I.75	1.95	.95	I.10	IO
10	G—H	11.84	12.64	4.50	I.75	2.05	1.05	I.IO	IO
12	E-F	13.78	14.58	4.50	1.75	2.05	1.05	I.10	12
12	G—H	14.08	14.88	4.50	I.75	2.20	I.20	I.10	12
14	E-F	15.98	16.78	4.50	2.00	2.15	I.15	I.IO	14
14	G—H	16.32	17.12	4.50	2.00	2.35	I.35	I.10	14
16	E-F	18.16	18.96	4.50	2.00	2.30	1.25	1.15	16
16	G-H	18.54	19.34	4.50	2.00	2.55	I.45	1.15	16
18	E-F	20.34	21.14	4.50	2.25	2.45	1.40	1.15	18
18	G-H	20.78	21.58	4.50	2.25	2.75	1.65	1.15	18
20	E-F	22.54	23.34	4.50	2.25	2.55	1.50	I.15	20
20	G-H	23.02	23.82	4.50	2.25	2.85	I.75	I.20	20
24	E-F	26.90	27.90	5.00	2.25	2.85	1.70	I.20	24
30	E	33.10	34.10	5.00	2.25	3.25.	1.80	I.50	30
30	F	33.40	34.40	5.00	2.25	3.50	2.00	1.55	30
36	E	39.60	40.60	5.00	2.25	3.70	2.05	1.70	36
36	F.	40.01	41.04	5.00	2.25	4.00	2.30	1.80	36

Within a comparatively few years the growth of cities and the increasing demands of manufacturing and mining districts and of railways, has developed a steadily increasing demand for cast iron pipe for high pressure service. On pages 27 to 30 will be found some notes regarding independent high pressure fire mains, which are now regarded essential in all important or congested sections of cities, and which through decreased fire losses and costs of insurance, more than pay their way. While independent water supplies are often installed under 100 pounds or more working pressure, for railways, mines and large manufacturing plants, they are as often needed at locations which can only be reached through heavy force mains, as at points where a gravity supply requires heavy pipe for the resulting pressures. Thus, aside from its use for independent fire line service, no

Standard Thicknesses and Weights of Cast Iron Pipe for Fire Lines and Other High Pressure Service TABLE NO. 4. Classes E, F, G, H In Telegraphing, to Indicate Class and Size, Combine Code Words with Terminals in First Column, thus 12-Inch, Class  ${\rm E}={\rm Acumaril}$ Hemp, Size Size Lead Code Words Diameters Code Word Code Word Code Word Code Word Diameter Diameter Adab Adeg Adil Pounds Joint Acum Pounds r Joint Code Class E ∞-Foot Head Class F 600-Foot Head Class G 00-Foot Head Class H 800-Foot Head te P Inside 1 Inches Approximate of Lead per Inside Pipe 217 Pounds Pressure 347 Pounds Pressure 260 Pounds Pressure 304 Pounds Pressure Approximat of Hemp p Terminals f Indicate P Nominal Nominal Pounds per Pounds per Pounds per Pounds per Thick-Thick-Thick Thickness ness ness ness Inches Inches Inches Inches Foot Length Length Foot Length Foot Foot Length 49.6 12.3 atore 6 .58 .61 520 .65 565 .69 6 41.7 500 43.3 47.I 595 .31 .66 .75 70.8 850 .80 75.0 15.8 8 8 61.7 65.7 790 .44 avel . 740 .71 000 .86 106.7 1280 1105 IO arca 10 86.3 1035 .80 92.I 100.9 1210 .92 19.2 . 53 .74 .82 122.1 .62 12 aril 12 113.8 1365 .89 1465 .97 135.4 1625 1.04 143.8 1725 22.7 .83 abaris 14 .90 145.0 1740 .99 157.5 1890 1.07 174.2 2000 1.16 186.7 2240 26.2 I.I 2155 beran 16 .98 179.6 1.08 195.4 2345 1.18 219.2 2620 I.27 232.5 2790 35.9 .97 16 238.4 286.7 18 bell . 18 2645 1.17 2860 1.28 267.1 3205 1.05 1.07 220.4 I.39 3440 40.3 286.3 brii 263.0 3155 1.27 320.8 3850 1.33 20 20 1.15 3435 I.39 1.51 344.6 4135 44.5 dicort 359.6 4315 392.9 53.I 1.60 21 24 1.31 I.45 4715 .... . . . . . . . . . . . . . 65.2 engra 30 I.55 521.7 6260 I.73 585.4 7025 . . . . 2.15 30 . . . . . . . . . . . . . 36 820.0 9840 36 iculo . 1.80 725.0 8700 2.02 77.9 3.20 . . . . . . . . . . . . .

UNITED STATES CAST IRON PIPE AND FOUNDRY COMPANY

All lengths to lay 12 feet. All weights are approximate; those per foot include allowance for bell; those per length include standard sockets; proportionate allowance to be made for any variation from the standard length. All high pressure pipe are tested by water pressure to 500 pounds, at the works.

For SPECIAL CASTINGS FOR HIGH PRESSURE PIPE see pages 98 to 101 and Table No. 3. One class of special castings is provided for Classes E and F pipe, and one class of special castings for Classes G and H pipe, 6 to 24 inches inclusive. One class of special castings is supplied for each class of 30 and 36 inch pipe.

small proportion of the demand for high pressure pipe comes from these other sources; and for such service and as supplementing the classes for lower pressures, we offer our standard E, F, G and H pipe per Tables No. 3 and No. 4. When required, the bell may be ordered with one or two half round lead grooves instead of the standard shown. Standard special castings are provided as per foot note under Table No. 4. Certain castings, notably some of the tees and crosses in which the metal is cut away by the arm openings, are made of steel, as required. A line of high pressure flange pipe and specials for corresponding high pressure service is provided. See pages 102 to 104.

In Table No. 5 we offer a full line of flexible joint pipe which will be found well adapted to ordinary conditions. The two designs are the same as to general dimensions and outside contour of the flexible joint bell, differing mainly on the inside of the bell and at the spigot ends. Type No.  $\tau$  is similar in some respects to the old Ward joint, while Type No. 2, the Metropolitan joint, is a newer form, in which the lead remains in the bell when the joint is deflected, and does not work outside the bell, as in the older joint.

When ordering flexible joint pipe, Types No. 1 and No. 2, provision should be made for connecting each end with the bell and spigot lines. (See continuation, page 48.)

General Dimensions, Thicknesses and Weights Standard Flexible Joint Pipe

Type No. 1. Code Word, Adom



TABLE No. 5

Code	Size	Class	А	в	с	D	Е	Weight per Length	Lead per a Pot	Solid Joint inds
	Inches							Pounds	Туре 1	Type 2
atore	6	B	.48	1.56	I.37	1.00	.87	503	11.9	9.0
aras	6	D	.55	1.56	I 37	1.00	.87	555	11.9	9.0
avel	8	B	.51	1.81	I.56	1.12	.94	673	19	14
anha	8	D	.60	1.81	1.56	I.I2	.94	780	19	14
arca	10	B	.57	2.06	1.75	I.I8	1.00	947	28	22
anis	10	D	.68	2.06	1.75	I.18	1.00	1080	28	22
aril	12	B	.62	2.25	1.87	I.25	1.06	1210	49	39
amus	12	D	.75	2.25	1.87	I.25	1.06	1400	49	39
abaris . abor beran bevel bell	14 14 16 16 18	B D B D B	.66 .82 .70 .89 .75	2.50 2.50 2.75 2.75 2.75 2.87	2.00 2.00 2.12 2.12 2.25	1.31 1.31 1.43 1.43 1.56	I.12 I.12 I.25 I.25 I.31	1450 1750 1862 2250 2300	64 64 76 76 91	51 51 60 60 73
bero	18	D	.96	2.87	2.25	1.56	1.31	2760	91	73
bril	20	B	.80	3.12	2.37	1.62	1.37	2625	112	92
balk	20	D	1.03	3.12	2.37	1.62	1.37	3200	112	92
dicort	24	B	.89	3.37	2.68	1.75	1.50	3534	136	112
dean	24	D	1.16	3.37	2.68	1.75	1.50	4290	136	112
engra	30	B	1.03	3.87	3.18	2.12	I.72	5067	181	146
erin	30	D	1.37	3.87	3.18	2.12	I.72	6360	181	146
iculo	36	B	1.15	4.12	3.50	2.50	I.94	6063	225	177
icar	36	D	1.58	4.12	3.50	2.50	I.94	7900	225	177

Type No. 2. Code Word, Afag



Deflection about 13 degrees. Either type made to order only. All weights are approximate. For heavy service see Types No. 3 and No. 4.

UNIVERSIT

Comor	al Di	monair		Thick		and V	Voight	Stan	dand E	lov	ible I	oint I	)ine	Cont
			)115,			120"		·						
Type No. 3 TABLE NO. 6 Full Lengths Short Lengths														
FULL LENGTHS SHORT LENGTHS   Dimensions Common to Nos 3 and 4 Type No. 3-Code. Afel Type No. 4-Code. Afim														
Dimensions Common to Nos 3 and 4 Type No. 3–Code, Afel Type No. 4–Code, Afim														
Sizes	Class D	Rad.	Gun Bo	Metal lts in	Code	Len	gths	Approx- imate	Code		Lengtl	ns	Approx- imate	Size
1nches	Thick- ness	D	Joint S	Flange T	minal	В	с	Section	minal	A	13	с	Joint	Inches
12	. 75	15.00	6	16 18	aril	145.13	148.38	1508	amus	20	10.13	14.25	617	12
14	.89	19.75	6	20	beran	145.75	149.25	2384	bevel	21	12.06	15.00	995	14
18 20	.96	22.13	6	22	bell bril	146.00	150.50	2809 3454	bero	24	13.50	17.00	1157	18
24	1.16	29.06	6	28	dicort	146.20	151.95	4646	dean	28	15.45	20.50	2101	24
30 36	1.37 1.58	35.75	6	34 40	iculo	140.75	153.50	9798	icar	33	21.00	23.50	3004 5109	30
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$														

Weights approximate only, and include gun metal bolts per table, Type No. 3 end sections may be ordered bell or spigot instead of flange if desired. Flange dimensions Class D. Bolts for end flanges furnished to order only-not included with the castings. Type No. 4 joints are furnished complete with lead calked bell and bolted collar, ready for use.

Thus it is well to have, in addition to the required number of flexible joint lengths, one length with flexible bell and ordinary spigot, and one length with ordinary bell and





flexible spigot. These latter may also be ordered in pairs, to use in laying a line in shallow water with standard bell and spigot pipe, so as to secure a flexible joint in every three or four joints.

For important lines laid in deep or swift water, especially if under heavy pressure, we offer flexible joints of our Types No. 3 and No. 4. As will be seen from the designs, these are heavier joints, with flanged collars secured by gun metal bolts, which cannot readily pull apart. Type No. 3 is a full length pipe, having this form of joint, as listed in Table No. 6. Type No. 4 is a joint of the same design, of short length, as used in special locations with flange pipe. When ordering Type No. 3 or No. 4 joints, provision should also be made as to ordering connecting end pieces, and all underwater flanged pipe joints should preferably have bronze or gun metal bolts.

Owing to the longer bells and spigots, the flexible joint pipe are heavier than

corresponding sizes and classes of bell and spigot pipe, and owing to the machine work upon them, take nearly twice as long to manufacture as regular bell and spigot pipe. Not infrequently much is gained in laying submerged lines during the low water, and when the streams are free from ice. Hence, in planning such mains, ample time should be allowed, that the pipe may be made up in due season.

The utmost care should be exercised in laying flexible joint pipe, to insure thoroughly made joints, which when fully calked should be moved within the limits of deflection before the next pipe is inserted and the joint submerged.

#### TABLE No. 7

3 6.00 6.50	7.00 10.25
4 7,50 8,00	8.75 13.00
6 IO.25 II.25 I	2.25 18.00
8 13.25 14.50 1	5.75 23.00
10 16.00 17.50 1	31.00
12 10.00 20.50 2	2.50 36.50
14 22.00 24.00 2	5.00 38.50
16 30700 33.00 3	5.75 64.75
18 33.80 36.00 4	72.00
20 37.00 40.50 4	1.00 80.00
24 44.00 48.00 5	2.50 05.00
30 54.25 59.50 6	4.75 117.50
36 64.75 71.00 7	7.25 140.25
42 75.25 78.75 8	5.50 155.25
48 85,50 94.00 10	2.25 202.25
54 97.60 107.10 11	6.60 238.60
60 108.30 118.80 12	255.50
72 128.00 140.50 15	3.00 302.50
84 147.00 161.50 17	5.60 348.00

#### Lead in Bell and Spigot Pipe Joints

The above table gives the calculated weight of lead required for pipe joints, both with and without gasket. The weight of a cubic inch of lead is taken as 0.41 pound. An allowance has been made for lead to project beyond face of the bell for calking. The specifications for pipes allow the lead space to vary from those given in tables, hence the weight of lead required for the joint may vary approximately it to i6 per cent. from weights given above.



# Standard Special Castings



In designing pump house, reservoir gate house and other pipe connections it is hoped that engineers will incorporate in their drawings, as far as may be, special castings of standard dimensions as shown in the tables herein. This will enable us to furnish more promptly any special castings

ordered of us, and greatly facilitate the filling of orders. While at each of our plants we make more or less special castings, at our Addyston, Burlington and Bessemer plants,

we have large special foundry and machine shops, some of them of most recent and modern construction. Attention is again directed to clauses in Standard Specifications, pages 36 to 41 inclusive, as well as notes on pages

> 36, 42, 51 and 106, relating to Specials. Our standard special castings will be found to be substantially of the same laying dimensions as those of the New England Water Works



Association, the exceptions being mainly in the large diameter tees and crosses with branch openings 14 inches and larger. In figuring these larger castings it was deemed best to increase their laying lengths

> from 2 to 4 inches, to allow more metal in corner sections and clearance of run and branch bells. In producing the designs for special cast-



ings we have aimed to insure castings of ample strength; hence, many of the listed tees and crosses are provided with ribs, or are ribbed and bolted, or for heavy pressures, are made of steel. Such castings are not included with regular specials, bell and spigot or flange, and prices will be quoted only on receipt of lists specifying



castings required. Bolted castings are made up with steel bolts protected by brass tubing, or, preferably, with gun metal bolts. By regular bell and spigot or flange specials, is meant the

ordinary run of such castings. Bolted Y branches and breeches pipe, and all tongue and groove or tongue and recess flanged castings are classed as extras.



Standard Lugs. Number and Weights of Lugs on Outlets of Different Sizes

#### TABLE No. 8

Code Terminal	Nominal Diameter Outlet Inches	Number of Pairs of Lugs	Approximate Weight Lugs on One Bell Pounds	Cod	le inal	Nominal Diameter Outlet Inches	Number of Pairs of Lugs	Approximate Weight Lugs on One Bell Pounds
aril abaris beran bell bril dicort	12 14 16 18 20 24	4 4 6 6 6 6	32 32 56 56 56 56	engra iculo lieu . tras . ura . une .		 30 36 42 48 54 60	6 6 8 8 8 8	80 80 111 114 134 137

L-5236

Two pairs of lugs are placed on the vertical axis of each bell, the others at equal distances around circumference. h is equal depth of bell on all sizes.

G equals 2.50 inches, X equals 1.25 inches, Y equals 1.63 inches for 12 to 24 inches inclusive.

G equals 3.00 inches, X equals 1.50 inches, Y equals 2.00 inches for 30 to 60 inches inclusive.

Standard lugs of the form and number of pairs here shown, may be ordered on bells of pipe and specials 12 inches in diameter and larger. An extra charge is made for pipe and castings with lugs. Such castings are made only to order.

All weights are approximate.

Standard Special Castings for Water Standard Curves, Bell and Spigot, 1/4, 1/8, 1/6 For Flanged Special Castings, see pages 87 to 97 ź 4 221/2". 45 -

TABLE No. 9

.



Code En State Stat														
Code Termi- nal	Nominal Diam., In.	Class	Dimer t	r	, Inches k	Approx. Weight Pounds								
ame .	4	D	. 52	16	22.60	82								
atore.	6	D	.55	16	22.60	130								
avel.	8	D	.60	16	22.60	200								
arca .	10	D	. 68	16	22.60	278								
arll .	12	D	.75	16	22.60	366								
anos .	14	В	.66	18	25.50	406								
abor .	14	D	.82	18	25.50	504								
basse	16	В	.70	24	34.00	594								
bara .	16	D	. 89	21	34.00	750								
belge.	18	В	• 75	24	34.00	710								
balk .	18	D	.96	24	34.00	888								
bucu.	<b>2</b> 0	В	. 80	24	34.00	840								
bonne	20	D	1.03	24	34.00	1070								
deros	24	В	.89	30	12.40	1290								
della .	24	D	1.16	30	42.40	1656								
etra .	30	Α	.88	36	50.90	1814								
etros.	30	В	1.03	36	50.90	2082								
enbin	30	С	I.20	36	50.90	2454								
engo.	30	D	I.37	36	50.90	2836								
lgar .	36	Α	.99	48	67.90	2964								
Icell .	36	В	1.15	48	67.90	3500								
lcet .	36	С	1.36	48	67.90	4120								
illus .	36	D	1.58	48	67.90	4820								

nal In.	50		1/8 Curv	res—(	Code, Ag	çal	С	de, Ag	es <b>;em</b>
Nomir Diam.,	Clas	t	Code Terminal	r	k	Approx. Weight Pounds	r	k	Approx, Weight Pounds
4	D	.52	ame	24	18.40	66	48	18.70	66
8	D	- 55	avel .	24	18.40	105	40	18.70	105
IO	D	.68	arca	24	18.40	202	48	18.70	202
12	D	.75	aril	21	18.40	265	48	18.70	265
14	В	.66	anos	36	27.60	359	72	28.10	312
14	D	. 82	abor	36	27.60	442	72	28.10	382
10	B	.70	basse .	30	27.60	445	72	28.10	355
10	B	.09	belge	30	27.00	550	72	28,10	401
18	D	.06	balk .	36	27.60	663	72	28.10	574
20	В	.80	bucu	48	36.70	758	96	37.50	676
20	D	1.03	bonne .	48	36.70	964	96	37.50	858
24	B	.89	deros .	60	45.90	1181	120	46.80	1072
24	D,	I.16	della	60	45.90	1515	120	46.80	1372
30	R	.88	etra	60	45.90	1475	120	10,80	1342
30	Č	1.03	enhin	60	15.90	1082	120	16.80	1520
30	D	I.37	engo	60	15.00	2201	120	46.80	2080
36	A	.99	igar	90	68.90	2472	180	70.20	2472
36	В	1.15	icell	90	68.90	2916	180	70.20	2916
36	C	1.36	icet	90	68.90	3430	180	70.20	3430
30		1.58	illus	90	68.90	4012	180	70.20	4012
+2	R	1.10 T 28	larel	90	68.00	3200	180	70.20	3200
42	č	1.51	laron	00	68.00	1600	180	70.20	4600
42	D	1.78	latest .	90	68.90	5360	180	70.20	5360
48	A	1.26	ocet	90	68.90	4230	180	70.20	4230
18	B	I.42	omen .	90	68.90	4820	180	70.20	4820
48	D	1.71	ofer	90	08.90	5796	180	70.20	5796
18	A	1.90	same	90	68.00	0750 5180	180	70.20	5180
51	B	1.55	sand .	00	68.00	5000	180	70,20	5000
54	C	1,00	sone .	90	68.90	7330	180	70.20	7330
54	D	1.23	slca	90	68.90	8620	180	70.20	8620
60	A	I.39	ulode	90	68.90	5990	180	70.20	5990
60	B	1.67	ufre	90	68.90	7130	180	70.20	7130
60	D	2.00	uton	90	68.90	8590	180	70.20	8590
00	D	2.38	uticy .	90	00.90	10240	100	70.20	10240
							1 1		

S=8 inches on sizes 4 and 6 inches. S=10 inches on sizes 8 inches. S=12 inches on sizes 10 36 inches. All weights are approximate. L-1101

S=6 inches on  $\frac{1}{6}$  Curves on sizes 4 to 30 inches inclusive. S=6 inches on  $\frac{1}{16}$  Curves on sizes 4 to 12 inches inclusive.

Standard Special Castings for Water







TABLE NO. 11. Standard Curves, Bell and Spigot TABLE NO. 12. Standard Offsets

TABLE No. 12. Standard Offsets Code Word, Alam

al Inches			39 Curv	es—C	Code, Ag	op	1 10	Curves- Agus	Code,
Nomir Diameter,	Clas	t	Code Terminal	r	k	Approx. Weight Pounds	г	k	Approx. Weight Pounds
ui(I)     4     6     8     10     12     14     16     18     18     20     2     24     30     30     36     36     36     3     36 <th>D D D D B D B D B D B D B D B D A B C D A B C D A B C D</th> <th>.52 .55 .60 .68 .75 .66 .82 .70 .80 .75 .96 .80 1.03 .89 1.16 .88 1.03 .89 1.16 .88 1.03 1.20 1.37 .99 1.15 1.35 1.58 1.10 1.28 1.58 1.78</th> <th>ame atore avel</th> <th>120 120 120 120 180 180 180 180 240 240 240 240 240 240 240 240 240 24</th> <th><math display="block">\begin{array}{c} 23.52\\ 23.52\\ 23.52\\ 23.52\\ 23.52\\ 35.28\\ 35.28\\ 35.28\\ 35.28\\ 35.28\\ 35.28\\ 35.28\\ 35.28\\ 35.28\\ 47.05\\ 47</math></th> <th>aw       66       104       150       192       250       364       450       453       570       542       674       808       1380       1350       1540       2090       1580       2090       1810       2090       2470       2880       2380       2720       3850</th> <th>480 480 480 480 480 480 480 480 480 480</th> <th>47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10</th> <th>808 1028 1080 1380 1350 1540 2090 1790 2100 2470 2880 2380 2380 2380 2380 2380 2380 238</th>	D D D D B D B D B D B D B D B D A B C D A B C D A B C D	.52 .55 .60 .68 .75 .66 .82 .70 .80 .75 .96 .80 1.03 .89 1.16 .88 1.03 .89 1.16 .88 1.03 1.20 1.37 .99 1.15 1.35 1.58 1.10 1.28 1.58 1.78	ame atore avel	120 120 120 120 180 180 180 180 240 240 240 240 240 240 240 240 240 24	$\begin{array}{c} 23.52\\ 23.52\\ 23.52\\ 23.52\\ 23.52\\ 35.28\\ 35.28\\ 35.28\\ 35.28\\ 35.28\\ 35.28\\ 35.28\\ 35.28\\ 35.28\\ 47.05\\ 47$	aw       66       104       150       192       250       364       450       453       570       542       674       808       1380       1350       1540       2090       1580       2090       1810       2090       2470       2880       2380       2720       3850	480 480 480 480 480 480 480 480 480 480	47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10	808 1028 1080 1380 1350 1540 2090 1790 2100 2470 2880 2380 2380 2380 2380 2380 2380 238
44 48 48 48 48 54 54 54 54 54 60 60 60	A B C D A B C D A B C D A B C D A B C D A B C	1.70 1.26 1.42 1.71 1.96 1.35 1.55 1.90 2.23 1.39 1.67 2.00 2.38	ocet omen ofer same sand sand sone sica ulode ufre ufre udrey	240 240 240 240 240 240 240 240 240 240	47.05 4	3350 3150 4170 4860 3750 4330 5290 6220 4340 5140 6200 7400	480 480 480 480 480 480 480 480 480 480	47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10 47.10	3050 3150 3480 4170 4860 3750 4330 5290 6220 4340 5140 6200 7400

Code Terminal	Nominal Diam., Inches	Class	r	I	Approx. Weight Pounds
		~			
ame .	4	D	8	35.85	91
atore .	0	D	14	46.25	183
avel	8	D	15	48.00	280
arca	IO	D	16	49.70	390
aril	12	D	17	51.45	530
anos .	14	В	18	53.70	555
abor .	14	D	18	53.70	695
basse .	16	В	19	55.40	708
bara .	16	D	19	55.40	900
-			1.20		
		-			
Nominal Diameter Inches	Class	t	k	s	n
				1.1.1	1
4	D	. 52	13.85	10.00	2.00
6	D	.55	24.25	10.00	2.00
8	D	.60	26.00	10.00	2.00
10	D	.68	27.70	10.00	2,00
12	D	.75	29.45	10.00	2.00
14	В	.66	31.20	10.00	2.50
14	D	.82	31.20	10.00	2.50
16	В	.70	32.90	10.00	2.50
16	D	.89	32.90	10.00	2.50

All weights are approximate.

L-1101

L-5324

# Standard Special Castings for Water



1/4 Curves with Base

# TABLE No. 13. Code Word, Alen

Code Terminal	Nominal Diameter Inches	Class	t	r	k	S	h	Approx. Weight Pounds
ame	4	D	. 52	16	22.60	8	5.50	141
atore	6	D	. 55	16	22.60	8	6.50	214
avel	8	D	. 60	16	22.60	10	7.50	309
arca	10	D	. 68	16	22.60	12	9.00	436
aril	12	D	. 75	16	22.60	12	10.00	579
anos	14	B	.66	18	25.50	12	12.00	717
abor	14	D	.82	18	25.50	12	12.00	815
basse	16	B	.70	24	34.00	12	13.00	1053
bara	16	D	.89	24	34.00	12	13.00	1209
belge	18	B	.75	24	34.00	12	14.00	1264
balk bucu bonne deros deiia	18 20 20 24 24	D B D B D	.96 .80 1.03 .89 1.16	24 24 24 30 30	34.00 34.00 34.00 42.40 42.40	12 12 12 12 12 12	14.00 15.00 15.00 17.50 17.50	1442 1619 1849 2379 2745
etra etros enbin engo igar	30 30 30 30 30 36	A B C D A	.88 1.03 1.20 1.37 .99	36 36 36 36 48	50,90 50,90 50,90 50,90 67,90	12 12 12 12 12 12	21.00 21.00 21.00 21.00 24.50	3718 3986 4358 4740 6002
iceil	36	B	1.15	48	67.90	12	24.50	6538
icet	36	C	1.36	48	67.90	12	24.50	7158
illus	36	D	1.58	48	67.90	12	24.50	7858

All weights are approximate.

L-5230

# Standard Special Castings for Water

UNITED STATES CAST IRON PIPE AND FOUNDRY COMPANY

TABLE No. 14. Standard Branches

	200	-	1.19								-	Code	Stems	
					Nominal	Diameter		Dim	ensions, I	nches	Alip	Alos	Alut	Aman
Code	e Te	ermi	nal				Class				3-Way I	Branches	4-Way B	Branches
					A	В		Н	J	I	2 Bells	3 Bells	3 Bells	4 Bells
arent					3	3	D	IO	22	IO	92	94	124	125
ica					4	3	D	II	23	II	121	120	153	153
me					4	4	D	II	23	II	125	128	164	166
lizo					6	3	D	12	24	12	173	170	207	204
iras					6	4	D	12	24	12	185	183	223	221
tore	•	•	•	•	6	6	D	12	24	12	203	200	259	257
inha					8	4	D	13	25	13	262	255	301	204
itico					8	6	D	13	25	13	278	270	333	325
ivel					8	8	D	13	25	13	301	204	378	372
ifft					IO	4	D	14	26	14	356	338	305	377
nion					IO	6	D	14	26	14	371	352	424	406
nis					IO	8	D	14	26	14	389	371	461	443
rca					IO	10	D	14	26	14	414	395	511	493
clie					12	4	D	15	27	15	473	445	514	486
mus					12	6	D	15	27	15	486	458	540	512
tum	•	•	•		12	8	D	15	27	15	502	474	573	545
cho					12	IO	D	15	27	15	519	491	605	577
ril					12	12	D	15	27	15	540	512	651	623
bunt					14	4	В	16	28	16	485	480	535	530
indum					14	4	D	16	28	16	614	588	666	641
tur	•	•		•	14	6	В	16	28	16	500	495	560	555
ivero					14	6	D	16	28	16	634	608	730	700
rizo					14	8	В	16	28	16	515	510	600	595
iveri					14	8	D	16	28	16	662	636	787	761
rate					14	IO	В	16	28	16	535	525	635	625
torem	1	•	•		14	IO	D	16	28	16	679	653	822	796
nos					14	12	В	16	28	16	560	550	680	670
bor					14	12	D	16	28	16	698	672	860	834
baris					14	14	B	16	28	16	575	569	723	715
city					14	14	D	16	28	16	750	724	938	963
rage					16	4	B	17	29	17	615	610	675	670

						undur d				
	Code Stems	s over W	eight Col	umns			Appr	oximate V	Veights, Po	unds
							-	Code	Stems	<u>.</u>
	Nominal D Inche	iameter es		Dim	ensions, Ir	nches	Allp	Alos	Alut	Aman
Code Terminal		D	Class		7		3-Way I	Branches	4-Way I	Branches
	A						2 Bells	3 Bells	3 Bells	4 Bells
agno	16 16	4	D B	17 17	29 29	17 17	783 630	760 625	864 695	841 690
acibus	16	6	D	17	29	17	802	779	902	879
ante	10	S	D	17	29	17	045 S21	040 808	730	725
andos	16	IO	B	17	29	17	660	655	760	755
barla	16 16	IO 12	D B	17	29	17	872 685	849 680	1042	1019
basan	16	12	Ď	17	29	17	884	861	1066	1013
basse	16	14	В	17	29	17	695	690	825	820
bara	16	14	D	17	29	17	903	880	1104	1082
beratt	16	10	В	17	29	17	729	727	904	901
bevel	16	16	D	17	29	17	991	969	1282	-1259
bias	18	4	D	10	30	18	755	750	520	815
biam	IS	6	B	18	30	18	953	760	040	835
biolan	18	6	D	18	30	18	968	942	1075	1049
biate	18	8	В	18	30	18	780	775	870	865
bione	18	8	D	18	30	18	1000	974	1140	1114
bolia	18	10	D	18	30	18	795	790	900	895
brona .	IS	12	B	18.	30	18	815	810	010	035
begi	18	12	D	18	30	18	1075	1049	1290	1264
belag	18	14	В	18	30	18	825	820	955	950
belas	18	14	D	18	30	18	1083	1057	1306	1280
balk	10	10	D	18	30	18	055	850	1020	1015
bell	18	18	B	18	30	18	805	880	-1101	1006
belon	18	18	D	18	30	18	1170	1144	1480	1454
belrod	20	4	В	19	31	19	923	916	1006	999
benk	20	4	D	19	31	19	1172	1148	1273	1248
beure	20	6	B	19	31	19	930	920	IOIO	1000
biene	20	6	D	19	31	19	1188	1164	1304	1280
bill	20	8	D	19	31	19	945	935	1035	1025
binai	20	10	B	19	31	19	955	945	1060	1050
bini	20	10	D	19	31	19	1252	1227	1431	1407
bio	20	12	В	19	31	19	975	965	1100	1090
brito	20	12	D	19	31	19	1288	1263	1502	1479
brom	20	14	B	19	31	19	980	970	IIIO	IIOO
buron	20	14	D	19	31	19	1342	1318	1013	1588
boroi	20	10	B	19	31	19	1010	1000	1170	1160
bucu	20	10	B	19	31	19	1347	1323	1022	1597
bonne .	20	18	Ď	19	31	19	1365	1341	1658	163.1
brii	20	20	В	19	31	10	1077	1070	1314	1307

# Standard Special Castings for Water TABLE No. 14—Continued. Standard Branches

All weights are approximate.

410

L-1105

#### Approximate Weights, Pounds Code Stems over Weight Columns Code Stems Nominal Diameter Inches Dimensions, Inches Alip Alos Alut Aman Code Terminal Class 3-Way Branches 4-Way Branches A B H J I 2 Bells 3 Bells 3 Bells 4 Bells bunt D IQ back B biolus D B buis berto D B borne IO D card IO B cana 1381 carlo D cape B cift D cire B D dea del B D deral deros B della D dicort B D digli donia A dango B dorum C dabam D A dage B dame daria C dast D deaw A . B delag IO . C dilas IO D dulf IO A deur B dra dalt C IQII D dade dangis A TS darb B dobs C D dofen dort A IQ B dalt dean C IO D dique dering A B dellos

# Standard Special Castings for Water TABLE No. 14—Continued. Standard Branches

Large diameter tees and crosses with ribs, or with ribs and bolted through flats when required. See page 51. L-1105 All weights are approximate.

#### IRON PIPE AND FOUNDRY COMPANY UNITED STATES CAST

	Code Sterr	ns over W	eight Colu	umns			Appr	oximate W	Veights, Po	ounds
								Code	Stems	
	Nominal I Incl	Diameter hes		Dim	ensions, Ir	nches	Alip	Alos	Alut	Aman
Code Terminal			Class				3-Way I	Branches	4-Way H	Branches
	A	В		H	J	I	2 Bells	3 Bells	3 Bells	4 Bells
bam	30	18	С	20	34	26	2.13.1	2353	2862	2781
ntib	30	18	D	20	3.1	26	2805	2701	3361	3348
ntis	30	20	Α	21	36	26	1857	1818	2157	2118
ola	30	20	В	21	36	26	2182	2088	2584	2100
rem	30	20	C	21	36	26	2667	2555	3237	3126
tori	30	20	D	21	36	26	3041	2921	3657	3538
tra	30	24	А	23	38	26	1979	1940	2312	2274
tros	30	24	В	23	38	26	2313	2219	2742	2648
nbin	30	24	C	23	38	26	2847	2736	3474	3362
ngo	30	24	D	23	38	26	3290	3170	4014	3895
ngra	30	30	A	26	43	26	2212	2129	2602	2520
rin	30	30	В	26	43	26	2599	2453	3106	2960
rnol	30	30	С	26	43	26	3310	3137	4110	3937
mu	30	30	D	26	43	26	3850	3660	* 4799	4609
rfen	36	8	A	14	26	27	1751	1777	1938	1963
rish	36	S	В	14	26	27	2055	2073	2268	2287
one	36	S	C	14	26	27	2421	2433	2679	2691
maro,	36	8	D	14	26	27	2780	2780	3038	3039
zia	36	10	А	15	27	27	1810	1835	1996	2021
olum	36	10	В	15	27	27	2128	2147	2345	2364
mie	36	IO	С	15	27	27	2534	2546	2822	2834
tten	36	10	D	15	27	27	2903	2902	3188	3188
lazo	36	12	A	16	28	27	1884	1909	2084	2109
stro	36	12	В	16	28	27	2219	2238	2458	2477
sta	36	12	С	16	28	27	2644	2656	2962	2973
rata	36	12	D	16	28	27	3032	3033	3349	3350
rolla	36	14	A	18	30	29	2039	2065	2279	2304
riate	36	14	B	18	30	29	2415	2433	2709	2728
rarla	36	14	C	18	30	29	2872	2883	3251	3263
scos	36	14	D	18	30	29	3470	3470	4033	4033
bas	36	16	A	19	31	29	2135	2160	2410	2436
ntly	36	16	B	19	31	29	2521	2540	2853	2872
bo	36	16	C	19	31	29	3003	3014	3431	3442
rn	36	16	D	19	31	29	3618	3617	4231	4230
orm	36	18	A	20	34	29	2279	2246	2581	2548
licon	36	18	В	20	34	29	2701	2650	3073	3022
ut	36	18	C	20	34	29	3206	3136	3673	3604
abas	. 36	18	D	20	34	29	3852	3755	4506	4409
amos	36	20	A	21	36	29	2409	2346	2752	2689
areo	36	20	В	21	36	29	2885	2800	3336	3251
esa	36	20	С	21	36	29	3537	3426	4212	4101
ifer	36	20	D	21	36	29	4050	3905	4757	4612
,ab	36	24	A	23	38	29	2451	2513	2844	2907
gadu	36	24	B	23	38	29	3099	3014	2624	3539
					6		0 1	1 1 .		

# . .

Large diameter tees and crosses with ribs, or with ribs and bolted through flats when required. See page 51. L-1105 All weights are approximate.

Np

	Code Stem	s over W	eight Colu	imns			Appr	oximate W	leights, Po	ounds
	1					1.11		Code	Stems	
	Nominal I Inch	Diameter		Dime	ensions, In	ches	Alip	Alos	Alut	Aman
Code Terminal			Class				3-Way E	Branches	4-Way B	Branches
	A	В		H	J	I	2 Bells	3 Bells	3 Bells	4 Bells
igand	36	24	DA	23	38	29	4511	4366	5307	5161
icell	36	30	B	26	43	20	3504	3438	1325	4170
icet	36	30	č	26	43	20	4248	4055	5110	4047
illus	36	30	D	26	43	20	5160	4018	6102	5050
iculo	36	36	Ā	20	45	20	3067	2046	3530	3418
				- ,	4.		5001	-940	5559	5410
iaba	36	36	В	29	46	29	4046	3891	4956	4800
illa	36	36	C	29	46	29	4788	4595	5867	5673
itude	36	36	D	29	46	29	5810	5567	7099	6857
irem	42	12	A	16	28	30	2507	2577	3467	3537
icar	42	12	В	16	28	30	2670	2889	3131	3170
ieben	42	12	C	16	28	30	3478	3507	3830	3860
	REPUBLIC						-			
itio	42	12	D	16	28	30	3971	3989	4307	4325
idous	42	14	A	18	30	32	2671	2739	2942	3010
igra	42	14	В	18	30	32	3075	3114	3400	3440
ilan	42	14	C	18	30	32	3747	3776	4147	4177
iferos	42	14	D	18	30	32	4590	4609	5288	5306
ibus	42	16	A	19	31	32	2778	2846	3080	3148
icant	12	16	B	TO	21	22	2106	2225	2552	2502
idity	40	16	Č	IO	21	32	2801	3235	3332 A325	4354
itivo	40	16	D	IO	21	32	4754	4772	43#5	4354
ista	42	18	A	20	34	32	2050	2041	3268	3258
idum	4-	18	B	20	34	32	2407	2257	3704	3744
itant	42	18	č	20	34	32	4303	4312	5108	5028
	4-				54	3-	4393	43	5200	5020
ilage	42	18	D	20	34	32	5049	4939	5819	5709
icolea	42	20	A	21	36	32	3104	3056	3459	3411
iches	42	20	В	21	36	32	3582	3486	4009	3913
kem	42	20	C	21	36	32	4615	4479	5387	5251
kunger	42	20	D	21	- 36	32	5297	5123	6122	5948
linos	42	24	A	23	38	32	3314	3266	3724	3676
linu	10		P			20	28-2	0756	1270	1071
lock	42	24	C	23	30	32	3052	3750	4370	4274
lock	42	24	D	23	30	34	4905	4029	5000	5/30
lard	42	24	A	23	30	32	5709	5535	0579	0405
lake	42	30	B	20	43	32	3079	3553	4144	4010
аке	41	30	D	20	43	34	4554	4370	5410	5230
lamie	42	30	С	26	43	32	5649	5402	6675	6428
lante	43	30	D	26	43	32	6561	6258	7720	7426
lapel	42	36	A	29	46	32	4076	3950	4705	4579
laret	42	36	В	20	46	32	4903	4718	5845	5659
laron	42	36	С	29	46	32	6150	5904	7261	7015
			D					(00	0	0
latesi	42	30	D	29	40	32	7187	0884	8512	8209
leaba	42	42	A	32	49	32	4393	4207	5109	4983
leam	42	42	B	32	49	32	5533	5348	0041	0455
neu	42	42	C	32	49	32	7001	0755	8392	8140
leat	42	42	D	32	49	32	8158	7855	9803	9500
			-				-		1	

# Standard Special Castings for Water TABLE NO. 14—Continued. Standard Branches

Large diameter tees and crosses with ribs, or with ribs and bolted through flats when required. See page 51. L-1105 All weights are approximate.

# Standard Special Castings for Water

# TABLE No. 14-Continued. Standard Branches

	Code Ste	ms over W	eight Col	umns			Appr	oximate V	Veights, P	ounds
							-	Code	Stems	
	Nominal	l Diameter ches	1000	Dim	ensions, I	nches	Alip	Alos	Alut	Aman
Code Terminal		1	Class				3-Way	Branches	4-Way	Branches
	A	В		Н	J	I	2 Bells	3 Bells	3 Bells	4 Bells
libe	· 48	12 12	A B	17	29 29	33	3266	3319	3653	3707
low	. 48	12	С	17	29	33	4510	4576	4940	5007
loto	. 48	12	D	17	29	33	5564	5624	6376	6436
lear	. 48	14	A	18	30	35	3422	3476	3762	3815
lest	48	14	B	18	30	35	4173	4226	4836	4889
lita	. 48	14	С	18	30	35	4965	5030	5712	5778
lobe	. 48	14	D	18	30	35	5754	5815	6596	6656
nary	. 48	16	A	19	31	35	3565	3619	3947	4001
nois	. 48	16	B	19	31	35	4046	4098	4466	4519
nuse	. 48	10	D	19	31	35	5055	5121	5755	5821
nade	. 48	10	D	19	31	35	5907	0028	0500	6921
nion	. 48	18	A	20	34	35	3775	3729	4166	4120
nelz	. 48	18	В	20	34	35	4287	4225	4718	4655
nera	. 48	18	C	20	34	35	5479	5407	6328	6256
onbius	- 48	18	D	20	34	35	6328	6227	7259	7158
ovia	. 40	20	R	21	30	35	3950	3800	4378	4282
Uvia	. 40	20	D	21	30	35	4500	4300	4973	4053
opiro	. 48	20	С	21	36	35	5745	5604	6652	6511
oten	. 48	20	D	21	36	35	6607	6425	7574	7392
orgen	- 48	24	A	23	38	35	4221	4125	4706	4609
olare	- 43	24	D C	23	38	35	5028	4908	5795	5078
onnie	40	24	Ď	23	30	35	7064	6882	72/2	7812
	. 40	~4	2	-3	30	35	1004	0002	7994	1012
orios	- 48	30	A	26	43	35	4748	4553	5361	5166
01105	. 48	30	B	26	43	35	5685	5451	6653	6418
occla	. 45	30	D	20	43	35	7042	0702	8205	7985
oltoe	40	26	A	20	43	35	5150	1052	-9303	5900
ocol	48	36	B	20	40	35	6322	6088	7382	7148
onot			C						0	
obes	. 48	30	D	29	40	35	7003	7323	8915	8635
ocet	. 40	12	A	29	40	35	5502	5307	6266	6060
omen .	. 48	12	B	32	49	35	6821	6587	7073	7730
ofer	. 48	42	C	32	49	35	8278	7999	9750	9470
odie		10	D		10		0.644			*****
tigah	40	42	A	32	49	35	9044	9301	7012	6816
toris	. 48	40	B	35	52	35	7650	7.12.1	0076	88.17
tras	. 48	48	č	35	52	35	0220	8050	11006	10726
trud	. 48	48	D*	35	52	35		10-		
						00				

Large diameter tees and crosses with ribs, or with ribs and bolted through flats, or made in steel. See page 51. L-1105 \* Made in steel.

All weights are approximate.

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# Standard Special Castings for Water



TABLE No. 15. Standard Base Tees

	No	m'l am.						Approx. Pou	Weight		No	m'l am.						Approx. Pou	Weight
Code Terminal	Inc	hes	Clas	1	s	'n	h	2 Bells	3 Bells	Code Terminal	Inc	hes	Class	1	.s	р	h	2 Bells	3 Bells
	e	f	-					Code Amep	Code Amis		е	f						Code Amep	Code Amis
arent .	3	3	D	10	22	IO	4.50	104	106	acibus .	16	6	D	17	20	17	13.00	1021	008
aca	4	3	D	II	23	II	5.50	139	138	alite	16	8	В	17	29	17	13.00	864	859
ame	4	4	D	II	23	II	5.50	143	146	atima .	16	8	D	17	29	17	13.00	1050	1027
alizo	6	3	D	12	24	12	6.50	205	202	andos .	16	IO	B	17	29	17	13.00	879	874
aras	0	4	D	12	24	12	0.50	217	215	baria	10	10	D	17	29	17	13.00	1091	1068
atore	0	0	D	12	24	12	0.50	235	232	Darot .	10	12	D	17	29	17	13.00	904	899
anha	8	4	D	13	25	13	7.50	318	311	basan .	16	12	D	17	20	17	13.00	1103	1080
atico	8	6	D	13	25	13	7.50	334	326	basse .	16	14	B	IT	20	17	13.00	014	000
avel	8	8	D	13	25	13	7.50	357	350	bara	16	14	D	17	20	17	13.00	1122	1000
afft	IO	4	D	14	26	14	9.00	435	417	beran .	16	16	В	17	29	17	13.00	948	946
anion .	10	6	D	14	26	14	9.00	450	431	bevel .	16	16	D	17	29	17	13.00	1123	1120
anis	10	8	D	14	20	14	9.00	468	450	bero	18	4	В	18	30	18	14.00	1035	1030
arca	10	10	D	TA	26	7.4	0.00	102	474	hing	78		D	- 8	20		** 00	1000	1007
aclie	12	1	D	15	27	15	10.00	506	568	biam	18	6	B	10	30	10	14.00	1233	1207
amus .	12	6	D	15	27	15	10,00	600	581	biolan .	18	6	D	18	30	18	14.00	1245	1222
atum .	12	8	D	15	27	15	10.00	625	597	biate	18	8	В	18	30	18	14.00	1060	1055
acho	12	IO	D	15	27	15	10.00	642	614	bione .	18	8	D	18	30	18	14.00	1280	1254
aril	12	12	D	15	27	15	10.00	663	635	bonca .	18	IO	В	18	30	18	14.00	1075	1070
abunt .	14	4	В	16	28	16	12.00	661	656	bolla	18	IO	D	18	30	18	14.00	1318	1202
anclum	14	4	D	16	28	16	12.00	790	764	brona .	18	12	В	18	30	18	14.00	1005	1000
atur	14	6	В	16	28	16	12.00	676	671	begi	18	12	D	18	30	18	14.00	1355	1329
avero .	14	6	D	16	28	16	12.00	018	784	belag .	18	14	B	18	30	18	14.00	1105	1100
arizo	14	8	в	10	28	10	12.00	091	080	belas	18	14	D	18	30	18	14.00	1363	1337
averi.	14	8	D	16	28	16	12.00	838	812	belge	18	16	В	IS	30	18	14.00	1135	1130
arate	14	IO	В	16	28	16	12.00	711	701	balk	18	16	D	18	30	18	14.00	1388	1362
atorem.	14	10	D	16	28	16	12.00	855	829	bell	IS	18	В	18	30	18	14.00	1175	1169
anos	14	12	В	16	28	16	12.00	736	726	belon .	18	18	D	18	30	18	14.00	1450	1424
abor	14	12	D	16	28	16	12.00	874	848	belrod .	20	4	В	19	31	19	15.00	1275	1265
abaris .	14	14	В	16	28	16	12.00	751	745	benk	20	4	D	IQ	31	IQ	15.00	1524	1500
acity	14	14	D	16	28	16	12.00	926	900	beure .	20	6	В	10	31	10	15.00	1282	1272
arage .	16	4	В	17	29	17	13.00	834	829	berd	20	6	D	19	31	19	15.00	1540	1516
agno	16	4	D	17	29	17	13.00	894	889	biene .	20	8	В	91	31	19	15.00	1297	1287
avate .	16	6	В	17	29	17	13.00	849	844	bill	20	S	D	19	31	19	15.00	1564	1540
	-		-	-	-				_		-	-		-					
All wei	ghts	are	appr	oxin	iate.														L- 5220

L- 5229

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# Standard Special Castings for Water

TABLE No. 15-Continued. Standard Base Tees

	Nor Dia	n'l m.						Approx. Pou	Weight		No	m'l						Approx. Pou	Weight
Code Terminal	Incl	nes	Class	1	s	р	h	2 Bells	3 Bells	Code Terminal	Inc	hes	Class	1	s	р	h	2 Bells	3 Bells
	е	f						Code Amep	Code Amis		е	f						Code Amep	Code Amis
binal bini bio biros	20 20 20 20	10 10 12	B D B D	19 19 19	31 31 31 31	19 19 19	15.00 15.00 15.00	1307 1604 1327 1610	1297 1579 1317 1615	dangis . darb dobs	30 30 30	14 14 14	A B C D	18 18 18	30 30 30	26 26 26	21.00 21.00 21.00	2499 2757 3111	2527 2741 3092
brito brom .	20 20	14 14	B D	19 19	31 31	19 19	15.00 15.00	1332 1694	1322 1670	dort dolt	30 30	16 16	A B	19 19	31 31	26 26	21.00 21.00	2600 2851	2627 2835
buron . borol . bucu bonne . bril bunt	20 20 20 20 20 20 20	16 16 18 18 20 20	B B D B D D	19 19 19 19 19 19	31 31 31 31 31 -31 31	19 19 19 19 19	15.00 15.00 15.00 15.00 15.00 15.00	1362 1699 1387 1717 1429 1814	1352 1675 1377 1693 1422 1790	dean dique . dering . dellos . ebam . entib	30 30 30 30 30 30	16 16 18 18 18 18	C D A B C D	19 19 20 20 20 20	31 31 34 34 34 34	26 26 26 26 26 26	21.00 21.00 21.00 21.00 21.00 21.00	3224 3644 2709 2996 3386 3757	3205 3630 2693 2928 3305 3743
back biolus . buls berto . borne . card	24 24 24 24 24 24 24	6 6 8 8 10 10	B D B D B D	21 21 21 21 21 21 21	33 33 33 33 33 33	21 21 21 21 21 21 21	17.50 17.50 17.50 17.50 17.50 17.50 17.50	1783 2144 1797 2171 1815 2206	1763 2111 1777 2138 1795 2173	entls eola erem etorl etra etros	30 30 30 30 30 30	20 20 20 20 24 24 24	A B C D A B	21 21 21 21 23 23	36 36 36 36 38 38	26 26 26 26 26 26	21.00 21.00 21.00 21.00 21.00 21.00	2809 3134 3619 3993 2931 3265	2770 3040 3507 3873 2892 3171
cana carlo cape cift clre dea	24 24 24 24 24 24 24	12 12 14 14 16 16	B D B D B D D	21 21 21 21 21 21 21 21	33 33 33 33 33 33 33	21 21 21 21 21 21 21	17.50 17.50 17.50 17.50 17.50 17.50	1836 2242 1876 2284 1917 2332	1816 2209 1855 2251 1897 2299	enbin . engo engra . erin ernol . ernu	30 30 30 30 30 30	24 24 30 30 30 30	C D A B C D	23 23 26 26 26 26 26	38 38 43 43 43 43	26 26 26 26 26 26	21.00 21.00 21.00 21.00 21.00 21.00	3799 4242 3164 3551 4262 4802	3688 4122 3081 3405 4089 4612
del deral deros . della dicort . digli	24 24 24 24 24 24 24 24	18 18 20 20 24 24	B D B D B D D	21 21 21 21 21 21 21	33 33 33 33 33 33 33	21 21 21 21 21 21 21	17.50 17.50 17.50 17.50 17.50 17.50	1934 2359 1948 2499 1997 2620	1914 2326 1928 2465 1977 2587	erfen. erish. eone. emaro. ezia. eolum.	36 36 36 36 36 36	8 8 8 8 10 10	A B C D A B	14 14 14 14 15 15	26 26 26 26 27 27	27 27 27 27 27 27 27	24.50 24.50 24.50 24.50 24.50 24.50 24.50	3236 3540 3906 4265 3295 3613	3262 3558 3918 4265 3320 3632
donia . dongo . dorum . dabam . dage dame .	30 30 30 30 30 30 30	6 6 6 8 8	A B C D A B	13 13 13 13 14 14	25 25 25 25 26 26	24 24 24 24 24 24 24	21.00 21.00 21.00 21.00 21.00 21.00	2224 2385 2645 2886 2270 2434	2252 2369 2625 2872 2298 2418	emle etten . elazo estro esta erata	36 36 36 36 36 36	10 10 12 12 12 12	C D A B C D	15 15 16 16 16	27 27 28 28 28 28	27 27 27 27 27 27 27	24.50 24.50 24.50 24.50 24.50 24.50	4019 4388 3369 3704 4129 4517	4031 4387 3394 3723 4141 4518
daria dast dean delag dilas	30 30 30 30 30	8 8 10 10 10	C D A B C	14 14 15 15	26 26 27 27 27	24 24 24 24 24 24	21.00 21.00 21.00 21.00 21.00 21.00	2717 2956 2321 2490 2809	2697 2942 2348 2473 2789	erolla . erlate . erala escos . ebas	36 36 36 36 36	14 14 14 14 16	A B C D A	18 18 18 18 18	30 30 30 30 31	29 29 29 29 29 29	24.50 24.50 24.50 24.50 24.50 24.50	3524 3900 4357 4955 3620	3550 3918 4368 4955 3645
dulf deur dra dalt dade	30 30 30 30 30	IO I2 I2 I2 I2 I2	D A B C D	15 15 15 15	27 27 27 27 27 27	24 24 24 24 24 24	21.00 21.00 21.00 21.00 21.00 21.00	3060 2347 2507 2863 3106	3046 2372 2492 2843 3092	ently . fod firm form falcon .	36 36 36 36 36	16 16 16 18 18	B C D A B	19 19 19 20 20	31 31 31 34 34	29 29 29 29 29	24.50 24.50 24.50 24.50 24.50 24.50	4006 4488 5103 3764 4186	4025 4499 5102 3731 4135

Large diameter tees ribbed (and bolted). See page  $_{\rm 5r.}$  All weights are approximate.

L-5229

				Та	BLI	e N	. I	5—C	ontinu	ed. Sta	nda	ard	Ba	se	Te	es			
	No Die	:n'l .m.	ž					Approx. Pou	Weight		No	m'l	×					Approx. Pou	Weight
Terminal	Ine	hes	Clas	1	*	р	h	2 Bells	3 Bells	Code Terminal	Inc	hes	Class	1	54	р	h	2 Bells	3 Bells
	e	(						Code Amep	Code Amis		e	E						Code Amep	Code Amis
faut	36 36 36 36 36 36	18 18 20 20 20 20	C D A B C D	20 20 21 21 21 21 21 21	34 34 36 36 36 36	29 29 29 29 29 29	24.50 24.50 24.50 24.50 24.50 24.50 24.50	4691 5337 3894 4370 5022 5535	4621 5240 3831 4285 4911 5390	iaret iaron iatesi . leaba ieam ileu	42 42 42 42 42 42 42	36 36 36 42 42 42	B C D A B C	29 29 29 32 32 32	46 46 49 49 49	32 32 32 32 32 32 32	28.00 28.00 28.00 28.00 28.00 28.00 28.00	7106 \$353 9390 6596 7736 9204	6921 8107 9087 6470 7551 8958
igab igadu igam igand igar icell	36 36 36 36 36 36	24 24 24 30 30	A B C D A B	23 23 23 23 26 26	38 38 38 38 43 43	29 29 29 29 29 29	24.50 24.50 24.50 24.50 24.50 24.50 24.50	3936 4584 5291 5996 4315 5079	3998 4499 5180 5851 4193 4923	ieat Ilbe Ieau Iow Ioto Iear	42 48 48 48 48 48 48 48	42 12 12 12 12 12 12 14	D A B C D A	32 17 17 17 17 18	49 29 29 29 29 30	32 33 33 33 33 35	28.00 31.50 31.50 31.50 31.50 31.50 31.50	10361 6361 6847 7605 8659 6517	10058 6414 6899 7671 8719 6571
icet Illus iculo iaba Illa itude irem	36 36 36 36 36 36 42	30 30 36 36 36 36 12	C D A B C D A	26 26 29 29 29 29 16	43 43 46 46 46 46 46 28	29 29 29 29 29 29 29 30	24.50 24.50 24.50 24.50 24.50 24.50 24.50 28.00	5733 6645 4552 5531 6273 7295 4710	5540 6403 4431 5376 6080 7052 4780	lest lita lobe nary nols nuse nade	48 48 48 48 48 48 48 48	14 14 14 16 16 16	B D A B C D	18 18 19 19 19 19	30 30 31 31 31 31 31	35 35 35 35 35 35 35 35	31.50 31.50 31.50 31.50 31.50 31.50 31.50 31.50	7268 8060 8849 6660 7141 8150 9062	7321 8125 8910 6714 7193 8216 9123
icar . ieben . itio . idous . igra . ilan . iferos .	42 42 42 42 42 42 42 42 42	12 12 12 14 14 14	B C D A B C D	16 16 16 18 18 18 18	28 25 30 30 30 30	30 30 32 32 32 32 32	28.00 28.00 28.00 28.00 28.00 28.00 28.00 28.00	4873 5681 6174 4874 5278 5950 6793	5092 5710 6192 4942 5317 5979 6812	nion neiz nera oubius . oster ovia opiro	48 45 48 48 48 48 48 48 48	18 18 18 20 20 20	A B C D A B C	20 20 20 21 21 21 21	34 34 34 36 36 36	35 35 35 35 35 35 35 35	31.50 31.50 31.50 31.50 31.50 31.50 31.50 31.50	6870 7382 8574 9423 7051 7595 8840	6824 7320 8502 9322 6955 7475 8699
lbus icant idity itivo ista idum . itant	42 42 42 42 42 42 42 42 42 42	16 16 16 16 18 18 18	A B C D A B C	19 19 19 20 20 20	31 31 31 31 34 34 34	32 32 32 32 32 32 32 32 32	28.00 25.00 28.00 28.00 28.00 28.00 28.00 28.00	4981 5399 6094 6957 5153 5610 6596	5049 5438 6123 6975 5144 5560 6515	oten orgen . olare . onnie . orlos . ollos .	48 48 48 48 48 48 48 48	20 24 24 24 24 24 30 30	D A B C D A B	21 23 23 23 23 23 26 26	36 38 38 38 38 43 43	35 35 35 35 35 35 35 35	31.50 31.50 31.50 31.50 31.50 31.50 31.50 31.50	9702 7316 8123 9288 10159 7843 8780	9520 7220 8003 9147 9977 7648 8546
llage . icolea . iches . kem . kunger . llnos . llnu .	42 42 42 42 42 42 42 42 42	18 20 20 20 20 20 24 24	D A B C D A B	20 21 21 21 21 21 23 23	34 36 36 36 36 38 38	32 32 32 32 32 32 32 32 32	25.00 25.00 25.00 25.00 25.00 25.00 25.00	7252 5307 5785 6818 7500 5517 6055	7142 5259 5689 6682 7326 5469 5959	orium . occia oltoe ocol onet obes ocet	48 48 48 48 48 48 48 48	30 36 36 36 36 36 42	C D A B C D A	26 26 29 29 29 29 29 32	43 43 46 46 46 46 46 49	35 35 35 35 35 35 35 35	31.50 31.50 31.50 31.50 31.50 31.50 31.50 31.50	10137 11146 8245 9417 10698 11925 8598	9857 10803 8048 9183 10418 11582 8402
lock lack lard lake lamie . lante lapel	42 42 42 42 42 42 42 42 42 42 42	24 24 30 30 30 30 30	C D A B C D A	23 23 26 26 26 26 26 29	38 38 43 43 43 43 43 46	32 32 32 32 32 32 32 32	28.00 25.00 25.00 25.00 25.00 28.00 28.00 28.00	7168 7912 5582 6757 7852 8764 6279	7032 7738 5756 6573 7605 8461 6153	omen . ofer . odis . tigab . toris . tras . trud .	48 48 48 48 48 48 48 48	42 42 42 48 48 48 48 48	B C D A B C D*	32 32 35 35 35 35 35	49 49 49 52 52 52 52	35 35 35 35 35 35 35	31.50 31.50 31.50 31.50 31.50 31.50 31.50 31.50	9916 11373 12739 9138 10754 12324	9682 11094 12396 8941 10519 12045

Standard Special Castings for Water

Large diameter tees ribbed (and bolted). See page 51. All weights are approximate. \* Made in steel.

1-5229



Standard Special Castings for Water



Standard	Y	Branc	hes,	Type :	
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TABLE No. 16. Code Word, Amot

Code	Nominal Diam., Inche	s Class	s	D	v	w	n	r	Thic	kness, In	ches	Approx. Weight
Terminal	e f								t	t <sub>2</sub>	t3	Pounds
aril	12     12       14     14       16     16       18     18       20     20	D B D B D B B B	16.0 16.0 17.0 17.0 18.0 18.0 18.0 18.0	21.50 24.00 27.50 27.50 30.00 30.00 34.00	8.00 9.0 9.0 10.50 10.50 12.0 12.0 13.50	9.79 11.30 11.30 13.00 13.00 14.70 14.70 14.70 16.40	1.17 1.08 1.32 1.12 1.39 1.17 1.46 1.26	30 30 30 30 30 30 30 30 30	•75 •66 •82 •70 •89 •75 •96 •80	1.08 .99 1.22 1.03 1.29 1.08 1.36 1.16	-75 -66 .82 -70 -89 -75 -96 -80	687 738 894 942 1275 1266 1607 1635
bunt deros della decort digli etra etros enbin	20     20       24     20       24     20       24     24       24     24       30     24       30     24       30     24       30     24	D B D A B C	18.0 12.00 12.00 18.00 18.00 12.00 12.00 12.00	34.00 34.00 38.00 38.00 38.00 38.00 38.00 38.00	$13.50 \\ 13.50 \\ 13.50 \\ 15.25 \\ 15.2$	16.40 16.40 16.30 19.30 19.30 19.30 19.30 19.30	1.57 1.26 1.57 1.36 1.75 1.36 1.36 1.36 1.75	30 30 30 30 30 30 30 30	1.03 .89 1.16 .89 1.16 .88 1.03 1.20	1.46 1.16 1.46 1.26 1.63 1.26 1.26 1.63	1.03 .80 1.03 .89 1.16 .89 .89 1.16	2296 1663 2393 2300 2957 2171 2217 2717
engs engra erin ernol ernu igar icell	30     24       30     30       30     30       30     30       30     30       30     30       36     30       36     30       36     30       36     30	D A B C D A B C	12.00 18.00 18.00 18.00 18.00 10.00 10.00 10.00	38.00 48.00 48.00 48.00 48.00 48.00 48.00 48.00	15.25 18.00 18.00 18.00 18.00 18.00 18.00 18.00	19.30 23.70 23.70 23.70 23.70 23.70 23.70 23.70 23.70	1.75 1.32 1.59 1.88 2.17 1.32 1.59 1.88	30 30 30 30 30 30 30 30	1.37 .88 1.03 1.20 1.37 .99 1.15 1.36	1.63 1.22 1.47 1.74 2.01 1.22 1.47 1.74	1.16 .88 1.03 1.20 1.37 .88 1.03 1.20	2811 3153 3687 4285 4941 3343 3874 4486
lilus iculo iaba illa itude lard lake lamie	36     30       36     36       36     36       36     36       36     36       36     36       42     30       42     30       42     30	D A B C D A B C	10,00 18,00 18,00 18,00 18,00 6,00 6,00	48.00 56.00 56.00 56.00 56.00 48.00 48.00 48.00	18.00 21.00 21.00 21.00 18.00 18.00 18.00	23.70 28.20 28.20 28.20 28.20 23.70 23.70 23.70 23.70	2.17 1.50 1.79 2.13 2.48 1.32 1.59 1.88	30 24 24 24 24 30 30 30	1.58 .99 1.15 1.36 1.58 1.10 1.28 1.54	2.01 1.39 1.66 1.98 2.31 1.22 1.47 1.74	1.37 .99 1.15 1.36 1.58 .88 1.03 1.20	5189 4949 5858 6804 8082 3368 3890 4543
iante lapel laret latesi leaba leam lien	42     30       42     36       42     36       42     36       42     36       42     36       42     36       42     36       42     42       42     42       42     42       42     42       42     42	D A B C D A B C	6.00 10.00 10.00 10.00 10.00 18.00 18.00 18.00	48.00 56.00 56.00 56.00 66.00 66.00 66.00	18.00 21.00 21.00 21.00 21.00 25.00 25.00 25.00	23.70 28.20 28.20 28.20 28.20 28.20 33.10 33.10 33.10	2.17 1.50 1.79 2.13 2.48 1.72 2.05 2.46	30 24 24 24 24 24 24 24 24	1.78 1.10 1.28 1.54 1.78 1.10 1.28 1.54	2.01 1.39 1.66 1.98 2.31 1.60 1.90 2.28	I.37 .99 I.15 I.36 I.58 I.10 I.28 I.54	5241 4904 5789 6761 8025 7394 8417 10377
leat	42     42       48     36       48     36       48     36       48     36       48     36       48     42       48     42       48     42	D A B C D A B C	18.00 2.00 2.00 2.00 2.00 10.00 10.00 10.00	66.00 56.00 56.00 56.00 56.00 66.00 66.00	25.00 21.00 21.00 21.00 21.00 25.00 25.00 25.00	33.10 28.20 28.20 28.20 28.20 33.10 33.10 33.10	2.85 1.50 1.79 2.13 2.48 1.72 2.05 2.46	24 24 24 24 24 24 24 24 24	1.78 1.26 1.42 1.71 1.96 1.26 1.42 1.71	2.64 1.39 1.66 1.98 2.31 1.60 1.99 2.28	1.78 .99 1.15 1.36 1.58 1.10 1.28 1.54	12072 4727 5584 6494 7731 7345 8338 10249
odis tlgat toris tras trud	48 42 48 48 48 48 48 48 48 48 48 48	D A B C D	10.00 18.00 18.00 18.00 18.00	66.00 76.00 76.00 76.00 76.00	25.00 28.00 28.00 28.00 28.00	33.10 37.60 37.60 37.60 37.60	2.85 1.99 2.32 2.78 3.20	24 24 24 24 24 24 24	1.96 1.26 1.42 1.71 1.96	2.64 1.86 2.15 2.57 2.95	1.78 1.26 1.42 1.71 1.96	11924 10200 12132 14716 16965

All weights are approximate.

L-5292



	TABLE	No. 1'	7. 1	Code V	Word,	Amuy
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ame atore avel	e 4	f					VV VV	- 11	*			Weigh
ame atore avel arca	4		12-12-12-12		100				1.5	t <sub>1</sub>	t <sub>2</sub>	Pound
atore avel arca	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	4	D	11.50	10.50	7.18	6.64	2.18	6	.52	.64	103
avel	0	6	D	13.00	13.00	9.27	7.46	3.27	6	.55	.67	181
arca	8	8	D	14.00	16.00	11.85	8.30	3.85	6	.60	.72	291
	IO	IO	D	15.50	18.50	13.94	9.12	4.94	6	.68	.83	434
arii	12	12	D	15.50	21.50	10.54	9.92	4.54	0	.75	.93	632
abaris	14	<b>T4</b>	В	16.00	24.00	18.62	10.76	4.62	6	.66	.84	600
acity	14	14	D	16.00	24.00	18.62	10.76	4.62	6	.82	1.00	985
beran	16	16	В	17.50	31.00	25.20	11.60	5.70	6	.70	1.03	967
bevel	16	16	D	17.50	31.00	25.20	11.60	5.70	6	.89	1.29	1413
bell	18	18	В	18.00	34.00	28.00	12.00	6.00	6	.75	1.12	1358
belon	18	18	D	18.00	34.00	28.00	12.00	6.00	6	.96	1.44	1737
bril	20	20	В	18.75	37.00	30.75	12.50	6.50	6	.80	1.20	1725
bunt	20	20	D	18.75	37.00	30.75	12.50	6.50	6	1.03	1.50	2199
deros	24	20	B	18.75	40.00		*****		6	.89	.80	2203
della	24	20	D	18.75	40.00			****	6	1.16	1.03	3087
dicort	24	24	В -	10.75	42.00				6	.89	.89	2600
digli	24	24	D	19.75	42.00				6	1.16	1.16	3599
etra	30	24	A	17.00	49.50				6	.88	.89	3178
etros	30	24	В	17.00	49.50				6	1.03	.89	3874
engra	30	30	A	22.75	52.50	*****			0	.88	.88	3519
erin	30	30	В	22.75	52.50				6	1.03	1.03	4360
igar	36	30	A	19.75	56.00				6	.99	.88	4338
icell	36	30	B	19.75	56.00				6	1.15	1.03	4425
iculo	36	36	A	24,00	60.00				6	.99	-99	4951
iaba	36	36	B	24.00	60.00				6	1.15	1.15	6509
lard	42	30	A	16.75	63.00				6	1.10	.88	5543
lake	42	30	В	16.75	63.00				6	1.28	1.03	6782
lapel	42	36 -	A	21,00	66.00				6	1.10	.99	6446
laret	42	36	В	21.00	66.00				6	1.28	1.15	7895
leaba	42	42	A	25.25	69.00				-6	1.10	1.10	7501
leam	42	42	В	25.25	69.00				6	1.28	1.28	9163
oltoe	48	36	A	18.00	71.00				6	1.26	.99	7850
ocol	48	36	В	18.00	71.00				6		1.15	9500
ocat		10						1	6	1.42		
omen	40	42	R	22.25	74.00				6	1.20	1.10	9110
tigah	40	42	A	26.29	74.00				6	1.26	1.20	10007
toris	48	48	B	26.50	77.00				6	1.42	1.42	12554

Y Branches, Type 2, for heavier pressure. Classes C and D to special design, but with same laying dimensions. All weights are approximate.



Standard Special Castings for Water

Standard Blow-off Branches



Code Terminal	Nom Dian Inc	ninal neter shes	Class	1	p	Thick Incl	ness	Approx. Weight Pounds	Code Terminal	Non Dian Inc	ninal neter shes	Class	1	р	Thicl	iness hes	Approx. Weight Pounds
	е	f			1	t1	t <sub>2</sub>			e	f				t1	t <sub>2</sub>	
anha . afft . anion . aclie . amus .	8 10 10 12 12	4 4 6 4 6	D D D D D	12 12 12 12 12 12	7 S 8 10 10	.60 .68 .68 .75 .75	.52 .52 .55 .52 .55	227 286 300 365 379	elazo . estro . esta . erate . irem .	36 36 36 36 42	12 12 12 12 12 12	A B C D A	13 13 13 13 13 15	23 23 23 23 23 26	.99 1.15 1.36 1.58 1.10	·75 ·75 ·75 ·75 ·75 ·75	1702 1972 2285 2627 2432
abunt . andum atur . avero . arage .	14 14 14 14 16	4 4 6 6 4	B D D B	12 12 12 12 12 12	11 11 11 11 12	.66 .82 .66 .82 .70	. 52 . 52 . 55 . 55 . 52	400 471 415 486 497	lcar . ieben . itio . ibus . icant .	42 42 42 42 42 42	12 12 12 16 16	B C D A B	15 15 15 15 15	26 26 26 26 26	1.28 1.54 1.78 1.10 1.28	· 75 · 75 · 75 · 75 · 70 · 70	2728 3271 3768 2489 2786
agero . avate . acibus. bero . bias .	16 16 16 18 18	4 6 6 4	D B D B D	12 12 12 12 12 12	12 12 12 13 13	. 89 . 70 . 89 . 75 . 96	.52 .55 .55 .52 .52	597 513 613 586 7°4	idity : itivo : libe : lean : low :	42 42 48 48 48 48	16 16 12 .12 12	C D A B C	15 15 17 17 17	26 26 30 30 30	1.54 1.78 1.26 1.42 1.71	.89 .89 .75 .75 .75	3365 3862 3274 3699 4417
biam . biolan . belrod . benk . beure .	18 18 20 20 20	6 6 4 4 6	B D D B	12 12 12 12 12 12	13 13 14 14 14 14	.75 .96 .80 1.03 .80	•55 •55 •52 •52 •55	603 720 687 850 705	loto . nary . nois . nuse . nade .	48 48 48 48 48 48	12 16 16 16 16	D A B C D	17 17 17 17 17 17	30 30 30 30 30	1.96 1.26 1.42 1.71 1.96	• 75 • 70 • 70 • 89 • 89	5107 3337 3762 4523 5214
berd . back . biolus . bais . berto .	20 24 24 24 24 24	6 6 8 8	D B D B D	12 12 12 12 12	14 16 16 16 16	1.03 .89 1.16 .89 1.16	• 55 • 55 • 55 • 60 • 60	867 916 1149 935 1170	same . sand . sone . sica . sman .	54 54 54 54 54	12 12 12 12 12 16	A B C D A	19 19 19 19 19	33 33 33 33 33 33	1.35 1.55 1.90 2.23 1.35	· 75 · 75 · 75 · 75 · 75 · 70	4287 4945 5981 7002 4355
dage . dame . daria . dast .	30 30 30 30	8 8 8	A B C D	13 13 13 13	20 20 20 20	.88 1.03 1.20 1.37	.60 .60 .60 .60	1269 1382 1616 1867	solie skins sify ulode	54 54 54 60	16 16 16 12	B C D A	19 19 19 21	33 33 33 36	1.55 1.90 2.23 1.39	.70 .89 .89 .75	5013 6096 7126 5263
deur . dra . dalt . dade .	30 30 30 30	I2 I2 I2 I2 I2	A B C D	13 13 13 13	20 20 20 20	.88 1.03 1.20 1.37	· 75 · 75 · 75 · 75	1315 1426 1658 1913	ufre . ufon . udrey . udha .	60 60 60 60	12 12 12 16	B C D A	21 21 21 21 21	36 36 36 36	1.67 2.00 2.38 1.39	• 75 • 75 • 75 • 70	6159 7418 8798 5336
erfen . erish . eone . emaro .	36 36 36 36	8 8 8	A B C D	13 13 13 13	23 23 23 23	.99 1.15 1.36 1.58	.60 .60 .60 .60	1653 1922 2234 2576	ugruf . ukel . ulette .	60 60 60	16 16 16	B C D	21 21 21	36 36 36	1.67 2.00 2.38	.70 .89 .89	6233 7542 8927

All weights are approximate.

L-1100

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Standard Special Castings for Water Standard Blow-off Branches with Manhole TABLE No. 19. Code Stem, Anef





Approximate Weight of Cap, 290 Pounds. Code Stem, Anit

Code Terminal	Nom'l Diam. Inches e f	1 p	n Thicl Inc. $t_1$	Approximate Weight, Lbs.	Code Terminal	Nom'l Diam. Inches e f	Class	1 p	n	Thick Incl	ness hes	Approximate Weight, Lbs.
dage dame daria dat deur deur deur dalt dalt erish erish erish erish enaro enaro enaro enaro estro esta esta esta irem icar icar itivo	30     8     A     B     C       30     8     8     D     A     B     C       30     8     8     D     A     B     C     D     A     B     C     D     A     B     C     D     A     B     C     D     A     B     C     D     A     S     A     B     C     D     A     S     A     A     S     A     A     S     A     S     S     A     S     S     A     S     S     A     S	17     20       17     20       17     20       17     20       17     20       17     20       17     20       17     20       17     20       17     20       17     23       17     23       17     23       17     23       17     23       17     23       17     23       17     23       17     23       17     23       17     23       17     23       17     23       17     23       17     26       17     26       17     26       17     26       17     26	21 .88 21 1.03 21 1.20 21 1.37 21 .87 21 .87 21 .88 21 1.03 21 1.37 24 1.35 24 1.35 24 1.35 24 1.55 24 1.55 27 1.24 27 1.24 27 1.78	-     -	like	4848484848484848484545454545456666666666	A B C D A B C D A B C D A B C D A B C D A B C D A B C D A A B B C D A A B C D A A B B C D A B B B A B B A B B C D A B B B A B B B B B B B B A B B B B B	17     30       17     30       17     30       17     30       17     30       17     30       17     30       17     30       17     30       19     33       19     32       21     36       21     36	30 30 30 30 30 30 30 30 30 30 30 30 30 3	1.26 1.42 1.71 1.96 1.26 1.35 1.35 1.35 1.35 1.35 1.35 1.35 1.35	-75 -75 -75 -70 -70 -89 -75 -75 -75 -75 -75 -75 -75 -75 -75 -75	3391 33803 4497 5167 5167 5167 5167 543866 45274 4390 5032 6039 7033 4458 5100 7033 4458 5100 7157 5357 75230 74610 8810 74610 75357 8810 8429 75357 74610 75357 74610 75357 76230 74610 75357 76230 7630 7630 7630 7630 7630 7630 7630 76

L-1100

# Standard Manhole Pipe TABLE No. 20. Code Stem, Anov



Standard Manhole Pipe

Approximate Weight of Cap, 290 Pounds Code Stem, Anit

Code Terminal	Nom'l Diam. Inches	Class	n	t	Weight Pounds	Code Terminal	Nom'l Diam. Inches	Class	n	t	Weight Pounds
enlis . eola . etori . gramos gareo . gesa . infer . icolea . icolea . kem . kunger .	30 30 30 36 56 56 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	A B C D A B C D A B C D	21 21 21 24 24 24 24 24 27 27 27 27	.88 1.03 1.20 1.37 .99 1.15 1.36 1.58 1.50 1.28 1.54 1.78	1536 1711 1973 2245 1953 2260 2614 3012 2535 2869 3445 3971	ostet . ovia . opiro . ster . stien . sier . uisti . udas . utor . urist .	48 48 48 48 54 54 54 54 56 66 60 60	A B C D A B C D A B C D	30 30 30 33 33 33 35 56 56 36	1.26 1.42 1.71 1.96 1.35 1.55 1.90 2.23 1.39 1.67 2.00 2.38	3194 3610 4292 4968 4006 4598 5578 6522 4750 5606 6720 7959

L-1100

 $l\!=\!17$  inches on 30 inches to 48 inches; 19 inches on 54 inches; 21 inches on 60 inches diameter.

All weights are approximate.



anis 18 IO 8 .68 D .60 170 aclie 12 4 18 .75 . 52 D 163 amus IS 6 ·75 ·75 12 D 181 .55 atum 12 8 18 .60 D 202 acho 12 10 18 .68 D .75 229 atur 14 6 20 .66 .55 В 194 avero 14 6 20 .82 . 55 D 234 . arizo 14 8 20 ,66 .60 В 220 averi 8 D 14 20 .82 . 60 260 .

18

18

18

All weights are approximate. On all sizes s=8 inches.

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6

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anion

afft

288 L-1102

143

146

160

198

179

202

23I

261

216

256

248

.60

.68

.68

.55

. 52

.55

D

D

D

121

131

150

150

162

180

201

201

218

240

267

249 288

275


## Standard Special Castings for Water Standard Reducers and Increasers, Type No. 2 TABLE No. 22—Continued

				Code S	stems over V	Weight Col	umns			W	eights, Pour	nds
		117		Nominal	Diameter		Thie	kness			Code Stems	
T	Code	e nal		Inc	enes	v	Inc	nes	Class	Apob	Asat	Asib
				e	f		tı	t <sub>2</sub>		Spigot Ends	Large End Bell	Small End Bel
irate				14	IO	20	.66	.68	В	250	305	279
atorem				14	IO	20	.82	.68	D	290	344	320
nos				14	12	20	.66	.75	В	284	339	321
kor				14	12	20	.82	.75	D	324	378	360
ivate				16	6	20	.70	.55	В	226	. 300	248
acibus				16	6	20	.So	.55	D	278	355	300
alite				16	S	20	.70	.60	В	252	326	280
atima	•		• •	16	8	20	.89	.60	D	304	381	332
indos				16	10	20	.70	.68	В	282	356	312
barla				16	IO	20	.89	.68	D	334	410	364
parot				16	12	20	.70	.75	В	317	391	353
basan				16	12	20	.89	.75	D	368	445	405
basse				16	14	20	.70	.66	В	315	389	370
bara				16	14	20	.89	.82	D	407	484	461
biate				18	8	20	.75	.60	В	287	374	315
bione		•	• •	18	8	20	.96	.60	D	345	438	373
anea				18	IO	20	.75	.68	В	317	404	347
olla				18	10	20	.96	.68	D	375	468	405
orona				18	12	20	.75	.75	В	352	438	388
begi				18	12	20	.96	.75	D	410	502	446
belag				18	14	20	- 75	.66	В	350	437	406
belas				18	14	20	.96	.82	D	448	541	502
belge				18	16	20	.75	.70	В	383	469	457
balk	•	•	• •	18	16	20	96	.89	D	492	585	569
oinal				20	10	26	.80	.68	В	414	516	445
ini				20	IO	20	1.03	.68	D	499	015	529
010	•	*	:	20	12	20	.80	.75	B	455	550	491
DIFOS		•	• •	20	12	20	1.03	.75	D	539	050	570
orito	*		• •	20	14	20	.80	.00	B	453	554	508
orom	•	•	• •	20	14	20	1.03	.82	D	583	700	038
oroi				20 20	10 16	26	.80 1.03	.70 .89	D	490 635	592 751	504
JUCH				20	18	26	80	75	В	531	633	617
bonne				20	18	26	1.03	.06	D	683	800	776
cape				24	IA	26	.80	66	B	552	680	607
ift				21	IA	26	1.16	.82	D	710	866	764
ire		-	-	24	16	26	.80	.70	В	580	717	663
lea		57		24 .	16	26	1.16	.80	D	762	917	838
lel				24	18	26	.80	.75	В	630	758	717
leral				24	18	26	1.16	.96	D	810	965	901
leros				24	20	26	.89	.80	В	675	803	776
lella	-			24	20	26	1.16	I.03	D	871-	1027	987
lering				30	18	26	.88	.75	A	710	903	796
dellos				30	18	26	1.03	.75	В	791	969	878
ebam				30	18	26	I.20	.96	С	956	1166	1048
entib				30	18	26	I.37	.96	D	1054	1305	1146
antic				30	20	26	.88	.80	A	754	0.47	856

#### CAST UNITED STATES IRON PIPE AND FOUNDRY COMPANY



#### TABLE No. 22-Continued

	Code Stem	is over Weight	Columns			W	eights, Pour	nds
	Nominal Dia	meter	Thic	kness			Code Stems	5
Code	Inches	v	Inc	hes	Class	Apob	Asat	Asib
	e	f	tı	t <sub>2</sub>		Spigot Ends	Large End Bell	Small End Bell
eola	30 30 30 30 30 30 30 30 30	20         26           20         26           20         26           20         66           20         66           20         66           20         66           20         66           20         66           24         26	1.03 1.20 1.37 .88 1.03 1.20 1.37 .88	.80 1.03 1.03 .80 .80 1.03 1.03 1.03 .89	B C D A B C D A	836 1018 1115 1468 1626 1981 2172 854	1014 1227 1366 1661 1804 2190 2423 1047	937 1134 1232 1569 1728 2098 2289 981
etros	30 30 30 30 30 30 30 30 36 36 36 36	24         26           24         26           24         26           24         26           24         66           24         66           24         66           24         66           20         32           20         32	I.03 I.20 I.37 .88 I.03 I.20 I.37 .99 I.15 I.36	.89 1.16 1.16 .89 .89 1.16 1.16 .80 .80 1.03	B C D A B C D A B C	935 1144 1242 1661 1820 2228 2419 1039 1170 1417	1113 1354 1493 1921 1998 2438 2670 1286 1450 1739	1063 1300 1398 1869 1946 2384 2575 1141 1272 1534
eseos	36 36 36 36 36 36 36 36 36 36 36 36 36 3	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	I.58 .99 I.15 I.36 I.58 .99 I.15 I.36 I.58 .99 I.15 I.36 I.58 .99 I.15	1.03 .80 .80 1.03 1.03 .89 .89 1.16 1.16 .89 .89 1.16 1.16 1.16 .88 1.03	D A B C D A B C D A B C D A B B	1589 1771 1994 2416 2710 1153 1283 *1562 1734 1964 2188 2664 2957 1243 1467	1951 2018 2274 2738 3072 1339 1564 1884 2096 2211 2468 2985 3319 1490 1747	1705 1872 2095 2533 2827 1280 1411 1718 1890 2091 2314 2820 3113 1436 1645
eunt ete	36 36	30 32 30 32	1.36 1.58	I.20 I.37	C D	1730 2013	2051 2375	1939 2264

All weights are approximate. On all sizes s=8 inches. See cuts on pages 68 and 73.

L-1102

## Standard Special Castings for Water Standard Reducers and Increasers, Type No. 2 TABLE No. 22—Continued

				-				1		1			
	Co	de			Nominal Inc	Diameter hes		Thic	kness hes		Apob	Asat	Asib
T	ſerm	inal			e	f	v	tı	t <sub>2</sub>	Class	Spigot Ends	Large End Bell	Small End Be
SSP					26	30	66		80	A	2110	2266	2212
s					36	30	66	1.15	1.03	B	2502	2783	2680
ro		-	-	1	36	30	66	1.36	1.09	Č	2050	3271	3150
re					36	30	66	1.58	1.37	D	3434	3706	3684
xre		1.5	23		42	20	32	I.10	.80	A	1262	1602	1364
men					42	20	32	1.28	.80	B	1413	1768	1515
sen					42	20	32	1.54	1.03	C	1753	2168	1860
nno		•		-	42	20	32	1.78	1.03	D	1975	2445	2092
ppe					42	20	66	1.10	.80	A	2152	2491	2254
ker					42	20	66	1.28	.80	B	2410	2764	2511
rie				1.4	42	20	66	1.54	1.03	C	2989	3405	3106
rst					. 42	20	66	1.78	1.03	D	3369	3839	3486
rve					42	24	32	I.IO	.89	A	1376	1715	1504
a					42	24	32	1.28	.89	B	1527	1881	1654
vas					42	24	32	1.54	1.16	C	1898	2313	2053
vez	•	•	•		42	24	32	1.78	1.16	D	2120	2590	2276
i					42	24	66	1.10	.89	A	2346	2685	2472
on				1	42	24	66	1.28	.89	B	2603	2958	2730
ret					42	24	66	1.54	1.16	C	3237	3652	3392
vio	*				42	24	66	1.78	1.16	D	3616	4086	3772
ifer					42	30	32	I.IO	.88	A	1467	1806	1660
ar					42	30	32	1.28	1.03	В	1711	2065	1889
adu			1.00		42	30	32	1.54	1.20	C	2065	2480	2275
am		•	•		42	30	32	1.78	1.37	D	2399	2869	2050
and					42	30	66	I.10	.88	A	2500	2839	2693
ar			•	1.	42	30	00	1.28	1.03	B	2917	3271	3095
all					42	30	00	1.54	1.20	C	3523	3938	3732
et					42	30	00	1.78	1.37	D	4093	4503	4344
lus					42	30	32	1.10	.99	A	1045	1984	1891
ha					42	30	32	1.28	1.15	DC	1920	2281	2207
ude	:	:		:	42 42	30	32 32	1.54	1.30 1.58	D	2320	3184	3076
em				1	12	26	66	1.10		A	2802	3143	3050
ar	-		-		42	36	66	1.28	I.15	B	3285	3630	3565
ben					42	36	66	1.54	1.36	C	3058	4373	4270
io					42	36	66	1.78	1.58	D	4631	5101	4003
ons					48	30	66	1.26	.88	A	2075	3381	3168
ra					48	30	66	I.42	1.03	B	3428	3883	3606
am					48	30	66	I.71	1.20	C	4092	4641	4801
eros				•	48	30	66	1.96	I.37	D	4762	5388	5013
us					48	30	132	1.26	.88	A	5363	5769	5556
ant					48	30	132	I.42	1.03	B	6180	6635	6359
ily					48	30	132	1.71	1,20	C	7379	7928	7588
ivo					48	30	132	1.96	1.37	D	8588	9214	8839
ta					48	36	66	1.26	.99	A	3278	3684	3525
um					48	36	66	1.42	1.15	B	3796	4252	4077
ant					48	36	● 66	1.71	1.36	C	4527	5076	4849

71

## Standard Special Castings for Water Standard Reducers and Increasers, Type No. 2 TABLE No. 22-Continued

		1.01		(D) ( )				Code Stems	
Code Terminal	Nomi	Inches	v	Inc	hes	Class	Apob	Asat	Asib
	e	f		t <sub>1</sub>	t1		Spigot Ends	Large End Beil	Smal End B
ıge	. 48	36	66	1.96	1.58	D	5300	5025	566
olea	. 48	36	132	1.26	.99	A	5909	6316	615
hes	. 48	36	132	I.42	I.15	В	6844	7299	712
it	. 48	36	132	1.71	I.36	С	8164	8713	848
n	- 48	36	132	1.96	1.58	D	9558	10184	992
as	. 48	42	06	1.20	I.10	A	3059	4066	399
se os	· 48 . 48	42 42	66	1.42 1.71	I.28 I.54	C B	4212 5100	4007	450
en	. 18	.12	66	1.06	1.78	D	5050	6585	642
es	. 48	42	132	1.26	I.IO	Ã	6507	7003	603
es	. 48	42	132	1.42	1.28	В	7594	8049	70
ti	. 48	42	132	1.71	I.54	С	9197	9746	961
ns	. 48	42	132	1.96	I.78	D	10747	11373	1121
les	- 54	36	66	1.35	.99	А	3722	4228	396
ns	. 54	36	66	I.55	I.15	B	4330	4925	461
ne	• 54	36	66	1.90	1.36	С	5259	5953	558
na	• 54	36	66	2.23	1.58	D	6181	6995	65.
	• 54	30	132	1.35	.99	R	7806	7210 Stot	8095
7	- 54	30	132	1.55	1.15	C	0181	10178	080
10	5.1	36	132	2 22	1.30	Ď	11148	101/0	900
ai	51	12	66	1.35	T. 10	Ă	1103	1600	44.1
n	. 54	42	66	1.55	1.28	В	4745	5340	510
ck	- 54	42	66	1.90	1.54	C	5832	6526	624
rd	. 54	42	66	2.23	1.78	D	6841	7655	731
ke	. 54	42	132	I.35	I.10	A	7398	7903	773
	• 54	42	132	1.55	1.28	B	8556	9151	891
	• 54	42	132	I.90	I.54	C	10517	II2II	1093
rot	• 54	42	132	2.23	1.78	D	12338	13152	1280
ron	. 54	40	66	1.35	1.20	B	4570	5083	490
esi .	. 54	40	66	I.90	I.7I	C	6401	7095	695
aba	. 54	48	66	2.23	1.96	D	7512	8326	813
am	. 54	48	132	1.35	I.26	A	8253	8759	866
u	. 54	48	132	I.55	I.42	В	9478	10073	993
at	• 54	48	132	1.90	I.7I	С	11544	12239	1209
	. 54	48	132	2.23	1.96	D	13550	14364	1417
1n	. 60	36	66	1.39	.99	A	4096	4711	434
to	. 60	30 36	66	1.07	1.15	C	4900 5867	5570 6692	518
ve .	60	36	66	2 28	т 58	D	6060	7031	720
st	. 60	36	132	1.30	.00	Ā	7384	7000	763
a	. 60	36	132	1.67	1.15	В	8846	9516	012
be	. 60	36	132	2.00	1.36	C	10581	11405	1090
ry	. 60	36	132	2.38	1.58	D	12554	13527	1291
is	. 60	42	66	1.39	I.IO	A	4477	5092	481
ise	. 60	42	66	1.67	P. 28	B	532I	599I	567

> Standard Special Castings for Water Standard Reducers and Increasers, Type No. 2



Short Increaser, 48 to 30 x 66 inches v



	Code Stems over	Weight Col	umns			W	eights, Pour	nds
	Nominal Diameter		Thie	kness	198		Code Stems	
Code Terminal	Inches	v	Inc	hes	Class	Apob	Asat	Asib
	e f		tı	t <sub>2</sub>		Spigot Ends	Large End Bell	Small End Bell
nade nion neiz	60         42           60         42           60         42           60         42	66 66 132	2.00 2.38 1.39	1.54 1.78 1.10	C D A	6440 7619 8072	7264 8593 8687	6855 8089 8411
nera onbius ostet ovia opiro	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	132 132 132 66 66	1.67 2.00 2.38 1.39 1.67	1.28 1.54 1.78 1.26 1.42	D A B	9595 11614 13743 4957 5832	10265 12439 14716 5572 6502	9950 12030 14213 5363 6287
oten orgen ogue olare onnie	60         .48           60         .48           60         .48           60         .48           60         .48           60         .48	66 66 132 132 132	2.00 2.38 1.39 1.67 2.00	1.71 1.96 1.26 1.42 1.71	C D A B C	7006 8285 8938 10517 12634	7830 9259 9552 11187 13458	7555 8910 9344 10972 13183
orlos	60 48 60 54	132 66	2.38 1.39	1.96 1.35	D A	14943 5404	15917 6019	15568 5910
orium	60         54           60         54           60         54           60         54           60         54           60         54           60         54           60         54           60         54	66 66 132 132 132	1.67 2.00 2.38 1.39 1.67 2.00	I.55 I.90 2.23 I.35 I.55 I.90	B C D A B C D	6348 7750 9178 9745 11462 13979	7018 8574 10152 10360 12132 14803	6961 8444 9992 10251 12075 14673
	54	132	2.30	2.23		10557	1/530	1/3/1

All weights are approximate.

On all sizes s=8 inches. See cuts on pages 68 and 70.

L-1102

#### Standard Special Castings for Water

Standard Sleeves



For dimensions a and b see Table No. 1

TABLE No. 23. Code Word, Asoc

Code Terminal	Nom'l Diam. Inches	Class	D	L	т	Approx. Weight Pounds	Code Terminal	Nom'l Diam. Inches	Class	D	L	т	Approx. Weight Pounds
ame andi acet avel ani arca agus arie	4 4 6 8 8 10 10		5.80 5.80 7.90 10.10 10.10 12.20 12.20 14.30	10 15 10 15 12 15 12 15 12 18	.65 .65 .70 .70 .75 .75 .80 .80 .80	47 61 68 87 104 119 123 176	icell icet illus iculo iaba illa itude lapel laret	36 36 36 36 36 36 36 36 42	B C D A B C D A B	39.40 39.80 40.20 39.00 39.40 39.80 40.20 45.30	15 15 15 24 24 24 24 24 15	1.40 1.60 1.80 1.25 1.40 1.60 1.80 1.40	943 1077 1217 1202 1362 1563 1772 1097
asis anos abor abaris	12 14 14 14	D B B D	14.30 16.20 16.20 16.50	18 15 18 15	. 85 .85 .90	223 220 249 240	laroi latesl leaba leam	42 42 42 42	C D A B	46.20 46.70 45.30 45.60	15 15 24 24	1.75 1.95 1.40 1.50	1381 1561 1577 1702
basse bara beran berel belge b	14 16 16 16 16 18	D B D D B	16.50 18.50 18.50 18.90 18.90 20.60	18 15 24 15 24	.90 .90 .90 I.00 I.00	280 274 391 305 443 321	lien leat ocet omen ofer odis	42 42 48 48 48 48 48	C D A B C D	46.20 46.70 51.60 51.90 52.50 53.10	24 24 15 15 15	1.75 1.95 1.50 1.65 1.95 2.20	1997 2262 1337 1481 1752 1986
balk bell belon bucu bonne	18 18 18 20 20	B D B B	20.60 21.00 21.00 22.70 22.70	24 15 24 15 24	.95 1.05 1.05 1.00	462 360 518 374	tigab toris tras trud same	48 48 48 48 51	A B C D A	51.60 51.90 52.50 53.10 57.70	24 24 24 24 24	1.50 1.65 1.95 2.20 1.60	1922 2129 2532 2879 1612
bril bunt deros detta dicort	20 20 24 24 24 24	D D B B D D	23.10 23.10 26.90 26.90 27.40	15 24 15 24 15	1.15 1.15 1.05 1.05 1.25	440 625 477 680 583	sand sone sica sman solie	54 54 54 54 54	B C D A B C	58.20 58.90 59.50 57.70 58.20	15 15 15 24 24	1.80 2.15 2.45 1.60 1.80	1835 2156 2450 2316 2634
etra etros enbin engo	30 30 30 30	A B C D	32.80 33.10 33.50 33.80	15 15 15 15	1.15 1.15 1.32 1.50	648 652 760 876	sify ulode ufre ufou	54 54 60 60	D A B C	59.50 63.90 64.50 65.30	24 15 15	2.45 1.70 1.90 2.25	3571 1906 2127 2491
erin ernol lgar	30 30 30 36	B C D A	32.80 33.10 33.50 33.80 39.00	24 24 24 24 15	1.15 1.15 1.32 1.50 1.25	943 949 1088 1262 833	udrey udha ugruf ukel ulette	60 60 60 60	A B C D	63.90 64.50 65.30 65.90	15 24 24 24 24 24	2.00 1.70 1.90 2.25 2.60	2895 2731 3058 3601 4231

All weights are approximate.

L-5324





# TAP FOR 2" W.I. PIPE

#### Bosses A and B cast on only when so ordered

Code Terminal	Nominal Diam. Inches	Class	d	0	1	t	m	k	r	Approx. Weight Pounds
me	100,000	D	1.00	6.70		60				26
tore	6	D	4.00	7.80		.65				40
ivel	8	D	4.00	10.00		.75				50
irca	10	D	4.00	12.10		.75	1.50	.75	16.20	8t
iril	12	D	4.00	14.20		.75	1.75	.75	18.70	104
abaris	14	B	4.00	16.10		.00	1.90	.75	22.40	140
icity	14	D	4.00	16.45		.00	1.90	.75	22.40	149
beran	16	B	4.00	18.40		1.00	2.00	-75	27.00	183
bevel	16	D	4.00	18.80		1.00	2.00	.75	27.00	198
bell	18	B	4.00	20.50	****	1.00	2.00	1.00	32.00	226
belon	18	D	4.00	20,92		1.00	2,00	1.00	32.90	242
oril	20	B	4.00	22.60		I.00	3.00	I.00	18.20	278
print	20	D	4.00	23.06		1,00	3.00	I.00	18.20	308
licort	24	B	4.00	26.80	2.50	1.05	3.50	1.00	23.50	392
ligei	24	D	4.00	27.32	2.50	1.05	3.50	1.00	23.50	442
ngra	30	A	4.50	32.74	2.62	1.15	3.50	1.15	34.80	589
rin	30	B	4.50	33.00	2.62	1.15	3.50	1.15	34.80	596
rol	30	C	4.50	33.40	2.62	1.15	3.50	1.15	34.80	647
rnu	30	D	4.50	33-74	2.62	1.15	3.50	1.15	34.80	704
culo	36	A	4.50	38.96	3.12	1.25	4.00	1.25	44.00	849
aba	36	B	4.50	39.30	3.12	1.30	3.95	1.25	44.00	918
lla	36	C	4,50	39.70	3.12	1.35	3.90	1.25	44.00	998
tude	36	D	4.50	40.16	3.12	1.40	3.85	1.25	44.00	1084
eaba	42	A -	5.00	45.20	3.37	1.40	4.00	1.40	63.50	1300
eam	42	B	5.00	45.50	3.37	1.50	3.90	1.40	63.50	1388
ien	42	E E	5.00	40.10	3.37	1.00	3.80	1.40	63.50	1539
cat	42	D	5.00	40.58	3.37	1.70	3.70	1.40	03.50	1079
igao	48	A	5.00 .	51.50	3.02	1.70	4.00	1.50	70.50	1772
oris	48	D C	5.00	51.80	3.02	1.90	3.80	1.50	70.50	1943
ras	48	D	5.00	52.40	3.02	2,00	3.70	1.50	70.50	2144
ruu	48	D	5.00	52.98	3.02	2.10	3.00	1.50	70.50	2341
and	54	P	5.50	57.00	3.87	1.90	4.50	1.50	82.00	2329
ing	54	C	5.50	50.10	3.87	2,00	4.40	1.50	82.00	2519
ica	54	Ď	5.50	50.00	3.87	2.10	4.30	1.50	82.00	2770
lade	54	A .	5.50	59.40	3.07	2,20	4.20	1.50	82.00	3000
ifre .	60	R	5.50	61.10	4.12	2.00	4,50	1.50	99.00	2808
fou	60	C	5.50	67.20	4.12	2.10	4.40	1.50	99.00	3082
idrev	60	Ď	5.50	67.80	4.12	2.20	4.30	1.50	99.00	3300
	00		3.30	03.02	4.12	2.30	4.20	1.50	99.00	3007







					51 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1					0.000		1000	0.20	-	-	
-	-	-	Sta	anda	rd Co	ndense	d Sp	pecia	l Ca	stings	for Wa	ter				
4	T	1	-				-	-				1			-	
1	114	A				+	17	-	1-			-	L	4	1	-
	1	-0->					For	401					to	14-0-1		
c	Condens	ed ¼ 1	Bend			Cor	dense	1 1% B	end			Cond	lense	d te E	Bend	
ABLE I	No. 3	5.	Code	e, <b>B</b> i	is TA	BLE N	0. 36	5. (	ode,	, Bod	TABLE	No.	37	. 0	ode	e, Bup
Code Terminal	Nominal Diam. Inches	Class	D R	Approx- imate Weight	spunod Tern	de ninal lauimoN	Inches	0	R	Approx- imate Weight Pounds	Code Terminal	Nominal Diam. Inches	Class	0	R	Approx- mate Weight Pounds
ame atore avel	4 6 8	D D D	468	58 94 143	ame			1.6	3 4 0 6 1 8	53 81 113	ame atore avel	468	DDD	1.63 2.50 3.31	8 12 16	53 81 115
arca aril anos	10 12 14	DBB	8 6 10 8 12 10	211 299 330	arca aril anos			4.1	3 10 0 12 1 14	178 245 265	arca aril anos	10 12 14	DDBD	4.13 5.00 5.81	20 24 28	180 248 268
basse bara belge	14 16 16 18	BDB	2 IO 2 IO 2 IO 4 I2	387 410 498	bass bara belg	e	4 B 6 D 8 B	5.8	1 14 3 16 3 16 5 18	305 351 415 436	basse	14 16 16 18	B D B	5.81 6.62 6.62 7.45	28 32 32 36	307 355 419 441
balk bucu bonne .	18 20 20	D B D	4 12 4 12 4 12	643 627 782	balk bucu bonr	· · 1 · · 2 10. 2		7.4	5 18 5 20 5 20	521 550 675	balk bucu bonne .	18 20 20	D B D	7.45 8.25 8.25	36 40 40	527 555 688
della	24 24	D	6 14 6 14	874	dero. della	<b>5</b> 2 1 2	4 D	10.0	0 24 24	755 955	della	24 24	D	10.00	48 48	705 965
	X	2		P-ro	T											Р—тот
f		2	1	P-10	-						<u>►</u>	ŀ				Р—тог
f	Conden	sed Y	Branc	P-ro	- Cab			Т		Conden	sed Reducer					Р—тот
Table	Conden E No.	sed Y 38.	Branc	P-ro	Cab		Non	T	ABLE	Condema S No.	sed Reducer 39. Coo	de, C	eg			P-101
TABLE	Conden e No.	Class I bes	Branc Co	P-ro	cab spinod spinod swiddy	Code Termina	Non Dia 1 e	T inal im. hes f	Class	Condena Condena No.	sed Reducer 39. Coo	de, C	eg ninal ches f	Class	v	Approx- imate Weight Pounds
TABLE Code Terminal ame : : avel : :	Conden E No.	and a class A pas	Brance Co	P-10 P-10 S de, S 1.50 2.40 2.75	Cab spunod stan sounder sounder	Code Termina aras : anha : atico :	Nom Dia Inc e 6 8 8	T inal m. bes f 4 6	HIGH Class	Condena Condena No.	sed Reducer 39. Coo Termina bera bera bera	al Nor Di Ind e i 16 i 18	reg ninali am. chess f 14 14 12 12	ddad Class	V 4 12 12	P-ror approx- imate Pounds Pounds
TABLE Code Terminal ame avel avel arca arca arca arca arca	Conden E No.	da u u u u u u u u u u u u u u u u u u u	Brance Co	P-10 P-10	Cab spunod station -xouddy 835 310 319 434 494	Code Termina anha : anha : anitico :	Non Dia I Inc e 6 8 8 10 10 10 10 10	T inal im. f 4 4 6 4 6 8 6	ABLE Class	Conden: Conden: No. V V 48 76 8 133 4 100 137 137 137 137 137 137 137 137	sed Reducer 39. Code Termina brona - brona - brona - brona - brona - brona - brona - brona - brona - belas - belas - belas - belas - belas -	al Nor Di Ind - 166 - 188 - 18 - 18 - 18 - 18 - 18 - 18 - 1	egg ninali am. chess f 14 12 12 12 14 14 16 16	d a d a d a d a d a d a d a d a d a d a	V 4 12 12 8 8 4	P-ror Approx- imate top 337 374 302 374 302 374 302 374 302 375
TABLE Code Terminal ame atore avel avel atore atore atore atore atore atore atore atore atore atore atore atore beran beran beran beran beran	Conden E No.	A Second Contract of the second secon	P Brance Co P 8.5 11.0 13.5 21.6 6 21.6 24.7 24.7 24.7 24.8	P-10 P-10	Cab spunod station sta	Code Termina anis - anico - anis - anion - anis - anis - atum - acho - arizo -	Non Dia I Inc e 6 8 8 10 10 10 12 12 12 12 12 14	T iinal im. hes f 4 6 4 6 4 6 8 8 8 8 8 8 8 8 8	ABLEA Class 1 d d d d d d d d d d d d d d d d d d d	Conden: Conden: No. V V 4 76 8 133 4 107 1335 4 107 1335 1337 4 107 1335 1337 137	sed Reducer 39. Code Termina brona belag belag belag belag belag belag belag belag belag belag belag belag belag belag	al Nor Di Ini e · 16 · 18 · 18 · 18 · 18 · 18 · 18 · 18 · 18	rinal am. cches f 14 12 12 12 14 14 16 16 16 16 14 14 14 14 14	B Class	V 4 12 12 8 8 4 4 12 12 8	P-ror spinod x02 x02 x02 x02 x02 x02 x02 x02 x02 x02
TABLE Code Terminal ame atore avel aria atit beran beran beran beran beran bell bell bell bell	Conden e No.	Sed Y 38. 38. 38. 46688880 44668880 4668880 4668880 4668880 4668880 4668880 4668800 46688000 46688000000 466880000000000000000000000000000000000	P Brance Co P 8.5 11.0 13.5 11.6 21.6 21.6 21.6 21.7 24.7 27.8 30.9 30.9	P-10 bites s 1.50 2.40 2.75 3.25 3.25 3.25 3.25 3.25 5.00 5.00 5.75 5.75 5.75 5.75 6.00 6.00	Cab spunod station sta	Code Termina anta - anita - an	Non Dia I Inc e 6 8 8 10 10 12 12 12 12 14 14 14 14 14	T iinal im. hes f 4 4 6 4 6 8 8 8 8 8 10 10	ABLEA CIPSS I D CIPSS I D	Condenii Condenii No. V V 4 76 8 133 8 133 4 137 2 133 8 120 8 120 1 137 1 137 1 1 1 1 1 1 1 1 1	sed Reducer 39. Code Termina brona belag b	al Nor Di Ini e · 16 · 18 · 18 · 18 · 18 · 18 · 18 · 18 · 18	egg ninalam. cches f 14 12 12 12 12 14 14 16 16 16 16 16 16 18 18 18 18	a d a a d a a d a a d a a d a a d a a d a a d a a d a a d a a d a a d a a d a a d a a d a a d a a d a a d a a a	V 4 12 28 88 4 4 12 2 1 1 8 88 4 4 4 6	P-ror spinod z69 337 375 450 437 335 450 437 345 450 437 344 407
TABLE Code Terminal ame atore avel aria atit beran beran beran beran beran beran beran beran bell	Conden E No. Nomin Inches e f 4 6 8 10 12 11 14 12 15 14 12 15 14 12 15 14 15 16 18 18 18 18 18 19 24 22 24 22 24 22 24 25 24 25 24 24 25 24 25 25 25 25 25 25 25 25 25 25	sed Y 38. 38. 4668 0 2 4 4 4 6 6 8 8 0 0 4 4 4 6 6 8 8 0 0 4 4 4 6 6 8 8 0 0 4 4 4 6 6 8 8 0 0 4 4 4 6 6 8 8 0 0 0 4 4 4 6 6 8 8 0 0 0 4 4 4 6 6 8 8 0 0 0 4 4 4 6 6 8 8 0 0 0 4 4 4 6 6 8 8 0 0 0 4 4 4 6 6 8 8 0 0 0 4 4 4 6 6 8 8 0 0 0 4 4 4 6 6 8 8 0 0 0 4 4 4 6 6 8 8 0 0 0 4 4 4 6 6 8 8 0 0 0 4 4 4 6 6 8 8 0 0 0 4 4 4 6 6 8 8 0 0 0 4 4 4 6 6 8 8 0 0 0 4 4 4 6 6 8 8 0 0 0 4 4 4 6 6 8 8 0 0 0 4 4 4 6 6 8 8 0 0 0 4 4 6 6 8 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	P Brance Co p 8.5 11.0 13.5 11.6 21.6 21.6 21.6 21.6 21.6 21.6 21.6	P-10 bites s 1.50 2.40 2.75 3.25 3.50 5.00 5.00 5.75 5.	Cab spunod station 100 100 100 100 100 100 100 100 100 10	Code Termina anta - anita - anita - anita - anita - anita - anita - anita - arita - arita - arita - atum - arita - a - arita - - - - - - - - - - - - - - - - - - -	Non Dir I I I I I I I I I I I I I I I I I I I	T inal ima hes f 4 4 6 4 6 8 8 8 8 10 12 12 10 10	ABLE Class Clas Cla	Conden: Conden: No. V 4 76 8 133 4 100 12 133 4 100 12 133 4 100 12 133 4 100 12 133 4 100 12 133 8 120 8 123 13 23 13 2 13 13 13 2 23 2 2 2922	sed Reducer 39. Code Termina brona belag b	s de, C	eg ninala am. ches f 14 12 12 12 14 16 16 16 16 18 18 16 16 18 18 18 16 16 18 18	Class Class	V 4 12 12 8 8 4 4 12 12 8 8 4 4 4 10 12 12	P-ror spinod z69 337 375 335 335 335 335 335 335 335 335
TABLE Code Ferminal ame atore avel avel beran beran beran beran beran bell bell bell bell bell bell	Conden E No. Nominu Inches e f 4 6 8 10 11 14 11 15 15 15 16 17 18 11 18 11 18 11 18 11 18 11 18 11 18 11 18 18	Class 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	P Brance Co P 8.5 11.0 13.5 11.0 13.5 11.0 21.6 24.7 24.7 24.7 24.7 24.7 30.9 34.0 34.0	P-10 bites s 1.50 2.40 5.00 5.00 5.00 5.75 5.75 6.00 7.00 7.00	Cab spunod the spunod trained trai trained trained trained trained trained trained tra	Code Termina aras - aniba - atico - afit anion - anis - ariz - anis - ariz - anis - ariz - anis - anis - anis - ariz - anis - anais - anis - ani	Non Dia I Inc 6 8 8 10 10 12 12 12 12 14 14 14 14 14 14 16 16 16	T iinal im. hes f 4 4 6 4 6 8 8 8 10 12 12 12 12 12 12 12 12 12 12 12 12	ABLEA CISSE	r-101 Condenii Condenii No. V V V 4 76 8 97 4 100 12 133 8 133 8 120 8 14 137 2 133 8 200 8 11 137 13 2 272 2 772 2 772 2 772 7 7 7 7	sed Reducer 39. Code Termina belag b	s de, C	egg ninala iam. ches f 14 12 12 12 14 16 16 16 16 16 18 18 16 16 18 18 18 16 16 16 20 20	Class Class	V 4 12 12 8 8 4 4 12 12 8 8 4 4 10 12 12 8 8 4 4 10 12 12 8 8	P-ror synthesis and set of the se

Standard Condensed Special Castings for Water



Tees and Crosses



	Nom Dian Inc	ninal neter hes	S		Appro We Pot	oximate ights inds	0.1	Nom Diam Inch	inal eter ies	s		Appro Wei Pot	eximate ghts inds
Terminal			Clas	0	Tees	Crosses	Terminal			Clas	0	Tees	Crosses
	e	f			Code Cis	Code Cod		e	f			Code Cis	Code Cod
ame	4 6 8 8 8 10 10	4 4 6 4 6 8 4 6	D D D D D D D D D D D D	4668888888	84 124 140 197 207 226 248 260	109 152 181 225 245 283 271 293	bouca boila	18 18 18 18 18 18 18 18 18	10 10 12 12 14 14 14 16 16	B D B D B D B D D	14 14 14 14 14 14 14 14	690 809 719 838 722 849 754 898	778 897 836 955 842 977 904 1075
anis	10 10 12 12 12 12 12 12 12 14	8 10 4 6 8 10 12 4	D D D D D D D D B	8 10 10 10 10 10 12	278 295 349 359 380 395 417 392	335 360 372 385 435 462 503 415	bell       .       .         belon       .       .         belrad       .       .         benk       .       .         beure       .       .         berd       .       .         berd       .       .         bill       .       .	18 18 20 20 20 20 20 20 20	18 18 4 6 6 8 8	B D B D B D B D	14 14 14 14 14 14 14 14	783 933 725 901 738 914 761 937	964 1145 754 930 780 956 826 1002
andum atur avero arizo averi atorem anos	14 14 14 14 14 14 14 14	4 6 8 8 10 10 12	D B D B D B D B	12 12 12 12 12 12 12 12 12 12	455 403 467 418 482 431 495 451	480 436 501 470 534 496 560 536	binal         . <th>20 20 20 20 20 20 20 20 20 20</th> <th>10 10 12 12 14 14 14 16 16</th> <th>B D B D B D B D D</th> <th>14 14 14 14 14 14 14</th> <th>779 955 805 981 813 998 839 1037</th> <th>862 1038 914 1090 925 1124 982 1202</th>	20 20 20 20 20 20 20 20 20 20	10 10 12 12 14 14 14 16 16	B D B D B D B D D	14 14 14 14 14 14 14	779 955 805 981 813 998 839 1037	862 1038 914 1090 925 1124 982 1202
abor	14 14 16 16 16 16 16	12 14 14 4 6 8	D B D B D B D B	12 12 12 12 12 12 12 12 12	515 460 530 487 581 500 594 523	боо 549 625 516 610 542 636 588	bucu         .         .           bonne         .         .           bril         .         .           bunt         .         .           back         .         .           biolus         .         .           buis         .         .	20 20 20 20 24 24 24 24 24 24	18 18 20 20 6 6 8 8	B D B D B D B D D	14 14 14 16 16 16	865 1070 895 1114 1023 1309 1046 1332	1034 1268 1094 1356 1065 1351 1111 1397
atima	16 16 16 16 16 16 16 16	8 10 12 12 14 14 16	D B D B D B D B D B	12 12 12 12 12 12 12 12 12	617 541 635 567 661 576 678 601	682 624 718 676 770 694 804 744	borne	24 24 24 24 24 24 24 24 24 24 24	10 10 12 12 14 14 16 16	B D B D B D B D B D B D	16 16 16 16 16 16 16	1064 1350 1090 1376 1097 1395 1124 1432	1147 1433 1199 1485 1212 1521 1267 1597
bevel	16 18 18 18 18 18 18	16 4 6 6 8 8	D B D B D B D	12 14 14 14 14 14 14 14	717 631 750 646 765 671 790	886 660 779 690 809 740 859	del	24 24 24 24 24 24 24 24	18 18 20 20 24 24 24	B D D B D	16 16 16 16 16 16	1150 1465 1180 1509 1237 1591	1319 1663 1379 1751 1489 1914

All weights are approximate.

P-100

#### Standard Special Castings, Extras

Smoke Flues. Coal Chutes

TABLE No. 41. Smoke Flues

		Тур Тур	e 1. e 2.	Cod Cod	le Wa	ord, Cum ord, Dab
(	Code	Ter	min	al		Nominal Diameter Inches
bucu						20
deros						24
etra				-		30
igar						36
lapel						42
ocet						48
same						54
ulode		•	•			60

Smoke Flues are made up with base tees and B. & S. pipe.

The hand-hole on Type 2 is cast onto standard tees, Table No. 14.

For weights of base tees see Table No. 15. For weights of straight pipe see Table No. 2.



Smoke Flue, Type 2



Cap for Coal Chute

TABLE No. 42



Smoke Flue, Type 1

Coal Chutes Code Word, Det

## Caps for Coal Chutes Code Word, Dir

Code Terminal	Nominal Diameter Inches	А	В	Е	t	Approx. Weight Pounds
bucu deros igar lapel same	20 24 30 36 42 48 54	$\begin{array}{c} 21.48\\ 25.68\\ 31.62\\ 37.84\\ 44.08\\ 50.38\\ 56.54\\ 56.54\end{array}$	21.72 25.92 31.86 38.08 44.32 50.62 56.78	4.00 4.00 4.50 4.50 5.00 5.00 5.50	·75 ·75 ·88 ·88 I.00 I.00 I.00	121 162 277 375 567 716 880

Coal chutes are made up with 1/2 curves and B. & S. pipe.

L-5231

For ½ curves see Table No. 10. For B. & S. pipe see Table No. 2.

Caps are made with checkered surface or recessed for cement or asphalt.

UNIT	ED	ST	ATE	S	CA	ST 3	RON	P I	PE	AN	D F	OUI	V D R Y	é co	) M P	AN
					Sta	ndarc	l Flan	ged	Pipe	for	Wate	r				
[							Тав	le N	0.4	3	181					
	ches	of nes	Bolt es	olts	10	o Foot I	Class Head, 43 I	s A Pounds	Pressu	re	20	o Foot	Clas Head, 86	s B Pounds	Pressu	ire
Code Term'l	ominal ter, In	meter ge, Incl	ter of ] e, Inch	er of B		Weig	Code Wo	ord, Doc	1.	e		Wet	Code Wo	ord, Dul		<u></u>
	Diame	Diar Flang	Diame Circl	Numb	Thick- ness, Inches	Foot	Length	Single Flange	Diamete Bolts Inches	Weight 3olts Sing Joint, Lbs	Thick- ness, Inches	Foot	Length	as per Single Flange	Diameter Bolts Inches	Weight Solts Sing Joint, Lbs
aca ame . atore . avei .	3 4 6 8	7.50 9.00 11.00 13.50	6.00 7.50 9.50 11.75	4 4 8 8	•39 •42 •44 •46	13.0 18.0 27.9 38.7	168.0 234.0 358.0 498.0	5.8 9.0 11.8 16.9	1/2/8/8/8	1.0 2.0 4.0 4.0	.42 .45 .48 .51	14.6 20.1 31.1 42.7	188.0 259.0 398.0 549.0	6.3 9.1 12.3 18.2	1/2/8/8	1.2 2.0 4.0 4.0
arca aril abaris . beran .	10 12 14 16	16.00 19.00 21.00 23.50	14.25 17.00 18.75 21.25	12 12 12 12 16	.50 .54 .57 .60	51.9 67.0 82.3 98.8	671.0 876.0 1070.0 1290.0	23.9 35.8 41.4 52.5	3/4/4/100/08	10.0 10.0 15.0 21.5	·57 .62 .66 .70	58.8 76.4 94.7 114.6	759.0 998.0 1231.0 1495.0	26.6 40.4 47.3 60.1	3/4/4 2/8	10.0 10.0 16.0 22.0
beli bril dicort . engra .	18 20 24 30	25.00 27.50 32.00 38.75	22.75 25.00 29.50 36.00	16 20 20 28	.64 .67 .76 .88	118.3 137.4 186.5 266.1	1528.0 1783.0 2424.0 3486.0	54-5 66.8 92.9 146.1	I I I I <sup>1</sup> /8	30.0 37.0 40.0 87.0	•75 .80 .89 1.03	137.8 163.1 217.3 312.6	1779.0 2114.0 2821.0 4077.0	62.5 78.7 106.8 162.9	1 1 1 1 1 <sup>1</sup> /8	32.0 40.0 42.0 91.0
lculo . lsta lien tras .	36 40 42 48	45.75 50.75 52.75 59.50	42.75 47.50 49.50 56.00	32 32 36 44	.99 1.06 1.10 1.26	358.7 427.2 464.6 608.0	4733.0 5684.0 6178.0 8112.0	214.6 279.1 301.3 408.1	1 <sup>1</sup> /8 1 <sup>1</sup> /4 1 <sup>1</sup> /4 1 <sup>3</sup> /8	100.0 119.0 137.0 231.0	1.15 1.23 1.28 1.42	418.7 497.0 542.2 687.2	5497.0 6586.0 7178.0 9132.0	236.6 311.2 335.9 442.9	1 <sup>1</sup> /8 1 <sup>1</sup> /4 1 <sup>1</sup> /4 1 <sup>3</sup> /8	104.0 125.0 143.0 240.0
					• 30	o Foot F	Class Iead, 130	s C Pounds	Pressu	ıre	40	o Foot I	Clas Iead, 173	s D Pounds	Pressi	ıre
						(	Code Wo	rd, Ebal				(	Code Wor	d, Ebem		
aca ame . atore . avel .	3468	7.50 9.00 11.00 13.50	6.00 7.50 9.50 11.75	4 4 8 8	•45 •48 •51 •56	15.5 21.3 32.9 48.0	199.0 275.0 421.0 614.0	6.6 9.7 12.8 19.0	100/4/4/4/4	2.0 3.0 6.5 6.5	.48 .52 .55 .60	16.4 22.8 35.3 51.2	211.0 295.0 451.0 654.0	7.1 10.4 13.7 20.1	100 14 14 14 14 13 14 13 14	2.0 3.5 6.5 6.5
arca arli . abaris . beran .	10 12 14 16	16.00 19.00 21.00 23.50	14.25 17.00 18.75 21.25	12 12 12 16	.62 .68 .74 .80	65.5 85.4 108.1 133.3	840.0 1109.0 1397.0 1727.0	27.3 42.0 49.6 63.9	7/8 7/8 I I	16.0 16.0 24.0 33.0	.68 •75 .82 .89	71.4 93.7 119.2 147.5	916.0 1216.0 1539.0 1910.0	29.6 45.6 54.5 70.2	7/8 7/8 I I	16.0 16.0 24.0 33.0
bell brli dicort . engra .	18 20 24 30	25.00 27.50 32.00 3 <sup>8</sup> .75	22.75 25.00 29.50 36.00	16 20 20 28	.87 .92 1.04 1.20	162.4 190.6 257.6 366.9	2083.0 2454.0 3321.0 4759.0	66.9 83.3 114.7 178.1	11/8 11/8 11/4 13/8	49.0 62.0 75.0 144.0	.96 1.03 1.16 1.37	178.4 212.3 286.0 421.2	2287.0 2731.0 3686.0 5436.0	73.4 92.1 126.9 191.0	I <sup>1</sup> /8 I <sup>1</sup> /8 I <sup>1</sup> /4 I <sup>3</sup> /8	50.0 63.0 78.0 150.0
lculo . lsta llen	36 40 42	45.75 50.75 52.75	42.75 47.50 49.50 56.00	32 32 36 44	1.36 1.48 1.54 1.71	497.7 601.6 657.4 832.7	6500.0 7921.0 8635.0 10979.0	263.8 350.7 373.0 493.4	13/8 11/2 11/2 11/2	171.0 219.0 251.0 312.0	1.58 1.72 1.78 1.96	581.9 703.4 764.1 960.8	7555.0 9203.0 9973.0 12578.0	286.0 389.0 402.0 524.3	13/8 11/2 11/2 11/2	181.0 231.0 264.0 334.0

 $\label{eq:NOTE-Thickness} \begin{array}{l} \text{NOTE-Thickness of flange equals approximately 1½ times thickness of pipe plus 1½ inch.} \\ \text{Pipe made in 12 foot lengths} \\ \text{and faced }_{16}^{16} \text{ inch short for gaskets.} \\ \text{All dimensions in inches.} \\ \text{Above are neat finished weights.} \\ \text{Allowance must be made for variation and finish.} \\ \end{array}$ 

All weights are approximate.

10

110

#### Standard Flanged Pipes-Short Lengths for Water



TABLE No. 44

	ches	es	Th	ickn	ess,	In.	W	eights	, Pour	nds		ches	es	г	hick	ness, l	In.	w	eights	, Pour	nds
Code	., In(	Inch		Cla	ass			Cla	ass	-		In	Inch		C	lass			Cla	ass	
Terminal	Diam	gth 1,					А	В	С	D	Code Terminal	Diam	gth 1,					Α	в	с	D
	Nom'l	Inen	A	В	С	D	Code Ebin	Code	Code	Code Ecip		l'moN	I.en	A	В	С	D	Code Ebin	Code Ebop	Code Ecam	Code Ecip
andi acet ani agus acti	44444	6 12 18 24 30	-42 -42 -42 -42 -42	+45 +45 +45 +45 +45	48 48 48	.52 .52 .52 .52 .52 .52	27 36 45 54 63	28 38 48 58 68	29 41 52 63 73	32 43 55 66 77	eces emur emo ebat eor	14 14 14 14 14	6 12 18 24 30	·57 ·57 ·57 ·57 ·57	.66 .66 .66 .66	•74 •74 •74 •74 •74	.82 .82 .82 .82 .82 .82	123 165 206 247 288	141 189 236 284 331	154 208 262 316 370	170 229 289 350 408
asis anes ance asti aca	4 4 4 4 6	36 48 60 72 6	.42 .42 .42 .42 .42 .44	.45 .45 .45 .45 .48	.48 48 .48 .48 .51	.52 .52 .52 .52 .52 .55	72 90 108 126 38	78 98 118 138 40	84 105 127 148 42	89 112 134 157 44	enni eria erez eret eras	14 14 14 14 16	36 48 60 72 6	·57 ·57 ·57 ·57 ·57	.66 .66 .66 .66	-74 -74 -74 -74 -80	.82 .82 .82 .82 .82 .89	329 411 493 576 153	* 378 473 567 622 177	364 532 640 748 195	467 586 706 825 214
ame alizo aras atore anha	666666	, 12 18 24 30 36	-44 -44 -44 -44	48 48 48 48 48 48	.51 .51 .51 .51 .51	•55 •55 •55 •55 •55	52 66 79 93 107	55 71 86 102 117	59 75 91 108 124	62 80 103 115 132	eunt ete esse es ero	16 16 16 16 16	12 18 24 30 36	.60 .60 .60 .60	.70 .70 .70 .70 .70	.80 .80 .80 .80 .80	.89 .89 .89 .89 .89	204 254 303 353 402	235 292 349 407 464	261 328 394 461 528	288 361 435 509 582
avel anis arca amus atum	66688	48 60 72 6 12	.44 .44 .44 .46 .46	.48 .48 .48 .51 .51	.51 .51 .51 .56 .56	•55 •55 •55 •60	135 164 191 53 73	148 179 210 57 78	157 190 223 62 86	168 203 238 65 91	ere evio evet evon evi	16 16 16 18 18	48 60 72 6 12	.60 .60 .64 .64	.70 .70 .70 .75 .75	.80 .80 .80 .87 .87	.89 .89 .96 .96	501 600 697 169 228	579 693 807 192 263	661 794 927 215 296	730 877 1025 235 326
acho aril atur anos abor	8 8 8 8 8	18 24 30 36 48	.46 .46 .46 .46 .46	.51 .51 .51 .51 .51	.56 .56 .56 .56	.60 .60 .60 .60	92 111 130 150 188	100 122 143 164 207	110 134 158 182 230	117 143 168 194 245	evez evas eva erve erst	18 18 18 18 18	18 24 30 36 48	.64 .64 .64 .64 .64	·75 ·75 ·75 ·75 ·75	.87 .87 .87 .87 .87 .87	.96 .96 .96 .96	287 346 405 458 582	332 401 470 539 677	378 459 540 621 784	415 503 582 682 850
agno bara bero bias biam	8 8 10 10	60 72 6 12 18	.46 .50 .50 .50	.51 .51 .57 .57 .57	.56 .56 .62 .62	.60 .60 .68 .68 .68	227 266 74 100 126	249 292 83 112 142	278 326 87 120 152	296 347 95 131 167	erre eper eppe enno esen	18 18 20 20 20	60 72 6 12 18	.64 .64 .67 .67 .67	-75 -75 -80 -80 -80	.87 .87 .92 .92 .92	.96 .96 1.03 1.03 1.03	701 819 202 271 340	815 952 238 321 402	946 1108 261 357 452	1038 1217 290 396 503
begi balk bell benk berd	10 10 10 10	24 30 36 48 60	.50 .50 .50 .50	•57 •57 •57 •57 •57 57	.62 .62 .62 .62 .62	.68 .68 .68 .68	152 178 204 256 308	171 201 230 289 348	185 218 251 316 382	202 238 274 345 417	emen evve ions ione inna	20 20 20 20 20	24 30 36 48 60	.67 .67 .67 .67	.80 .80 .80 .80 .80	.92 .92 .92 .92 .92	1.03 1.03 1.03 1.03 1.03	409 477 546 673 821	484 565 647 810 973	548 643 738 929 1119	609 715 821 1034 1246
bini bio brom bucu bril	10 12 12 12 12 12	72 6 12 18 24	-50 -54 -54 -54 -54	·57 .62 .62 .62 .62	.62 .68 .68 .68	.68 .75 .75 .75 .75	360 106 139 172 206	406 118 157 195 233	447 127 169 212 255	488 138 184 231 278	inom iez idas ical ian	20 24 24 24 24 24	72 6 12 18 24	.67 .76 .76 .76 .76	.80 .89 .89 .89 .89	.92 1.04 1.04 1.04 1.04	1.03 1.16 1.16 1.16 1.16 1.16	958 279 373 466 559	1136 322 431 540 649	1310 359 487 616 745	1459 397 540 683 826
buis enta ebe eaba emie	12 12 12 12 12 12	30 36 48 60 7 <sup>2</sup>	-54 -54 -54 -54 -54	.62 .62 .62 .62 .62	.68 .68 .68 .68	·75 ·75 ·75 ·75 ·75	239 273 340 407 474	271 310 386 462 539	298 340 426 511 596	325 371 465 559 651	ipse ivor iven ivit ives	24 24 24 24 24 24	30 36 48 60 72	.76 .76 .76 .76 .76	.89 .89 .89 .89 .89	1.04 1.04 1.04 1.04 1.04	1.16 1.16 1.16 1.16 1.16 1.16	659 746 933 1119 1306	757 876 1083 1301 1518	874 1003 1260 1518 1775	969 1112 1398 1684 1970

See Table No.  $_{\rm 43}$  for flange diameters, bolt circles, etc. All weights are approximate.

P-52 A

Standard Flange and Bell Pipe-Short Lengths



TABLE No. 45

	ches	es	Th	ickn	ess,	In.	w	eights	, Pont	nds		ches	es	Т	'hick	ness,	In.	w	eights	Poun	ds
	I., In(	Inch		Cla	ass			Cla	ass			1., In	Inch		C	lass			Cla	ass	
Code Terminal	Diam	th 1,					A	В	С	D	Code Terminal	Diam	th 1,					A	В	С	D
	l'moN	Ireng	A	В	С	D	Code Ecos	Code Edan	Code Edep	Code Edis		l'moN	Leng	A	В	С	D	Code	Code Edan	Code Edep	Code Edis
andi acet ani agus acti	4 4 4 4 4 4	6 12 18 24 30	.42 .42 .42 .42 .42	•45 •45 •45 •45 •45	-48 -48 -48 -48 -48	.52 .52 .52 .52 .52	36 45 54 63 7 <sup>2</sup>	39 49 59 69 79	42 52 63 74 85	45 56 68 79 90	eces emur emo ebat eor	14 14 14 14 14	6 12 18 24 30	•57 •57 •57 •57 •57 •57	.66 .66 .66 .66	• 74 • 74 • 74 • 74 • 74 • 74	.82 .82 .82 .82 .82 .82	170 212 253 294 335	182 230 277 324 372	200 254 308 362 416	210 270 329 389 449
asis anes ance asti aca	4 4 4 4 6	36 48 60 72 6	•42 •42 •42 •42 •42 •44	•45 •45 •45 •45 •48	.48 .48 .48 .48 .48 .51	.52 .52 .52 .52 .52	81 99 117 135 55	89 109 129 149 61	95 117 138 159 62	102 125 147 170 63	enni eria erez eret eras	14 14 14 14 14 16	36 48 60 72 6	·57 ·57 ·57 ·57 ·57 ·60	.66 .66 .66 .66 .70	•74 •74 •74 •74 •74 •80	.82 .82 .82 .82 .82 .89	376 468 540 622 216	419 514 608 703 232	470 578 686 794 259	508 627 747 866 272
ame alizo aras ator anha	66666	12 18 24 30 36	•44 •44 •44 •44 •44	-48 -48 -48 -48 -48 -48	.51 .51 .51 .51 .51	·55 ·55 ·55 ·55 ·55	69 83 96 110 124	76 92 107 123 138	79 95 111 128 144	81 99 116 134 151	eunt ete esse es ero	16 16 16 16	12 18 24 30 36	.60 .60 .60 .60	•70 •70 •70 •70 •70	.80 .80 .80 .80 .80	.89 .89 .89 .89 .89	265 315 364 414 463	289 346 403 461 518	325 392 458 525 592	346 419 493 567 641
avei . ' anis arca amus atum	6 6 8 8	48 60 72 6 12	•44 •44 •44 •46 •46	-48 48 -48 -51 -51	.51 .51 .51 .56 .56	• 55 • 55 • 55 • 60 • 60	152 181 208 80 99	169 200 231 83 104	177 209 242 95 119	187 222 257 97 123	ere evio evet evon evi	16 16 16 18 18	48 60 72 6 12	.60 .60 .60 .64 .64	•70 •70 •70 •75 •75	.80 .80 .80 .87 .87	.89 .89 .89 .96 .96	562 661 758 248 307	633 747 862 266 335	725 858 991 301 382	788 935 1083 315 404
acho arii atur amos abor	8 8 8 8 8 8	18 24 30 36 48	•46 •46 •46 •46 •46	.51 .51 .51 .51 .51	.56 .56 .56 .56 .56	.60 .60 .60 .60	118 138 157 176 215	126 147 168 190 232	143 167 191 215 263	149 174 200 225 277	evez evas eva erve erst	18 18 18 18 18	18 24 30 36 48	.64 .64 .64 .64 .64	-75 -75 -75 -75 -75 -75	.87 .87 .87 .87 .87	.96 .96 .96 .96 .96	366 425 485 544 662	404 473 542 610 748	463 544 626 707 869	494 583 672 761 940
agno bara bero blas biam	8 8 10 10 10	60 72 6 12 18	.46 .46 .50 .50 .50	.51 .51 .57 .57 .57	·56 ·56 ·62 ·62 ·62	.60 .60 .68 .68 .68	253 292 108 134 160	274 317 114 143 173	311 359 125 158 191	328 379 131 166 202	erre eper eppe enno esen	18 18 20 20 20	60 72 6 12 18	.64 .64 .67 .67 .67	•75 •75 •80 •80 •80	.87 .87 .92 .92 .92	.96 .96 1.03 1.03 1.03	780 898 294 363 431	886 1024 318 400 481	1032 1194 368 463 558	1118 1296 388 494 600
begi baik beii benk berd	10 10 10 10	24 30 36 48 60	.50 .50 .50 .50 .50	·57 ·57 ·57 ·57 ·57	.62 .62 .62 .62 .62	.68 .68 .68 .68 .68	186 212 238 290 342	202 232 261 320 379	224 256 289 354 420	238 274 309 381 452	emen evve ions ione inna	20 20 20 20 20	24 30 36 48 60	.67 .67 .67 .67 .67	.80 .80 .80 .80 .80	.92 .92 .92 .92 .92	1.03 1.03 1.03 1.03 1.03	500 569 637 775 912	563 644 726 889 1052	654 749 844 1035 1220	706 812 919 1131 1343
bini bio brom bucu brij	10 12 12 12 12 12	72 6 12 18 24	·50 ·54 ·54 ·54 ·54	·57 .62 .62 .62 .62	.62 .68 .68 .68 .68	.68 •75 •75 •75 •75	394 140 174 207 241	437 150 188 226 264	485 170 213 255 298	523 178 224 271 318	inom iez idas ica i iam	20 24 24 24 24 24	72 6 12 18 24	.67 .76 .76 .76 .76	.80 .89 .89 .89 .89	.92 1.04 1.04 1.04 1.04	1.03 1.16 1.16 1.16 1.16	1049 389 482 575 668	1215 418 526 . 635 744	1416 497 625 754 883	1555 523 669 809 952
buis enta ebe eaba emie	12 12 12 12 12 12	30 36 48 60 72	·54 ·54 ·54 ·54 ·54	.62 .62 .62 .62 .62	.68 .68 .68 .68 .68	·75 ·75 ·75 ·75 ·75	274 308 375 442 509	302 341 417 493 570	341 383 469 554 640	365 412 505 599 691	ipse ivor iven ivit ives	24 24 24 24 24 24	30 36 48 60 72	.76 .76 .76 .76 .76	.89 .89 .89 .89 .89	1.04 1.04 1.04 1.04 1.04	1.16 1.16 1.16 1.16 1.16 1.16	762 855 1042 1228 1415	853 971 1178 1396 1613	1012 1141 1398 1656 1913	1095 1238 1524 1810 2096

See Table No.  $_{\rm 43}$  for flange diameters, bolt circles, etc. All weights are approximate.

P-52

UNITED STATES CAST IRON PIPE AND FOUNDRY	COMPANY
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· Standard Flange and Spigot Pipe-Short Lengths



TABLE No. 46 .

12.11	ches	es	Th	ickn	ess,	In.	W	eights	, Pour	nds	1.1.27.	ches	es	Т	hick	mess,	In.	w	eights	, Pour	nds
	., Inc	Inch		Cla	iss			Cla	iss			., Inc	Inch		0	lass			Cla	ass	
Code Terminal	Diam	rth 1,					А	В	-C	D	Code Terminal	Diam	cth 1,					А	в	с	D
	l'moN	Leng	A	В	С	D	Code Edot	Code	Code Efes	Code Efit		l'moN	Leng	A	В	С	D	Code Edot	Code Efap	Code Efes	Code Efit
acet ani agus acti asis	4 4 4 4 4	12 18 24 30 36	.42 .42 .42 .42 .42 .42	-45 -45 -45 +45 -45	.48 .48 .48 .48 .48	.52 52 52 .52 .52	27 36 45 54 63	29 39 49 59 69	31 42 53 63 74	33 45 56 67 79	emur emo ebat eor enni	14 14 14 14 14	12 18 24 30 36	·57 ·57 ·57 ·57 ·57 ·57	.66 .66 .66 .66	·74 ·74 ·74 ·74 ·74 ·74	.82 .82 .82 .82 .82 .82	124 165 206 247 288	142 189 237 284 331	158 212 266 320 374	174 234 293 353 412
anes ance asti ame alizo	4 4 4 6 6	48 60 72 12 18	.42 .42 .42 .44 .44	-45 -45 -45 -48 -48	.48 .48 .48 .51 .51	-52 -52 -52 -55 -55	81 99 117 40 54	89 109 129 43 59	95 117 138 46 62	102 124 147 48 66	eria erez eret eunt ete	14 14 14 16 16	48 60 72 12 18	•57 •57 •57 •60	.66 .66 .70 .70	·74 ·74 ·74 .80 .80	.82 .82 .82 .89 .89	370 452 535 151 201	426 520 615 175 232	482 590 698 197 264	531 651 770 218 291
aras ator anha avel anis	66666	24 30 36 48 60	-44 -44 -44 -44	.48 .48 .48 .48 .48	.51 .51 .51 .51 .51	·55 ·55 ·55 ·55 ·55	67 81 95 123 152	74 90 105 136 167	78 95 111 144 177	83 101 118 154 189	esse es ero ere evio	16 16 16 16 16	24 30 36 48 60	.60 .60 .60 .60	.70 .70 .70 .70 .70	.80 .80 .80 .80 .80	.89 .89 .89 .89 .89	250 300 349 448 547	289 347 404 519 633	330 397 464 597 730	365 439 512 660 807
arca atum acho aril atur	68888	72 12 18 24 30	-44 -46 -46 -46 -46	.48 .51 .51 .51 .51	.51 .56 .56 .56	-55 .60 .60 .60	179 56 75 94 113	198 61 82 104 125	210 67 91 115 139	224 71 97 123 148	evet evi evez evas eva	16 18 18 18 18	72 12 18 24 30	.60 .64 .64 .64	·70 ·75 ·75 ·75 ·75	.80 .87 .87 .87 .87	.89 .96 .96 .96	644 173 232 291 350	747 200 269 338 407	863 229 311 392 473	955 252 341 430 519
amos abor agno bara bias	8 8 8 8 8 10	36 48 60 72 12	.46 .46 .46 .46 .50	.51 .51 .51 .51 .51 .57	.56 .56 .56 .56	.60 .60 .60 .60	133 171 210 249 76	146 189 231 274 85	163 211 259 307 93	174 225 270 327 101	erve erst erre eper enno	18 18 18 18 20	36 48 60 72 12	.64 .64 .64 .64 .67	·75 ·75 ·75 ·75 ·80	.87 .87 .87 .87 .92	.96 .96 .96 .96 1.03	409 527 646 764 204	476 614 752 889 242	554 717 879 1041 274	609 787 965 1144 304
biam begi balk bell benk	10 10 10 10	18 24 30 36 48	.50 .50 .50 .50 .50	-57 -57 -57 -57 -57	.62 .62 .62 .62 .62	.68 .68 .68 .68	102 128 154 180 232	115 144 174 203 262	125 158 191 224 289	137 172 208 244 315	esen emen evve ions ione	20 20 20 20 20	18 24 30 36 48	.67 .67 .67 .67	,80 ,80 ,80 ,80 ,80	.92 .92 .92 .92 .92	1.03 1.03 1.03 1.03 1.03	273 342 410 479 616	323 405 486 568 731	369 465 560 655 846	411 517 623 729 942
berd bini brom bucu bril	10 10 12 12 12	60 72 12 18 24	-50 -50 -54 -54 -54	-57 -57 .62 .62 .62	.62 .62 .68 .68	.68 .68 .75 .75 .75	284 336 103 136 170	321 379 117 155 193	355 420 127 170 213	3 <sup>8</sup> 7 45 <sup>8</sup> 139 186 233	inna inom idas ical iam	20 20 24 24 24 24	60 72 12 18 24	.67 .67 .76 .76 .76	.80 .80 .89 .89 .89	.92 .92 1.04 1.04 1.04	1.03 1.03 1.16 1.16 1.16 1.16	754 891 280 373 466	894 1057 324 433 542	1036 1227 372 501 630	1154 1367 413 556 699
buis enta ebe eaba emie	12 12 12 12 12 12	30 36 48 60 72	·54 ·54 ·54 ·54 ·54	.62 .62 .62 .62 .62	.68 .68 .68 .68	-75 -75 -75 -75 -75	203 237 304 371 438	231 270 346 422 499	256 298 384 469 554	280 326 420 514 606	ipse icor iven ivit ives	24 24 24 24 24 24	30 36 48 60 72	.76 .76 .76 .76	.89 .89 .89 .89 .89	1.04 1.04 1.04 1.04 1.04	1.16 1.16 1.16 1.16 1.16 1.16	560 653 840 1026 1213	650 769 976 1194 1411	759 888 1145 1403 1660	842 985 1271 1557 1843

See Table No. 43 for flange diameters, bolt circles, etc. All weights are approximate.

P-52

τ	UNITEI	) ST	ATE	s c	ASI	IR	O N	PIPI	E A	ND F	OUNI	ORY	сомр	ANY	
						Hy	draulic	e Cyli	nders						
						1	-								
	Hydraulic Cylinders in lengths to 12 feet For Bored Cylinders Code, <b>Efov</b> For Rough Cylinders Code, <b>Egas</b>														
	For Bored Cylinders Code, <b>Efov</b> For Rough Cylinders Code, <b>Egas</b> Each with flanges faced. Drilled to order only														
	Each with flanges faced. Drilled to order only TABLE No. 47														
	Coart Diame Coart Diame Cast Cast Cast Bord Pinness of Bord Bord Cast Bord Sources of Sources Cast Bord Cast Cast Bord Cast														
	Code     Linitiange     Minen     Minen     Minen       Code     Leter when     Linitiange     Linitiange     Linitiange       Miner     Minen     Cast     Inches       Bored     Linitiange     Minen     Linitiange       Miner     Cast     Linitiange     Linitiange       Bored     Linitiange     Sast     Linitiange       Miner     -     -     Diameter       Inches     0     Flainge     Linitiange       Miner     -     -     -       Miner     -														
	ame aras atore anha atico avei afit anion	11.50 11.50 11.50 11.50 11.50 11.50 11.50 11.50 13.50	12 12 12 12 12 12 12 12 12 14	.75 .81 .88 .94 1.00 1.13 1.25 .75	.50 .56 .63 .69 .75 .88 1.00	13.00 13.13 13.25 13.38 13.50 13.75 14.00	17.00 17.00 17.00 17.00 17.00 17.00 17.00 17.00	1.50 1.50 1.50 1.50 1.50 1.50 1.50	I.25 I.25 I.25 I.25 I.25 I.25 I.25 I.25	90 100 106 116 123 139 156 105	61 69 77 86 94 110 127 71	37 36 35 34 33 31 28 42	31 30 29 28 27 26 24 25	A-L A-L L A-L L L A	
	anis arca aclie amus . atum acho aril abunt .	13.50 13.50 13.50 13.50 15.50 15.50 15.50 15.50	14 14 14 16 16 16	.88 1.00 1.13 1.25 .75 .88 1.00 1.13	.63 .75 .88 1.00 .50 .63 .75 .88	15.25 15.50 15.75 16.00 17.00 17.25 17.50 17.75	19.00 19.00 19.00 19.00 22.00 22.00 22.00 22.00	1.50 1.50 1.50 1.50 1.63 1.63 1.63 1.63	1.25 1.25 1.25 1.25 1.38 1.38 1.38 1.38	123 142 161 181 119 140 162 183	90 108 128 147 81 101 123 145	39 37 35 32 65 62 59 56	32 30 29 27 55 52 49 47	L A L L L A-L L	
	andum . atur avero . arizo averi arate atorem . anos	15.50 17.50 17.50 17.50 17.50 17.50 19.50 19.50	16 18 18 18 18 18 20 20	1.25 1.00 1.06 1.13 1.25 1.50 1.00 1.13	1.00 •75 •81 •88 1.00 1.25 •75 •88	18.00 19.50 19.63 19.75 20.00 20.50 21.50 21.75	22.00 24.00 24.00 24.00 24.00 24.00 26.00 26.00	1.63 1.63 1.63 1.63 1.63 1.63 1.63 1.63	1.38 1.38 1.38 1.38 1.38 1.38 1.38 1.38	205 181 193 205 230 279 201 227	167 138 150 162 186 236 153 179	53 65 64 63 61 57 71 67	45 55 54 52 49 44 60 56	L L A A L A-L A-L	
	abor abaris . acity arage . agno . avate . acibus . alite	19.50 21.50 21.50 23.50 23.50 23.50 23.50 23.50	20 22 24 24 24 24 24 24 24	1.25 1.13 1.25 1.00 1.13 1.25 1.38 1.56	1.00 .88 1.00 .75 .88 1.00 1.13 1.31	22.00 23.75 24.00 25.50 25.75 26.00 26.25 26.63	26.00 28.00 28.00 30.00 30.00 30.00 30.00 30.00	1.63 1.63 1.63 1.63 1.63 1.63 1.63 1.63	1.38 1.38 1.38 1.38 1.38 1.38 1.38 1.38	254 249 279 272 303 335 384	206 196 225 182 213 245 277 326	63 73 68 83 78 73 67 64	52 61 56 66 62 57 54	A-L A A-L A-L A-L A-L A-L L	
	atima andos barla. barot basan basse bara. beran	25.50 25.50 26.50 26.50 27.50 29.50 29.50 29.50	26 26 27 27 28 30 30 30	I.25 I.38 I.25 I.38 I.25 I.00 I.19 I.25	1.00 1.13 1.00 1.13 1.00 .81 .94 1.00	28.00 28.25 29.00 29.25 30.00 31.63 31.88 32.00	32.50 32.50 33.50 33.50 34.50 36.50 36.50 36.50	1.75 1.75 1.75 1.75 2.00 2.00 2.00 2.00	1.50 1.50 1.50 1.75 1.75 1.75 1.75 1.75	328 362 340 376 352 318 357 377	265 299 274 310 284 245 284 304	97 90 101 95 119 136 132 127	83 76 86 80 104 119 115 110	L A L L A L A-L	
	bevel . bero blas blam blolan . blate bione .	29.50 29.50 32.50 35.50 35.50 35.50 35.50	30 30 33 36 36 36 36 36	1.38 1.50 1.25 1.25 1.38 1.50 1.75	I.13 I.25 I.00 I.00 I.13 I.25 I.50	32.25 32.50 35.00 38.00 38.25 38.50 39.00	36.50 36.50 39.50 44.50 44.50 44.50 44.50 44.50	2.00 2.00 2.00 2.00 2.00 2.00 2.00 2.00	1.75 1.75 1.75 1.75 1.75 1.75 1.75 1.75	416 453 414 450 497 544 639	343 383 333 363 409 456 551	120 113 137 219 208 198 188	103 99 120 192 182 173 164	A-L L L L L L L	

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These cylinders can be bored approximately 1/8 inch larger or smaller. We are prepared to make the flanges to suit requirements either as to diameter or thickness. Outside diameters cannot be changed, but a combination can be made by using a pattern with a smaller core than shown in table. In some cases these cylinders can be made as long as 15 feet. All weights are approximate.



See Table No. 43 for flange diameters, bolt circles, etc.

All weights are approximate.

Standard Flanged Special Castings for Water



Standard Flanged 1/4 Curves TABLE No. 52. Code Word, Elib



Standard Flanged 1/4 Curve, Short Radius

TABLE No. 53. Code Word, Eloc

Code Terminal	Nom'l Diameter Inches	Class	t	r	k	Approx. Weight Pounds
ame	4	D	.52	16	22.60	69
atore	6	D	.55	16	22.60	101
avel	8	D	.60	16	22.60	147
arca	10	D	.68	16	22.60	209
aril	12	D	· 75	16	22.60	287
anos	14	B	. 66	18	25.50	315
abor	14	D	. 82	18	25.50	387
basse	16	B	. 70	24	34.00	470
bara belge balk bucu	16 18 18 20	D B D B	.89 •75 .96 .80	24 24 24 24 24	34.00 34.00 34.00 34.00	604 558 707 670
bonne	20	D	1.03	24	34.00	851
deros	24	B	.89	30	42.40	1067
della	24	D	1.16	30	42.40	1377
etra	30	A	.88	36	50.90	1546
etros	30	B	1.03	36	50.90	1799
enbin	30	C	1.20	36	50.90	2085
engo	30	D	1.37	36	50.90	2367
igar	36	A	.99	48	67.90	2682
icell	36	B	1.15	48	67.90	3103
icet	36	C	1.36	48	67.90	3653
illus	36	D	1.58	48	67.90	4226
lapel	42	A	1.10	48	67.90	3520
laret	42	B	1.28	48	67.90	4077
laron	42	C	1.54	48	67.90	4874
latesl	42	D	1.78	48	67.90	5602
ocet	48	A	1.26	48	67.90	4634
omen	48	B	1.42	48	67.90	5201
ofer	48	C	1.71	48	67.90	6216
odis	48	D	1.96	48	67.90	6982

. P-65 See Table No. 43 for flange diameters, bolt circles, etc. All weights are approximate.

Code Terminal-	Nom'l Diameter Inches	Class	t	1	Approx. Weight Pounds
ame	4	D	. 52	II	60
atore	6	D	. 55	12	89
avel	8	D	.60	13	136
arca	10	D	.68	14	200
aril	12	D	.75	15	285
anos	14	В	.66	16	297
abor	14	D	.82	16	376
basse	16	В	. 70	17	390
1			-		
bara	16	D	.89	17	492
belge	18	В	.75	18	474
balk	18	D	.96	18	602
bucu	20	В	.80	19	589
bonne	20	D	1.03	19	747
deros	24	В	.89	21	851
della	24	D	1.16	21	1090

P-63.

			Stand	lard	Flan	ged S	pecia	l Ca	stings	for	Wate	r			
F			1				*					-		*	
$\frac{1}{145^{\circ}}$															
A Curve de C															
Standard Flanged Curves. TABLE No. 54															
Lass t Curve. Code, Emay															
International     Image: Construction of the second s															
4 6 8 10	DDDDD	.52 .55 .60 .68	ame . atore . avel . arca .	24 24 24 24 24	18.4 18.4 18.4 18.4	57 83 121 170 228	48 48 48 48 48	18.7 18.7 18.7 18.7 18.7	57 83 121 170 228	12 Cur	ve. Cod	e, Emic	Curve	ve. Code	, Emo
14 14 16 16	B D B D B	.75 .66 .82 .70 .89	anos . abor . basse . bara . belge .	36 36 36 36 36	27.6 27.6 27.6 27.6 27.6 27.6	341 419 418 528 484	72 72 72 72 72 72 72	28.1 28.1 28.1 28.1 28.1 28.1	341 419 418 528 484	r	k	Approx. Weight Pounds	r	k	Approx. Weight
18 20 20 24 24	D B D B D B D	.96 .80 1.03 .89 1.16	balk . bucu . bonne . deros . della .	36 48 48 60 60	27.6 36.7 36.7 45.9 45.9	612 670 851 1066 1377	72 96 96 120 120	28,1 37.5 37.5 46.8 46.8	612 670 851 1066 1377	240 240 240 240 240	47.05 47.05 47.05 47.05	799 1019 1070 1376	480 480 480 480	47.10 47.10 47.10 47.10 47.10	799 1019 1070 1376
30 30 30 30 30	A B C D A	.88 1.03 1.20 1.37 .99	etra . etros . enbin . engo . igar .	60 60 60 90	45-9 45-9 45-9 45-9 68.9	1337 1553 1797 2036 2542	120 120 120 120 120 180	46.8 46.8 46.8 46.8 70.2	1337 1553 1797 2036 2542	240 240 240 240 240 240	47.05 47.05 47.05 47.05 47.05 47.05	1314 1553 1794 2029 1834	480 480 480 480 480	47.10 47.10 47.10 47.10 47.10 47.10	1314 1553 1794 2029 1834
36 36 36 42 42	B C D A B	1.15 1.36 1.58 1.10 1.28	icell . icet . illus . lapel . laret .	90 90 90 90 90	68.9 68.9 68.9 68.9 68.9	3039 3459 3999 3342 3871	180 180 180 180 180	70.2 70.2 70.2 70.2 70.2 70.2	3039 3459 3999 3342 3871	240 240 240 240 240 240	47.05 47.05 47.05 47.05 47.05	2118 2485 2852 2426 2821	480 480 480 480 480	47.10 47.10 47.10 47.10 47.10	2118 2485 2852 2426 2821
42 42 48 48 48 48	C D A B C	1.54 1.78 1.26 1.42 1.71	laron latesi ocet omen ofer	90 90 90 90 90	68.9 68.9 68.9 68.9 68.9	4616 5314 4396 4935 5 <sup>8</sup> 97	180 180 180 180 180	70.2 70.2 70.2 70.2 70.2 70.2	4616 5314 4396 4935 5 <sup>8</sup> 97	240 240 240 240 240 240	47.05 47.05 47.05 47.05 47.05 47.05	3316 3804 3201 3565 4247	480 480 480 480 480	47.10 47.10 47.10 47.10 47.10	3316 3804 3201 3565 4247
48 54 54	D A B C D	1.96 1.35 1.55 1.90 2.23	odis . same . sand . sone . sica .	90 90 90 90 90	68.9 68.9 68.9 68.9 68.9	7719 5392 6082 7551 8749	180 180 180 180 180	70.2 70.2 70.2 70.2 70.2 70.2	7719 5392 6082 7551 8749	240 240 240 240 240 240	47.05 47.05 47.05 47.05 47.05 47.05	4809 3952 4442 5504 6332	480 480 480 480 480	47.10 47.10 47.10 47.10 47.10	4809 3952 4442 5504 6332
54							11								

See Table No.  $_{43}$  for flange diameters, bolt circles, etc. All weights are approximate.



## Standard Flanged Special Castings for Water Standard Flanged Tees and Crosses

See Table No. 43 for Flange Diameters, Bolt Circles, Etc. Sizes, 24 inches and larger, with Ribs, Bolts through Flats, Etc., as required

#### TABLE No. 55

$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Crosses Code Enab 836 1022 851 1063 752 944 784 976 818 1026 885 1127
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Code Enab 836 1022 851 1063 752 944 784 976 818 1026 885 1127
ame       .       .       4       4       D       11.0       11.0       12.0	836 1022 851 1063 752 944 784 976 818 1026 885 1127
avel       .       .       8       8       D       13.0       19.5       250       berd       .       .       20       6       D       19.0       19.0       900         afift       .       .       10       4       D       14.0       14.0       251       277       303       303       biene       .       .       20       8       B       19.0       19.0       729         atils       .       .       10       8       D       14.0       14.0       280       303       335       bianti       .       20       8       B       19.0       19.0       19.0       746         arca       .       .       10       8       D       14.0       14.0       280       335       355       binai       .       20       10       B       19.0       19.0       19.0       746         arca       .       .       12       4       D       15.0       15.0       351       377       bio       .       20       10       B       19.0       19.0       19.0       746         atium       .       .       12       6       D	944 784 976 818 1026 885 1127
aclie         .         12         4         D         15.0         15.0         351         377         bio         .         20         12         B         19.0         19.0         779           amus         .         12         6         D         15.0         15.0         364         403         biros         .         20         12         B         19.0         19.0         779           atum         .         12         8         D         15.0         15.0         364         435         biros         .         20         12         B         19.0         19.0         779         91.0         19.0         19.0         79.0         92.0         79.0         93.0         79.0         93.0         79.0         78.0         78.0         78.0         78.0         78.0	885 1127
acho       .	899 1196 974
abunt       .       14       4       B       16.0       16.0       374       400       boroi       .       20       16       D       19.0	1256 995 1303 1072 1360
averi       .       I4       8       D       16.0       16.0       484       539       back       .       .       24       6       B       21.0       21.0       103         arate       .       .       I4       10       B       16.0       16.0       420       492       biolus       .       .       24       6       B       21.0       21.0       130         atorem       .       I4       10       D       16.0       16.0       501       573       buis       .       .       24       6       B       21.0       21.0       1020         atorem       .       14       12       B       16.0       16.0       449       551       berto       .       .       24       8       D       21.0       21.0       1020         abor       .       .       14       12       D       16.0       16.0       530       632       borne       .       24       8       D       21.0       21.0       21.0       21.0       21.0       21.0       21.0       21.0       21.0       21.0       21.0       21.0       21.0       21.0       21.0       21.0<	1052 1344 1084 1376 1118
abaris       .       I4       I4       B       I6.0       I6.0       451       555       Card       .       24       I0       D       21.0       21.0       1341         acity       .       .       I4       I4       D       I6.0       557       681       Card       .       24       I2       B       21.0       21.0       1341         arage       .       .       16       4       B       17.0       17.0       482       508       Cardo       .       .       24       I2       B       21.0       21.0       1301         aguo       .       .       .       .       .       .       .       .       24       I2       B       21.0       21.0       1301         ayate       .       <	1426 1185 1527 1209 1596
acibus       .       .       16       6       D       17.0       17.0       599       638       cire       .       .       24       16       B       21.0       21.0       1124         alite       .       .       16       8       B       17.0       511       566       dea       .       .       24       16       B       21.0       21.0       1454         atima       .       .       16       8       D       17.0       7.0       511       566       dea       .       .       24       16       D       21.0       21.0       1454         atima       .       .       16       8       D       17.0       17.0       528       600       derai       .       .       24       18       B       21.0       21.0       1135         barla       .       .       16       10       D       17.0       17.0       528       600       derai       .       .       24       18       D       21.0       21.0       1135         barla       .       .       .       .       .       .       .       .       24       20 </th <th>1274 1654 1295 1963 1372</th>	1274 1654 1295 1963 1372
barot       .       .       16       12       B       17.0       17.0       557       659       della       .       .       24       20       D       21.0       2	2028 1512 2226 1321 1510
bevel       .       16       16       D       17.0       17.0       716       876       doit       .       30       12       C       19.5       24.0       1679         bero       .       18       4       B       18.0       18.0       562       588       dade       .       30       12       C       19.5       24.0       1679         bias       .       18       4       D       18.0       18.0       562       588       dade       .       30       12       D       19.5       24.0       1800         bias       .       18       4       D       18.0       18.0       575       614       darb       .       30       12       D       19.5       24.0       1800         biam       .       18       6       D       18.0       726       770       614       darb       .       30       14       A       22.5       26.0       1403         bloian       .       18       6       D       18.0       18.0       726       770       708       730       14       C       22.5       26.0       1773	1720 1879 1520 1724 2013
biate       . <th>2372 1742 1876 2171</th>	2372 1742 1876 2171
broma       .       18       12       B       18.0       18.0       637       739       dique       .       .       30       16       D       23.5       26.0       2305         begi       .       .       18       12       D       18.0       18.0       783       885       dering       .       .       30       16       D       23.5       26.0       2305         belag       .       .       18       14       B       18.0       18.0       643       751       dellos       .       .       30       18       B       24.5       26.0       1555         belas       .       18       14       D       18.0       18.0       817       952       ebam       .       30       18       B       24.5       26.0       1794         col       18       18.0       18.0       18.0       18.0       18.0       18.0       18.0       12.0       13.0       13.0       13.0       13.0       13.0       13.0       13.0       13.0       13.0       13.0       13.0       13.0       13.0       13.0       13.0       13.0       13.0       13.0       14.0       <	2541 1718 1967 2435

90

#### Standard Flanged Special Castings for Water

Standard Flanged Tees and Crosses

See Table No. 43 for Flange Diameters, Bolt Circles, Etc.

Sizes, 24 inches and larger, with Ribs, Bolts through Flats, Etc., as required

## TABLE No. 55-Continued

	Nom Dian Inc	inal neter hes				Appro Weig	oximate ht, Lbs.		Nom Dian Incl	inal neter hes				Appro Weigh	oximate at, Lbs.
Code Terminal			Class	1	р	Tees	Crosses	Code Terminal			Class	1	р	Tees	Crosses
	е	f				Code Emuf	Code Enab		e	f				Code Emuf	Code Enab
entib entis eola erem etori etra	30 30 30 30 30 30	18 20 20 20 20 24	D A B C D A	24.5 25.5 25.5 25.5 25.5 25.5 25.5 27.5	26.0 26.0 26.0 26.0 26.0 26.0	2386 1608 1856 2230 2489 1749	2670 1792 2060 2568 2826 1986	ista idum itant itage icolea iches	42 42 42 42 42 42 42 42	18 18 18 18 20 20	A B C D A B	25.0 25.0 25.0 25.0 26.0 26.0	32.0 32.0 32.0 32.0 32.0 32.0 32.0	2668 3073 3849 4394 2801 3206	2804 3217 4212 4803 2986 3391
etros enbiu engo engra erin ernol	30 30 30 30 30 30	24 24 24 30 30 30	B C D A B C	27.5 27.5 27.5 30.5 30.5 30.5	26.0 26.0 26.0 30.5 30.5 30.5	2013 2458 2735 1989 2349 2854	2265 2880 3176 2328 2764 3453	kem kunger linos linw lock lack	42 42 42 42 42 42 42 42	20 20 24 24 24 24 24	C D A B C D	26.0 26.0 28.0 28.0 28.0 28.0 28.0	32.0 32.0 32.0 32.0 32.0 32.0 32.0	4024 4591 3021 3450 4340 4954	4454 5069 3271 3700 4875 5541
ernu elazo estro esta erata erolla	30 36 36 36 36 36 36 36	30 12 12 12 12 12 12 14	D A B C D A	30.5 19.5 19.5 19.5 19.5 19.5 22.5	30.5 27.0 27.0 27.0 27.0 29.0	3263 1678 1925 2241 2623 1898	3940 1774 2028 2342 2784 2025	lard lake lamie lante lapel laret	42 42 42 42 42 42 42 42	30 30 30 30 36 36	A B C D A B	31.0 31.0 31.0 31.0 34.0 34.0	36.5 36.5 36.5 36.5 36.5 36.5 36.5	3368 3868 4941 5675 3725 4295	3734 4261 5749 6601 4214 4846
ariate erarla ebas ently fod	36 36 36 36 36 36	14 14 14 16 16 16	B C D A B C	22.5 22.5 22.5 23.5 23.5 23.5 23.5	29.0 29.0 29.0 29.0 29.0 29.0	2180 2550 3035 1980 2269 2670	2318 2710 3315 2125 2424 2866	laron latesi leaba leam lieu leat	42 42 42 42 42 42 42 42	36 36 42 42 42 42	C D A B C D	34.0 34.0 37.0 37.0 37.0 37.0 37.0	36.5 36.5 37.0 37.0 37.0 37.0 37.0	5493 6348 4083 5023 6114 7073	6520 7469 4736 6046 7430 8608
firn	36 36 36 36 36 36 36	16 18 18 18 18 18 20	D A B C D A	23.5 24.5 24.5 24.5 24.5 24.5 25.5	29.0 29.0 29.0 29.0 29.0 29.0 29.0	3209 2058 2357 2770 3304 2147	3565 2227 2530 2979 3717 2340	nary nois nuse nade noin neil	48 48 48 48 48 48 48 48 48	16 16 16 16 18 18	A B C D A B	24.0 24.0 24.0 24.0 25.0 25.0	35.0 35.0 35.0 35.0 35.0 35.0 35.0	3365 3773 4668 5293 3488 3860	3520 3908 5008 5688 3632 4034
gareo gesa inier igab igadu igam	36 36 36 36 36 36 36 36	20 20 20 24 24 24 24	B C D A B C	25.5 25.5 25.5 27.5 27.5 27.5	29.0 29.0 29.0 29.0 29.0 29.0	2458 3059 3483 2328 2660 3284	2662 3477 3919 2583 2928 3782	nera onbius ostet ovia opiro oten	48 48 48 48 48 48 48 48	18 18 20 20 20 20	C D A B C D	25.0 25.0 26.0 26.0 26.0 26.0	35.0 35.0 35.0 35.0 35.0 35.0	4830 5492 3640 3956 5085 5762	5204 5926 3932 4218 5576 6312
igand	36 36 36 36 36 36 36	24 30 30 30 30 36 36	D A B C D A B	27.5 30.5 30.5 30.5 30.5 33.5 33.5	29.0 33.5 33.5 33.5 33.5 33.5 33.5 33.5	3755 2577 3112 3730 4301 2864 3511	4290 2011 3610 4405 5030 3311 4206	orgen oque onnie orios ollos orium	48 48 48 48 48 48 48 48 48 48 48	24 24 24 24 30 30 30	A B C D A B C	28.0 28.0 28.0 28.0 31.0 31.0 31.0	35.0 35.0 35.0 35.0 39.5 39.5 39.5	3916 4329 5449 6153 4379 5084 6110	4186 4599 6024 6818 4762 5737 6925
illa itude irem icar ieben itio idous	36 36 42 42 42 42 42 42	36 36 12 12 12 12 12 12	C D A B C D A	33-5 33-5 20.0 20.0 20.0 20.0 20.0 20.0	33-5 33-5 30.0 30.0 30.0 30.0 30.0 30.0	4228 4908 2243 2573 3037 3450 2491	5134 5947 2335 2669 3141 3554 2598	occia	8888888 4444488888	30 36 36 36 36 42 42	D A B C D A B	31.0 34.0 34.0 34.0 34.0 37.0 37.0	39.5 39.5 39.5 39.5 39.5 40.0 40.0	6929 4822 5642 6839 7755 5244 6161	7845 5398 6508 7990 9005 5930 7197
igra	42 42 42 42 42 42 42 42	14 14 14 16 16 16	B C D A B C D	23.0 23.0 23.0 24.0 24.0 24.0	32.0 32.0 32.0 32.0 32.0 32.0 32.0	2869 3406 4085 2591 2972 3541	2987 3546 4439 2721 3102 3706	ofer odis tigab toris tras trud	4888888	4 4 4 8 8 8 8	C D A B C D*	37.0 37.0 40.0 40.0 40.0 40.0	40.0 40.0 40.0 40.0 40.0 40.0	7428 8478 5578 6683 8102	8738 9988 6364 7977 9701
All weights a	re apr	proxi	mate.	*	Made	in stee	4547 el.					-			P-70-72

91



## Standard Flanged Special Castings for Water Standard Flanged Tees with Bases See Table No. 43 for Flange Diameters, Bolt Circles, Etc.

TABLE No. 56. Code Word, Enec

Code Terminal	Nom Dian Inc	ninal neter hes	Class	I	р	h	pprox. Veight Jounds	Code Terminal	Non Dian Inc	ninal neter hes	Class	1	р	h	.pprox. Veight ounds
	е	f					A\4		e	f					47H
ame aras atore anha atico	4 6 8 8	4 4 5 4 6	D D D D D	11 12 12 13 13	11 12 12 13 13	5.50 6.50 6.50 7.50 7.50	108 154 167 206 215	bili binal bini bio biros	20 20 20 20 20 20	8 10 10 12 12	D B D B D	19.0 19.0 19.0 19.0 19.0	19.0 19.0 19.0 19.0 19.0	15.0 15.0 15.0 15.0 15.0	1146 976 1171 1009 1221
avel afft anlon anls arca	8 10 10 10	8 4 6 8 10	D D D D D D D	13 14 14 14 14	13 14 14 14 14	7.50 9.00 9.00 9.00 9.00	235 311 329 340 360	brito brom buron borol bucu	20 20 20 20 20	14 14 16 16 18	B D B D B	19.0 19.0 19.0 19.0 19.0	19.0 19.0 19.0 19.0 19.0	15.0 15.0 15.0 15.0 15.0	1019 1256 1054 1286 1068
acile amus atum acho arii	12 12 12 12 12	4 6 8 10 12	D D D D D	15 15 15 15	15 15 15 15	IO O IO.O IO.O IO.O IO.O	430 444 460 477 506	bonne bril bunt back blolus	20 20 20 24 24 24	18 20 20 6 6	D B D B D	19.0 19.0 19.0 21.0 21.0	19.0 19.0 19.0 21.0 21.0	15.0 15.0 15.0 17.5 17.5	1310 1103 1338 1313 1600
abunt andum atur avero arizo	14 14 14 14 14	4 4 6 8	B D B D B	16 16 16 16 16	16 16 16 16	12.0 12.0 12.0 12.0 12.0	500 585 517 598 533	buls berto bolne card cana	24 24 24 24 24 24	8 10 10 12	B D B D B	21.0 21.0 21.0 21.0 21.0 21.0	21.0 21.0 21.0 21.0 21.0 21.0	17.5 17.5 17.5 17.5 17.5	1329 1616 1346 1641 1379
averi arate atorem anos abor	14 14 14 14 14	8 10 10 12 12	D B D B D	16 16 16 16 16	16 16 16 16 16	12.0 12.0 12.0 12.0 12.0	614 550 631 579 660	carlo cape clít cire dea	24 24 24 24 24 24	12 14 14 16 16	D B D B D	21.0 21.0 21.0 21.0 21.0 21.0	21.0 21.0 21.0 21.0 21.0 21.0	17.5 17.5 17.5 17.5 17.5	1691 1391 1726 1424 1754
abaris acity arage agno avate	14 14 16 16 16	14 14 4 6	B D B D B	16 16 17 17 17	16 16 17 17 17	12.0 12.0 13 0 13 0 13.0	581 687 642 742 655	del deral deros della dlcort	24 24 24 24 24 24	18 18 20 20 24	B D D B	21.0 21.0 21.0 21.0 21.0 21.0	21.0 21.0 21.0 21.0 21.0 21.0	17.5 17.5 17.5 17.5 17.5	1435 1940 1473 1975 1543
aclbus alite atlma andos barla	16 16 16 16 16	6 8 10 10	D B D B D	17 17 17 17 17	17 17 17 17 17	13.0 13.0 13.0 13.0 13.0	759 671 776 688 801	digii deur dra dolt dade	24 30 30 30 30	24 12 12 12 12	D A B C D	21.0 19.5 19.5 19.5 19.5	21.0 24.0 24.0 24.0 24.0 24.0	17.5 21.0 21.0 21.0 21.0	2070 1385 1580 1839 1960
barot basan basse bara beran	16 16 16 16 16	12 12 14 14 14	B D B D B	17 17 17 17 17 17	17 17 17 17 17 17	13.0 13.0 13.0 13.0 13.0	717 817 719 831 749	dangis darb dobs dofen dort	30 30 30 30 30	14 14 14 14 14 16	A B C D A	22.5 22.5 22.5 22.5 22.5 23.5	26.0 26.0 26.0 26.0 26.0	21.0 21.0 21.0 21.0 21.0 21.0	1565 1770 1935 2315 1660
bevel bero blas blam blolan	16 18 18 18 18	16 4 4 6 6	D B D B D	17 18 18 18 18 18	17 18 18 18 18	13.0 14.0 14.0 14.0 14.0	876 672 908 775 926	dalt dean dique dering dellos	30 30 30 30 30	16 16 16 18 18	B C D A B	23.5 23.5 23.5 24.5 24.5	26.0 26.0 26.0 26.0 26.0	21.0 21.0 21.0 21.0 21.0 21.0	1885 2160 2465 1735 1975
blate blone bonca bolla brona	81 18 18 18 18	8 8 10 10 12	B D B D B	81 81 18 18 18	18 18 18 18 18	14.0 14.0 14.0 14.0 14.0	791 942 808 967 837	ebam entib entis cola erem	30 30 30 30 30	18 18 20 20 20	C D A B C	24.5 24.5 25.5 25.5 25.5	26.0 26.0 26.0 26.0 26.0	21.0 21.0 21.0 21.0 21.0 21.0	2235 2565 1790 2035 2410
begl belag belas belge balk	81 18 18 18 18 18	12 14 14 16 16	D B D B D	18 18 18 18	18 18 18 18 18	14.0 14.0 14.0 14.0 14.0	983 843 1017 886 1052	etori etra etros enblu engo	30 30 30 30 30	20 24 24 24 24 24	D A B C D	25.5 27.5 27.5 27.5 27.5 27.5	26.0 26.0 26.0 26.0 26.0	21.0 21.0 21.0 21.0 21.0 21.0	2670 1990 2250 2700 2975
bell belon beure berd blene	18 18 20 20 20	18 18 6 6 8	B D B D B	18 18 19 19	18 18 19 19	14.0 14.0 15.0 15.0 15.0	894 1073 943 1130 959	engra erin ernol ernu elazo	30 30 30 30 30 36	30 30 30 30 12	A B C D A	30.5 30.5 30.5 30.5 30.5 19.5	30.5 30.5 30.5 30.5 27.0	21.0 21.0 21.0 21.0 21.0 24.5	2230 2590 3090 3510 1860
All weigh	ts are	appro	xinate.	1										P-	-71-72 A

## Standard Flanged Special Castings for Water

#### Standard Flanged Tees with Bases

See Table No. 43 for Flange Diameters, Bolt Circles, Etc.

#### TABLE No. 56-Continued. Code Word, Enec

Code Terminal	Nom Diam Incl	inal eter hes	Class	1	р	h	pprox. eight punds	Code Terminal	Non Dian Inc	ninal neter hes	Class	1	р	h	pprox. eight ounds
	e	f					Pop		е	f					PWA
estro esta erata erolla eriate	36 36 36 36 36	12 12 12 14 14	B C D A B	19.5 19.5 19.5 22.5 22.5	27.0 27.0 27.0 29.0 29.0	24.5 24.5 24.5 24.5 24.5 24.5	2005 2420 2805 2080 2360	kunger linos linw lock lack	42 42 42 42 42 42 42	20 24 24 24 24 24 24	D A B C D	26.0 28.0 28.0 28.0 28.0 28.0	32.0 32.0 32.0 32.0 32.0 32.0	28.0 28.0 28.0 28.0 28.0 28.0	4870 3300 3850 4740 5355
erarla escos ebas ently fod	36 36 36 36 36	14 14 16 16 16	C D A B C	22.5 22.5 23.5 23.5 23.5 23.5	29.0 29.0 29.0 29.0 29.0	24.5 24.5 24.5 24.5 24.5 24.5	2730 3215 2160 2450 2850	lard lake lamie lante lapel	42 42 42 42 42 42	30 30 30 30 36	A B C D A	31.0 31.0 31.0 31.0 34.0	36.5 36.5 36.5 36.5 36.5 36.5	28.0 28.0 28.0 28.0 28.0 28.0	3770 4270 5340 6075 4225
firn form falcon faut gabas	36 36 36 36 36	16 18 18 18 18	D A B C D	23.5 24.5 24.5 24.5 24.5 24.5	29.0 29.0 29.0 29.0 29.0	24.5 24.5 24.5 24.5 24.5 24.5	3440 2290 2590 3000 3530	laret larom latesi leaba leam	42 42 42 42 42 42	36 36 36 42 42	B C D A B	34.0 34.0 34.0 37.0 37.0	36.5 36.5 36.5 37.0 37.0	28.0 28.0 28.0 28.0 28.0 28.0	4795 5995 6850 4685 5625
gamos gareo gesa infer igab	36 36 36 36 36 36	20 20 20 20 24	A B C D A	25.5 25.5 25.5 25.5 27.5	29.0 29.0 29.0 29.0 29.0	24.5 24.5 24.5 24.5 24.5 24.5	2375 2690 3290 3715 2670	lien leat nary nois nuse	42 42 48 48 48	42 42 16 16 16	C D A B C	37.0 37.0 24.0 24.0 24.0	37.0 37.0 35.0 35.0 35.0	28.0 28.0 31.5 31.5 31.5 31.5	6715 7675 3795 4205 5100
igadu igam igand igar icell	36 36 36 36 36	24 24 24 30 30	B C D A B	27.5 27.5 27.5 30.5 30.5	29.0 29.0 29.0 33.5 33.5	24.5 24.5 24.5 24.5 24.5 24.5	3000 3625 4095 2915 3450	nade nion neil onbius	48 48 48 48 48 48 48	16 18 18 18 18	D A B C D	24.0 25.0 25.0 25.0 25.0	35.0 35.0 35.0 35.0 35.0	31.5 31.5 31.5 31.5 31.5 31.5	5725 3920 4290 5260 5920
icet illus iculo ioba illa	36 36 36 36 36	30 30 36 36 36	C D A B C	30.5 30.5 33.5 33.5 33.5 33.5	33.5 33.5 33.5 33.5 33.5 33.5	24.5 24.5 24.5 24.5 24.5 24.5	4070 4640 3265 3910 4630	ostet ovia opiro oten orgen	48 48 48 48 48 48	20 20 20 20 24	A B C D A	26.0 26.0 26.0 26.0 28.0	35.0 35.0 35.0 35.0 35.0	31.5 31.5 31.5 31.5 31.5 31.5	4070 4385 5515 6190 4465
itude irem icar ieben itio	36 42 42 42 42 42	36 12 12 12 12	D A B C D	33-5 20.0 20.0 20.0 20.0	33-5 30-0 30-0 30-0 30-0	24.5 28.0 28.0 28.0 28.0	5310 2480 2800 3270 3790	oque olare onnie orios ollos	48 48 48 48 48	24 24 24 30 30	B C D A B	28.0 28.0 28.0 31.0 31.0	35.0 35.0 35.0 39.5 39.5	31.5 31.5 31.5 31.5 31.5 31.5	4880 6000 6700 4930 5630
idous igra ilan iferos ibus	42 42 42 42 42 42	14 14 14 14 16	A B C D A	23.0 23.0 23.0 23.0 24.0	32.0 32.0 32.0 32.0 32.0 32.0	28.0 28.0 28.0 28.0 28.0	2720 3100 3630 4315 2820	orium occia oltoe ocol onet	48 48 48 48 48	30 30 36 36 36	C D A B C	31.0 31.0 34.0 34.0 34.0	39+5 39+5 39+5 39+5 39+5 39+5	31.5 31.5 31.5 31.5 31.5 31.5	6660 7480 5370 6190 7390
icant idity itivo ista idum	42 42 42 42 42 42 42	16 16 16 18 18	B C D A B	24.0 24.0 25.0 25.0	32.0 32.0 32.0 32.0 32.0 32.0	28.0 28.0 28.0 28.0 28.0 28.0	3205 3770 4441 2900 3350	obes ocet omen ofer odis	48 48 48 48 48	36 42 42 42 42 42	D A B C D	34.0 37.0 37.0 37.0 37.0 37.0	39-5 40.0 40.0 40.0 40.0	31.5 31.5 31.5 31.5 31.5 31.5	8400 5995 6910 8180 9220
itant ilage icolea iches kem	42 42 42 42 42 42	18 18 20 20 20	C D A B C	25.0 25.0 26.0 26.0 26.0	32.0 32.0 32.0 32.0 32.0 32.0	28.0 28.0 28.0 28.0 28.0 28.0	4130 4675 3080 3485 4305	tigab toris tras trud	48 48 48 48	48 48 48 48	A B C D*	40.0 40.0 40.0 40.0	40.0 40.0 40.0 40.0	31.5 31.5 31.5 31.5	6420 7530 8950

P-72 A

Large diameter tees and crosses with ribs, or with ribs and bolted through flats, or made in steel. See page 51. \* Made in steel.

All weights are approximate.





All weights are approximate.

0

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L-4987 P-68-73

Standard Flanged Special Castings for Water



Standard Flanged Reducers, 30 to 48 Inches TABLE No. 57-Continued

	Non	ninal			Th	icknes	s, Incl	hes						Weights	, Pounds	
Code	Inc	hes	Clas	is A	Clas	ss B	Cla	ss C	Clas	s D	v	8	Class A	Class B	Class C	Class D
	е	f	tı	t2	tı	t <sub>2</sub>	t1	t <sub>2</sub>	tı	t <sub>2</sub>			Code Enof	Code Enug	Code Epac	Code Eped
dering	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	18 18 20 20 24 24 20 24 24 20 24 24 20 24 24 20 20 24 24 20 20 20 20 20 20 20 20 20 20 20 20 20	.88 .88 .88 .88 .88 .88 .88 .88 .88 .99 .99	-755 -755 -860 -800 -800 -800 -800 -800 -800 -800	1.03 1.03 1.03 1.03 1.03 1.03 1.15 1.15 1.15 1.15 1.28 1.28 1.28 1.28 1.28 1.28 1.28 1.28	.755. .755. .800800. .800.	$\begin{array}{c} 1,20\\ 1,20\\ 1,20\\ 1,20\\ 1,20\\ 1,36\\ 1,36\\ 1,36\\ 1,36\\ 1,36\\ 1,36\\ 1,54\\ 1,57\\ 1,77\\$	.96 .96 1.03 1.03 1.16 1.16 1.16 1.03 1.20 1.20 1.20 1.20 1.20 1.20 1.20 1.20	1.37 1.37 1.37 1.37 1.37 1.58 1.58 1.58 1.58 1.58 1.58 1.78 1.78 1.78 1.78 1.78 1.78 1.78 1.7	.96 .96 1.03 1.03 1.16 1.16 1.03 1.16 1.37 1.37 1.37 1.37 1.37 1.37 1.35 1.37 1.35 1.37 1.35 1.37 1.35 1.37 1.35 1.37 1.35 1.37 1.35 1.37 1.35 1.37 1.35 1.37 1.35 1.37 1.35 1.37 1.35 1.37 1.35 1.37 1.35 1.37 1.35 1.37 1.35 1.35 1.35 1.35 1.35 1.35 1.35 1.35 1.35 1.35 1.35 1.35 1.35 1.35 1.35 1.35 1.35 1.35 1.35 1.55	26 66 66 66 66 66 32 66 36 66 36 66 36 66 36 66 36 66 36 66 36 66 36 66 36 66 36 66 36 66 36 66 36 66 6	* * * * * * * * * * * * * * * * * * * *	780 1462 834 936 1746 1897 1281 2096 1401 2286 1427 2515 1547 2515 1547 2515 1666 2801 1885 3052 2014 3246 5653 2235 3605 6258 2497 3747 6063	863 1612 908 1690 1021 1906 2305 1617 1590 2585 1734 2836 1734 2836 1734 2836 1734 2836 1734 2733 2689 6439 2459 2459 27	1019 1025 1090 2053 1232 2322 2322 2322 2322 2540 1099 2807 1885 3150 2074 3414 3414 3414 3450 2074 3415 3150 2074 3415 3150 2074 3415 3150 2074 3415 3150 2074 3415 3150 2074 3415 350 2074 3415 350 2074 360 2075 3712 2075 3712 2075 3712 3712 3712 3712 3712 3712 3712 3712	11111 2113 1179 2237 1310 2503 1703 2827 1867 3102 2016 2016 2016 2016 2016 2016 2016 2

Standard Flanged Off-sets

TABLE No. 58. Code Word, Epif



See Table No. 43 for flange diameters, bolt circles, et All weights are approximate.

Code Terminal	Nom'l Diam. Inches	Class	t	r	h	1	Approx. Weight Inches
ame	4 6 8 10 12 14 14 16 18 18 20 24		- 52 - 55 - 66 - 68 - 75 - 66 - 82 - 70 - 89 - 75 - 89 - 75 - 89 - 75 - 80 - 1.03 - 89 - 1.05 - 80 - 80 - 80 - 80 - 75 - 80 - 80 - 80 - 75 - 75 - 75 - 75 - 75 - 75 - 75 - 75	4 4 4 4 4 6 6 6 6 6 6 8 8 0 6	14 14 14 14 21 21 21 21 21 21 28 28 28 35 25	33.90 33.90 33.90 33.90 50.90 50.90 50.90 50.90 50.90 50.90 50.90 67.90 67.90 67.90 84.80 84.80	113 166 241 341 477 683 839 838 1050 968 1223 1340 1703 2134 2134

P-74



Blank Flanges 3-14 inches, no Ribs; 16-30 inches, 3 Ribs; 36-48 inches, 4 Ribs.

#### TABLE No. 59. Code, Epog

Code Terminal	Nominal Diam. Inches	Class	D	t1	t <sub>2</sub>	Approx. Weight Pounds
acet .	3	D	7.50	.65	.85	9
andi .	4	D	9.00	.65	.91	14
aca .	6	D	11.00	.70	.96	23
amus .	8	D	13.50	.75	1.03	36
bero .	10	D	16.00	.80	1.15	55
bio .	12	D	19.00	.85	1.26	84
eces .	14	B	21.00	.85	1.12	94
emur .	14	D	21.00	.90	1.36	108
eras	16	B	23.50	.90	1.18	127
eunt	16	D	23.50	1.00	1.47	151
evon	18	B	25.00	.95	1.26	150
evi	18	D	25.00	1.05	1.57	177
eppe .	20	B	27.50	1.00	1.33	194
enno .	20	D	27.50	1.15	1.68	234
iez .	24	B	32.00	1.05	1.47	278
idas .	24	D	32.00	1.25	1.87	341
icell . igar . illus . iculo .	30 30 30 30	A B C D	38.75 38.75 38.75 38.75 38.75	1.15 1.15 1.32 1.50	1.45 1.68 1.93 2.19	423 452 518 589
iila : itude : irem : itio :	36 36 36 36	A B C D	45.75 45.75 45.75 45.75 45.75	1.25 1.40 1.60 1.80	1.62 1.86 2.17 2.50	647 732 844 959
ldous . kem . kunger linos .	42 42 42 42	A B C D	52.75 52.75 52.75 52.75 52.75	1.40 1.50 1.75 1.95	1.78 2.05 2.44 2.80	955 1053 1238 1397
linu .	48	A	59.50	1.50	2.02	1328
lock .	48	B	59.50	1.65	2.26	1469
ioto .	48	C	59.50	1.95	2.70	1745
iow .	48	D	59.50	2.20	3.07	1975

Code Terminal	Nominal Diam. Inches	Class	D	S	Р	t₂	Approx. Weight Pounds
acet .	3	D	7.50	4.38	1.50	.85	9
andi .	4	D	9.00	5.50	1.63	.91	12
aca .	6	D	11.00	7.63	1.75	.96	18
amus	8	D	13.50	9.75	2,00	1.03	27
bero .	IO	D	16.00	12.00	2.25	1.15	40
bio .	12	D	19.00	14.13	2.38	1.26	60
eces .	14	В	21.00	16.50	2.50	1.12	76
emur	14	D	21.00	16.50	2,.50	1.36	84
eras .	16	В	23.50	18.50	2.63	1.18	90
eunt.	16	D	23.50	18.50	2.63	1.47	103
evon.	18	В	25.00	20.50	2.75	1.26	107
evi .	18	D	25.00	20.50	2.75	1.57	120
eppe.	20	В	27.50	22.50	2.75	1.33	128
еппо.	20	D	27.50	22.50	2.75	1.68	145
iez .	24	В	32.00	26.50	3.00	I.47	174
idas .	24	D	32.00	26.50	3.00	1.87	189

TABLE No. 60. Code, Epal

L-5232

These flanges can be chased for smaller pipes than given above.

For drilling, etc., of blank flanges and screw flanges, see Table No. 43.

All weights are approximate.

L-5232





Standard Curves, Bell and Spigot, for High Pressure Service. TABLE No. 65

			1/4 Curve	s. Co	de Wo	ord, Et	om	¼ Curve	s. Co	de Wo	rd, E	vag	<sup>1</sup> <sub>16</sub> Curves.	<sup>1</sup> <sub>16</sub> Curves. Code Word, Ev		
Nominal Diameter Inches	Class	t	Code Term'l	r	k	S	Approx, Weight Pounds	Code Term'i	r	k	s	Approx. Weight Pounds	Code Term'l	r	k	Approx. Weight Pounds
6 8 8 10 10 12 12 14 16 16 16 18 18 20 20 20 20 20 30 30 36 36	보고보내노대노대노대노대노대노대	.61 .69 .71 .80 .92 .89 1.06 1.08 1.27 1.17 1.39 1.27 1.17 1.51 1.45 1.55 1.73 1.80 2.02	atore	16 16 16 16 16 16 16 18 24 24 24 24 24 24 24 	22.60 22.60 22.60 22.60 22.60 22.60 22.60 25.50 34.00 34.00 34.00 34.00 34.00	8 8 10 12 12 12 12 12 12 12 12 12 12 12 12 12	153 178 237 273 353 409 466 548 637 746 922 1104 1138 1372 1361 1026 	atore	24 24 24 24 24 24 24 24 24 24 24 24 24 36 36 36 36 36 36 36 60 00 90	$\begin{array}{c} 18.40\\ 18.40\\ 18.40\\ 18.40\\ 18.40\\ 18.40\\ 18.40\\ 27.60\\ 27.60\\ 27.60\\ 27.60\\ 27.60\\ 36.70\\ 45.90\\ 45.90\\ 45.90\\ 68.90\\ 68.90\end{array}$	6666666666666666666	127 147 186 213 266 307 350 600 827 1030 824 1030 1228 1468 1978 2634 3038 4633 5255	deros etra etros igar Iceli	120 120 120 120 180 180	46.80 46.80 46.80 70.20 70.20	1797 2394 2686 4633 5255

Standard Sleeves for High Pressure Service. TABLE No. 66. Code Word, Evin

L-4857



atore         .         6         F         8.02         10         .75           acet         .         .6         H         8.18         10         .85           avel         .         .8         F         10.22         12         .85           arid         .         .8         H         10.40         12         .95           agus          10         H         12.64         12         1.05	ounds
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	81 93 126 141 171 189 239 274 324 379 393 461 583 571 583 571 583 571 1023 764 491 583 572 764 1023 1139 1389 1560

All weights are approximate.

L-4871



Standard Branches for High Pressure. TABLE No. 67

Code	Non Dian	ninal				Appro Wei Pou	ximate ight inds	Code	Non Dian	ninal				Appro We Pot	ximate ight inds
Terminal	Inc	hes	Class	1	р	3-Way	4-Way	Terminal	Inc	hes	Class	1	р	3-Way	4-Way
	e	f				Code Evon	Code Evup		e	f				Code Evon	Code Evup
atore ame atico anha avel atico atico atico atore atore atore atore anis atore achi arca anion achi achi atore acho acho akor	e 6 6 8 8 8 8 8 8 8 8 8 8 8 8 8 8 10 10 10 10 10 10 10 10 12 12 12 12 12 12	f 6 6 6 6 8 8 8 10 10 6 6 8 8 10 10	FHFHFH FHFHFH FHFHFH	12 13 13 13 13 13 13 13 13 13 13 13 14 14 14 14 14 15 15 15 15 15	12 12 13 13 13 13 13 13 13 13 13 14 14 14 14 14 14 15 15 15 15 15	order in steel	order in steel	barot basan basan bara beran bevel biolan biolan biolan biolan bonca bonca bolla bella belag belag belag belag belag belge balk	e 16 16 16 16 16 16 18 18 18 18 18 18 18 18 18 18 18 18 18	f 12 12 14 14 16 16 6 6 8 8 10 10 12 12 12 14 14 16 16 10 10 12 12 14 16 16 16 10 10 10 10 10 10 10 10 10 10	FHFHFH FHFHFH FHFHFH	17 17 17 17 17 17 17 17 17 17 17 17 17 1	17 17 17 17 17 17 17 17 17 17 17 17 17 1	order in steel .	order in steel
aril aca atur avero averi averi averi atorem atorem abor abor abaris acity avate alite alite andos barla	$\begin{array}{c} 12\\ 12\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14\\ 14$	12 6 6 8 8 10 10 12 12 14 14 14 6 6 8 8 10 10	FHFHFH FHFHFH FHFHFH	15 15 16 16 16 16 16 16 16 16 16 16 17 17 17 17 17	15 15 16 16 16 16 16 16 16 16 16 17 17 17 17 17	Made only to	Made only to	bell belon belon berd biene biil bini bini bio biros biros brito brom boroi boroi bucu bonne bril bril buru bonne bril bunt bunt	18 18 20 20 20 20 20 20 20 20 20 20 20 20 20	18 18 6 8 8 10 10 12 12 14 14 16 16 18 18 20 20	FHFHFH FHFHFHFHFH	18 18 19 19 19 19 19 19 19 19 19 19 19 19 19	18 19 19 19 19 19 19 19 19 19 19 19 19 19	Made only to	Made only to
Daria	10	10	н	17	17			bunt	20	20	Н	19	19	1	-4871

Standard Special Castings for High Pressure Service



Standard Reducers and Increasers

TA	BLF	No	68
1 0	DLL	TAO.	UC

	Non Dian Inc	ninal neter bes	Thi ne luc	ick- ss hes			Weig	;ht, Po	unds		Non Dian Inc	ninal neter hes	Thi ne lnc	ck- ss hes			Weig	ght, Po	unds
Code	е	f	t1	t <sub>2</sub>	Class	v	Spigot Ends	Large End Bell	Small End Bell	Code Termina	е	f	tı	tg	Class	v	Spigot Ends	Large End Bell	Small End Bell
							Code Fab	Code Falt	Code Fels								Code Fab	Code Falt	Code Fels
atico . atore . anion . aril .	8 8 10 10	6 6 6	.71 .80 .80 .92	.61 .69 .61 .69	F H F H	18 18 18 18	141 165 177 208	182 210 234 270	173 199 209 242	bolia . brona . begi . belag .	18 18 18 18	10 12 12 14	1.39 1.17 1.39 1.17	.92 .89 1.04 .99	H F H F	20 20 20 20	551 505 604 555	717 642 770 692	614 574 683 640
anis . abor . amus . abaris	10 10 12 12	8 8 6 6	.80 .92 .89 1.04	.71 .80 .61 .69	F H F H	18 18 18 18	207 240 218 258	264 303 287 336	247 286 250 292	belas . belge . balk . binal .	18 18 18 20	14 16 16 10	1.39 1.17 1.39 1.27	1.16 1.08 1.27 .80	H F H F	20 20 20 26	659 605 727 617	825 742 893 773	765 710 852 674
atum . aca . acho . alizo .	12 12 12 12	8 8 10 10	.89 1.04 .89 1.04	.71 .80 .80 .92	F H F H	18 18 18 18	248 290 284 333	317 369 353 412	289 336 341 396	bini . bio . biros . brito .	20 20 20 20	10 12 12 14	I.51 I.27 I.51 I.27	.92 .89 1.04 .99	H F H F	26 26 26 26	730 668 792 727	923 824 985 882	793 737 870 812
atur . avero . arizo . averi .	14 14 14 14	6 6 8 8	.99 1.16 .99 1.16	.61 .69 .71 .80	F H F H	20 20 20 20	281 328 313 362	366 433 398 467	313 362 353 408	brom . buron . boroi . bucu .	20 20 20 20	14 16 16 18	1.51 1.27 1.51 1.27	1.16 1.08 1.27 1.17	H F H F	26 26 26 26	856 784 935 856	1050 940 1129 1012	962 890 1061 993
arate . atorem anos . akor .	14 14 14 14	10 10 12 12	.99 1,16 .99 1,16	.80 .92 .89 1.04	F H F H	20 20 20 20	350 408 394 461	435 513 479 566	407 470 463 539	bonne . cape . cire . del .	20 24 24 24 24	18 14 16 18	1.51 1.45 1.45 1.45	1.39 .99 1.08 1.17	H F F	26 26 26 26	1024 895 953 1025	1217 1115 1173 1244	1189 980 1058 1161
avate . acibus alite . atima .	16 16 16 16	6 6 8 8	1.08 1.27 1.08 1.27	.61 .69 .71 .80	F H F H	20 20 20 20	331 396 362 430	436 521 467 555	363 430 403 476	deros . dering dellos . entls .	24 30 30 30	20 18 18 20	I.45 I.55 I.73 I.55	1.27 1.17 1.39 1.27	F E F E	26 26 26 26	1104 1231 1337 1310	1324 1536 1674 1615	1260 1367 1473 1465
andos . barla . barot . basan .	16 16 16 16	10 10 12 12	1.08 1.27 1.08 1.27	.80 .92 .89 1.04	F H F H	20 20 20 20	400 476 444 529	505 601 549 654	45 <sup>8</sup> 538 513 607	eola . etra . etros . erolla .	30 30 30 36	20 24 24 20	I.73 I.55 I.73 I.80	1.51 1.45 1.45 1.27	F E F E	26 26 26 32	1416 1479 1584 1872	1754 1784 1922 2290	1572 1698 1804 2028
basse bara biate bionne banea	16 16 18 18 18	14 14 8 8 10	1.08 1.27 1.17 1.39 1.17	.99 1.16 .71 .80 .80	F H F H F	20 20 20 20 20	494 584 424 506 462	599 709 560 671 598	579 689 464 551 518	eriate . eces . emur . eret . eras .	36 36 36 36 36	20 24 24 30 30	2.02 1.80 2.02 1.80 2.02	1.51 1.45 1.45 1.55 1.73	FEFEF	32 32 32 32 32 32	2048 2065 2240 2300 2596	2534 2482 2726 2718 3082	2203 2285 2460 2605 2934

S = 8 for all sizes.

All weights are approximate.

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L-4857

Standard Special Castings for High Pressure Service



## Standard Steel Tees with Flanged Branches, High Pressure Service\* TABLE No. 69. Code Word, Fer

Code Terminal	Nominal Diam., Ins.	Class	1	р	Approx. Weight Pounds	Code Terminal	Nom Diam.	inal , Ins	Class	1	р	Approx. Weight Pounds
atum ance arizo averi alite biate bione biene bill	12         8           12         8           14         8           16         8           18         8           18         8           20         8	F H F H F H F H	15 15 16 16 17 17 18 18 18 19 19	15 15 16 16 17 17 18 18 19 19	order in steel	darb	30 30 30 30 30 30 30 30 30 36 36 36	14 16 16 18 18 20 20 12 12 12 12 14	FEFEF EFEFE	18 19 20 20 21 21 15 15 18	26 26 26 26 26 26 26 26 26 27 27 27 29	order in steel
borne cana cape cire del del deur dra dangis	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	FFFF FFF FEFE	21 21 21 21 21 21 21 21 15 15 15 18	21 21 21 21 21 21 21 24 24 24 26	Made only to	eriate ebas ently form falcon gamos gareo igab igadu	36 36 36 36 36 36 36 36 36 36	14 16 16 18 18 20 20 24 24	FEFEF EFEF	18 19 20 20 21 21 23 23	29 29 29 29 29 29 29 29 29 29	Made only to

L-4967



Expansion Joint for High Pressure Service

Expansion Joint, High Pressure TABLE NO. 70. Code Word, Fil

Cod	еТ	Cerm	inal		Nom'l Díam. Inches	А	В	т	Approx. Weight Pounds
andi aca amus		• • •			4 6 8	5.00 5.00 5.50	15 17 18	-57 .61 .71	128 207 329
bio		:	• •	• •	10 12	6.00	19 20	.80	474 650

P-41

\*All flanges for high pressure service should be ordered "Tongue and Groove," or "Tongue and Recess." See Table No. 72. For diameter of flanges, bolt circles, etc., see Table No. 71.

All weights are approximate.

UNIT	ED	SТ	АТЕ	S	CAS	ST 1	RON	ΡI	ΡE	A N	D F	OUN	IDR 3	c c c	) M P	ANY					
										G	0000		0000								
1		Stan	dard	F1	angeo	l Pip	e for	High	Pro	essure	. 1	ABLE	No.	71**							
	Diam. s	lange	Bolt	olts	Class I	S-500-F	oot Head Code Wa	l, 217 Po	unds P	ressure	Class F-600-Foot Head, 260 Pounds Pressure										
Code Term'l	inal nche	n of F	1. of H Inche	ı of le, In of B		n of le, Ir of B	n of le, Ir of B	n of le, Ir	n of le, In	k- es	Weigl	ht, Poun	ds per	es of	Weight	N S C	Weig	ht, Pound	ds per	t of es	Weight
	Nom	Diam	Dian	No.	Thic nes Inch	Foot	Length	Single Flange	Diam Bolt Inch	Single Joint Lbs.	Thic nes Inch	Foot	Length	Single Flange	Diam Bol Inch	Single Joint Lbs.					
atore . avel . arca . arti . abarls . beran . bell . bril . dicort . engra . iculo .	6 8 10 12 14 16 18 20 24 30 36	12.50 15.00 17.50 20.00 22.50 25.00 27.00 29.50 34.00 41.50 48.50	10.63 13.00 15.25 17.75 20.00 22.50 24.50 26.75 31.25 38.00 44.75	12 12 16 16 20 20 24 24 28 32 36	.58 .66 .74 .82 .90 .98 I.07 I.15 I.31 I.55 I.80	37.74 54.66 78.74 104.15 133.08 165.00 202.32 222.18 328.52 484.71 674 19	496.00 718.00 1032.00 1366.00 1748.00 2173.00 2650.00 2939.90 4311.00 6443.00 8997.00	21.32 31.25 43.47 58.20 75.63 96.57 111.24 136.65 184.53 313.50 453.12	3/4 7/8 7/8 7/8 7/8 7/8 1 1 1/8 1 1/4 1 3/8 1 1/2	10.94 16.42 22.54 23.20 41.44 42.50 52.37 74.11 118.36 181.70 266.22	.61 .71 .80 .89 .99 1.08 1.17 1.27 1.45 1.73 2.02	39.52 60.61 84.67 112.43 146.22 180.79 219.81 262.52 361.64 537.94 748.72	519.00 794.00 1109.00 1474.00 1919.00 2381.00 2879.00 3450.00 4746.00 7126.00 9950.00	22.17 33.20 46.63 62.48 82.27 105.62 120.88 149.95 203.05 335.11 482.83	3/4 7/8 7/8 7/8 7/8 7/8 7/8 7/8 7/8 7/8 7/8	11.06 16.68 23.04 23.74 42.58 43.82 53.95 76.51 122.47 233.12 333.90					
21					Class (	Class G –700-Foot Head, 304 Pounds Pressure Class H–800-Foot Head, 347 Pounds Pressure															
atore	6	12 50	10.62	12	65	Code Word, Flob					60	45.00	Loae wo	ru, rus	1 3/.	11.42					
avel. arca aril. abaris. beran	8 10 12 14 16	12.50 15.00 17.50 20.00 22.50 25.00	13.00 15.25 17.75 20.00 22.50	12 16 16 20 20	.05 .75 .86 .97 1.07 1.18	42.05 65.05 92.54 124.63 160.16 199.16	500.00 848.00 1206.00 1625.00 2092.00 2608.00	22.80 33.91 48.08 64.91 84.98 108.98	7/8 7/8 I I I <sup>1</sup> /8	11.24 16.92 23.53 24.40 43.64 45.14	.09 .80 .92 1.04 1.16 1.27	45.22 68.79 98.47 132.91 172.58 214.94	591.00 898.00 1284.00 1734.00 2255.00 2812.00	24.04 36.08 51.13 69.43 91.86 116.43	74 78 78 1 1 1 <sup>1</sup> /8	11.42 17.28 24.02 34.62 44.86 63.76					

\* Flanges as ordered, per Table No. 72.



Tongue and Groove

Tongue and Groove Joint

TABLE No. 72

\* Flanges can be made either tongue and groove or tongue and recess, as shown in Table

No. 72.

Tongue and Recess Joint

Tongue and Recess

Todo Torminal	Nominal			Code Word	d, For		Code Word, Fres				
Joue Terminar	Inches	А	В	С	D	E	F	В	C	Е	F
atore	6	7.38	8.38	8.44	7.31	. 10	.13	8.38	8.44	. 19	.13
avel	8	9.38	10.63	10.69	9.31	.25	.10	10.63	10.69 .	.25	.19
arca	IO	11.25	12.75	12.81	11.19	.25	.19	12.75	12.81	.25	.19
arii	12	13.75	15.25	15.31	13.69	.25	.19	15.25	15.31	.25	. 19
ibaris	14	15.00	16.50	16.56	14.94	.25	.19	16.50	16.56	.25	.19
eran	16	36.75	18.50	18.56	16.69	.25	.19	18.50	18.56	.25	.19
ell	18	19.00	21.00	21.06	18.94	.25	.19	21,00	21.06	.25	.19
orii	20	21.00	23.00	23.06	20.94	.25	. 19	23.00	23.06	.25	.19
alcort, , , ,	24	25.50	27.50	27.56	25.44	.25	.19	27.50	27.56	.25	.19
engra	30	32.00	34.50	34.56	31.94	. 31	.25	34.50	34.56	.31	.25
сию, , , , ,	36	38.50	41.50	41.56	38.44	. 31	.25	41.50	41.56	.31	.25

For flange diameters, bolt circles and bolts, see Table No. 71 above.

J. B. L.-D 7



Standard Flanged Special Castings

For 250 Pounds Working Pressure



Standard Flanged 1/4 Curves\*

TABLE No. 73. Code Word, Frin-

Code Terminal	Nominal Diameter Inches	Class	t	L	Approx. Weight Pounds
ame . , .	4	F	.57	7.00	51
atore .	6	F	.61	8.50	93
avel	8	F	.71	10.00	159
arca	IO	F	.80	11.50	240
aril	12	F	.89	13.00	337
anos	14	F	.99	14.50	479
basse .	16	F	1.08	16.00	630
belge .	18	F	1.17	18.00	821
bucu .	20	F	1.27	20.00	. 1068
deros .	24	F	1.45	24.00	1647
	1				all's and the second

See note below regarding flanges.



P-30



#### Standard Flanged 1/8 Curves\*

TABLE No. 74. Code Word, Frol

Code Terminal	Nominal Diameter Inches	Class	t	L	Approx. Weight Pounds
ame	4	F	.57	4.50	53
atore .	6	F	.61	5.50	89
avel	8	F	.71	6.00	140
arca	10	F	.80	7.00	209
aril	12	F	.89	8.00	301
anos	14	F	.99	8.00	390
basse .	16	F	1.08	9.00	516
belge .	18	F	I.17	9.50	632
bucu .	20	F	1.27	10.00	780
deros .	24	F	1.45	11.50	1133

P-28

P-35

#### Standard Flanged Reducers\*

#### TABLE No. 75. Code Word, Frud

. Co	le Tei	min	al		Nominal Diameter Inches	Class	t	t <sub>2</sub>	L	Approximate Weight Pounds
aras					6 x 4	F	.61	.57	9	66
atico		-	÷ *		SX 0	F	.71	.01	11	112
acho					12 X 10	F	.89	.80	14	245
akor					14 X 12	F	.99	.89	16	347
basan					16 X 12	F	1.08	.89	16	398
bara	•	•			10 X 14	F	1.05	.99	10	445
boroi				-	20 X 16	F	1.27	1.08	20	680
bonne					20 X 18	F	1.27	I.17	20	753
della					24 X 20	F	1.45	1.27	22	1016

\*All flanges are "Tongue and Groove" or "Tongue and Recess" as shown in Table No. 72.

For flange diameters, bolt circles, etc., see Table No. 71.

All weights are approximate.

UNITED STATES CAST IRON PIPE AND FOUNDRY COMPANY Standard Flanged Special Castings-Continued For 250 Pounds Working Pressure Standard Flanged Tees and Crosses\* Standard Flanged Base Tees\* TABLE No. 76 TABLE No. 77. Code Word, Gan

Code Term'l	Nominal Diameter, In.	Class	L	L2	App We Pou Tee Code Furl	rox. ight nds Cross Code Fut
ame atore avel arca aril acity bevel belon deral	4 6 8 10 12 14 16 18 20 24	FFFFFFFFFF	7.00 8.50 10.00 11.50 13.00 14.50 16.00 18.00 20.00 24.00	$\begin{array}{c} 14.00\\ 17.00\\ 20.00\\ 23.00\\ 26.00\\ 29.00\\ 32.00\\ 36.00\\ 40.00\\ 48.00 \end{array}$	82 145	105 183

ch sizes are made in steel, to order only

#### Standard Flanged Y Branches

TABLE No. 78. Code Word, Ges

Code Terminal	Nom'l Diam. Inches	Class	A	B	L	Approx. Weight Pounds
ame    .    .      atore    .    .      avel    .    .      arca    .    .      aril    .    .      acity    .    .      bevel    .    .      belon    .    .      bunt    .    .	4 6 8 10 12 14 16 18 20 24	<b>FFFFFFFFF</b> FFFFFF	$\begin{array}{c} 13.50\\ 17.50\\ 20.00\\ 23.00\\ 26.50\\ 30.00\\ 33.00\\ 36.00\\ 38.00\\ 44.00\\ \end{array}$	3.00 4.00 5.00 5.50 6.00 6.50 7.50 8.00 8.50 I0.00	$\begin{array}{c} 16.50\\ 21.50\\ 25.00\\ 28.50\\ 32.50\\ 36.50\\ 40.50\\ 44.00\\ 46.50\\ 54.00\\ \end{array}$	97 188

\* All flanges are "Tongue and Groove" or "Tongue and Recess," as shown in Table No. 72.

For flange diameters, bolt circles, etc., see Table No. 71.

8 to 24-inch sizes are made in steel, to order only.

All weights are approximate.

\*Standard Flanged Y Branches

					8 to 24	-in
aril acity bevel belon bunt deral.	· · · · · · · · · · · · · · · · · · ·	12 14 16 18 20 24	FFFFF	13.00 14.50 16.00 18.00 20.00 24.00	26.00 29.00 32.00 36.00 40.00 48.00	

Code Term'l	17.41	Nominal Diameter, In.	Class	L	L2	Н
ame atore avel arca acity bevel . belon . bunt deral	• • • • • • • •	4 6 8 10 12 14 16 18 20 24	FFFFFFFFF	7.00 8.50 10.00 11.50 13.00 14.50 16.00 18.00 20.00 24.00	14.00 17.00 20.00 23.00 26.00 29.00 32.00 36.00 40.00 48.00	7.00 8.00 9.25 10.50 11.00 14.00 15.25 15.50 16.75 18.75

P-32

P-27

107 182

P---34
# Standard Bell and Spigot Gas Pipe

Standard Gas Pipe. The tables of standard gas pipe and the following tables of special castings, were adopted as the standard of the American Gas Light Association at the thirty-third annual meeting, held at Milwaukee, Wis., October 18th to 20th, 1905, and have been accepted by this Company as standards for gas pipe and specials. In Table No. 79 the thicknesses and weights for pipe are given for service under ordinary conditions. In Table No. 80 somewhat heavier pipe are listed, as used by many gas engineers for service in the larger cities and towns, under paved streets, and especially those on which the traffic is heavy. They are also preferably used for lines laid in newly made streets, or where the sub-soil conditions are such as to make the heavier pipe desirable. The past few years have shown a very marked increase in the quantity of these heavier pipe that is being put down. Evidently the lessened breakage and leakage resulting from their use is appreciated.

The two standards of bell differ only in joint room and in the form of the lead groove, and either class of pipe may be supplied to order, with either lead groove, as preferred. For cement joints, we make pipe with and without grooves, some of our friends preferring simply plain bells.

As to special castings, we are as rapidly as possible making the necessary preparation in new patterns, fixtures, etc., to enable us to supply any of the standards called for. Meanwhile, unless these standards are specified, we may furnish special castings from regular patterns of the nearest dimensions and weights. All weights for gas specials are estimated, and some castings, therefore, may exceed somewhat the usual variation percentages. All of our Standard Gas Specials are made with grooves in bells as shown in cut above Table No. 79.

Standard short length bell and spigot pipe in lengths to lay 12 inches, varying by 6-inch steps up to lengths to lay 72 inches, are classed as Special Castings. In ordering these short length bell and spigot pieces for gas pipe, Table No. 45 may be used with the code stem "Gonba" prefixed to the terminals.

Standard Flanged Pipe for Gas, see page 116.





TARLE	No	70	Code	Word	Gil
TUDE	TAO'	19.	Cout	W UIU.	, un

Code	Nominal Outsi	le Thickness	Diameter Inc	Diameter Sockets Inches		Depth Sockets Inches		Weight Ponnds per	
Terminal	Inches Inche	Inches	Pipe	Special Castings	Pipe	Special Castings	Foot	Length	
ame atore avel arca beran bril dicort engra	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{c} 0 & .40 \\ 0 & .43 \\ 5 & .45 \\ 0 & .54 \\ 0 & .54 \\ 0 & .62 \\ 4 & .68 \\ 2 & .76 \\ 4 & .85 \end{array}$	5.80 7.90 10.05 12.10 14.20 18.30 22.59 26.77 32.00	5.80 7.90 10.05 12.10 14.20 18.30 22.59 26.77 32.00	$ \begin{array}{r} 4.00 \\ 4.00 \\ 4.00 \\ 4.00 \\ 4.50 \\ 4.50 \\ 4.50 \\ 5.00 \\ 5$	$ \begin{array}{r} 4.00 \\ 4.00 \\ 4.00 \\ 4.00 \\ 4.50 \\ 4.50 \\ 4.50 \\ 5.00 \\ 5$	19.3 30.3 42.0 55.8 73.8 111.3 151.4 204.1 282.2	232 364 504 670 885 1334 1817 2449 3302	
iculo lieu tras	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	6 .95 0 1.07 0 1.26	39.21 45.45 51.75	39.21 45.45 51.75	5.00 5.00 5.00	5.00 5.00 5.00	379.0 497.3 664.0	4549 5967 7968	





P-- 56



TABLE INO. 00. COUC WORD,	ABLE	Gon
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Code	Nominal	Nominal Outside Thickne		Diameter Inc	Diameter Sockets Inches		Depth Sockets Inches		Weight Pounds per	
Terminal	Inches	Inches	Inches	Pipe	Special Castings	Pipe	Special Castings	Foot	Length	
ame	4	5.00	.42	5.80	5.80	4.00	4.00	20.0	240	
atore	6	7.10	.47	7.90	7.90	4.00	4.00	32.8	394	
avel	8	9.05	.49	9.85	9.85	4.00	4.00	45.3	544	
arca	10	11.10	.51	11.90	II.90	4.00	4.00	58.7	703	
aril	12	13.20	.57	14.00	14.00	4.50	4.50 "	76.1	913	
beran	16	17.40	.65	18.40	18.40	4.50	4.50	117.2	1406	
bril	20	21.60	.75	22.60	22.60	4.50	4.50	166.7	2000	
dlcort	24	25.80	.82	26.80	26.80	5.00	5.00	224.0	2688	
engra	30	32.00	I.00	33.00	33.00	5.00	5.00	323.9	3887	
iculo	36	38.30	1.05	39.30	39.30	5.00	5.00	442.7	5312	
lieu	42	44.50	1.26	45.50	45.50	5.00	5.00	581.3	6975	
tras	48	50.80	I.38	51.80	51.80	5.00	5.00	739.6	8875	

P-56A



Standard Special Castings for Gas



Standard 1/4 Bends, 4 to 24 inches

TABLE No. 81

	iam.					Approx. Pou	Weight
Code	nche	G	Н	I	K	2 Bells	1 Bell
	Nom					Code Grat	Code Gren
ame .	4	.40	4.50	15.00	3.00	61	51
atore .	6	.43	6.25	16.50	4.50	95	83
avel .	8	.45	8.00	18.00	6.00	139	123
arca .	IO	.49	9.75	19.50	7.50	185	169
aril .	12	.54	11.25	21.00	9.00	263	239
basse .	16	.62	14.50	24.00	12.00	449	406
bucu .	20	.68	17.75	27.00	15.00	667	608
deros .	24	.76	21,00	30.00	18.00		901



## Standard <sup>1</sup>/<sub>8</sub> Bends, Type 2 TABLE No. 84. Code Word, Grol

Code Terminal	Nom'l Diam. Inches	G	H ·	I	К	Approx. Weight Pounds
ame	4 6 8 10 12	.40 .43 .45 .49 .54	13.65 14.48 15.31 16.14 16.97	3.16 4.23 5.31 6.39 7.22	4 6 8 10 12	74 113 161 210 291
	-					P-6A

See notes on page 105.



## Standard <sup>1</sup>/<sub>4</sub> Curves, 24 to 48 inches TABLE No. 82. Code Word, **Grid**

Code Terminal	Nom'l Diam. Inches	G	К	R	s	Approx. Weight Pounds
deros etra igar lapel ocet	24 30 36 42 48	.76 .85 .95 1.07 1.26	42.40 50.90 67.90 84.80 93.32	30 36 48 60 66	12 12 12 12 12 12	1145 1782 2923 4544 6531



## Standard 1/8 Bends, Type 1

TABLE No. 83

	iam. s					Approx. Pou	Weight nds
Code	'1 D	G	Н	I	K	2 Bells	r Bell
	Nom					Code Gruf	Code Gur
ame .	4	.40	3.16	20.50	4	59	59
atore .	6	.43	4.23	21.50	6	- 90	94
avel .	8	.45	5.31	22.25	8	129	135
arca .	IO	.49	6.39	23.00	IO	168	182
aril .	12	.54	7.22	24.00	12	237	252
basse .	16	.62	9.12	25.00	16	397	407
bucu .	20	.68	II.03.	27.25	20	577	598
deros .	24	.76	,12.94	29.00	24		865
etra .	30	.85	15.67	31.50	30		1298
							P-3

See following page for 1/8 curves, 20 to 48-inch.

P-6

P-5

All weights are approximate.

### Standard Special Castings for Gas-Continued



Standar	d 1/8	Curves
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TABLE No. 85. Code Word, Guz

Code Terminal	Nom'l Diam. Inches	G	K	R	Approx. Weight Pounds
bucu	20	.68	36.70	48	601
	24	.76	45.90	60	960
	30	.85	45.90	60	1324
	36	.95	68.90	90	2443
	42	1.07	68.90	90	3204
	48	1.26	68.90	90	4248

P-4

## Standard 1/16 Bends, Type 1

TABLE No. 86

	iam. ss					Approx. Pou	Weight inds
Code Terminal	1 D nche	G	н	I	K	2 Bells	1 Bell
	I1 I1					Code Hal	Code Hed
ame . atore.	4	.40	2.69	20.25	6	58 87	58 91
avel.	8	.45	4.38	21.25	12	124	130
arca . aril .	10 12	.49	5.22	22.00	15 18	100 223	174 238
basse	16	.62	7.27	23.75	24	369	385
deros	20 21	. 68	8.71 10.16	24.75	30	530	550 787
etra .	30	.85	12.20	27.75	45		1164



## Standard <sup>1</sup>/<sub>16</sub> Bends, Type 2 TABLE NO. 87. Code Word, **Him**

Р---



See notes on page 105. All weights are approximate. See following page for  $\frac{1}{16}$  curves, 20 to 48-inch.

Code Terminal	Nom'l Diam. Inches	G	Н	I	K	Approx. Weight Pounds
ame	4	. 40	14.70	2.69	6	75
atore	6	. 43	15.53	3.53	9	114
avel	8	. 45	16.38	4.38	12	162
arca	10	. 49	17.25	5.22	15	211
aril	12	. 54	17.81	5.81	18	290

P-6B

### Standard Special Castings for Gas-Continued



# Standard 16 Curves



Code Te	rminal		Nominal Diameter Inches	G	К	R	Approximate Weight Pounds
bucu		 	20 24 30 36 42 48	.68 .76 .85 .95 1.07 1.26	37.50 46.80 46.80 70.20 70.20 70.20	96 120 120 180 180 180	602 960 1326 2443 3204 4248

P-2

## Standard Caps

### TABLE No. 89. Code Word, Hus



	Code	Ter	minal	1	Nominal Diameter Inches	D	F	G	Approx. Weight Pounds
ame atore avel arca aril basse bucu deros etra igar lapel ocet					 4 6 8 10 12 16 20 24 30 36 42 48	$\begin{array}{c} 5.80\\ 7.90\\ 10.05\\ 12.10\\ 14.20\\ 18.30\\ 22.59\\ 26.77\\ 32.99\\ 39.21\\ 45.45\\ 51.75\\ \end{array}$	$\begin{array}{c} 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.50\\ 4.50\\ 4.50\\ 5.00\\ 5.00\\ 5.00\\ 5.00\\ 5.00\\ 5.00\end{array}$	.40 .43 .49 .54 .62 .68 .76 .85 .95 1.07 1.26	24 35 50 63 92 152 219 314 467 665 936 1294

16 to 30, two ribs 36 to 48, three ribs

Lugs at center 12 to 24 inches, at side 30 to 48 inches

P-17

See notes on page 105. For plugs, hat flanges and bushings, see page 114.

For split sleeves, hub sleeves, solid sleeves, service sleeves, see page 113.

All weights are approximate.



Standard Tees and Crosses for Gas. TABLE No. 90

$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		Nom	inal	701 1-1						Weight,	Pounds	
Code Terminal         Image: Code Term		Diam Inch	eter ies	Inc	ness hes		1999	1	Cro	sses	Т	ees
A         B         C         D         C         D         C         Code Ibas         Code Ibas         Code Ibas         Code Ibbs         Ibbs         Ibbs         Ibbs	Code Terminal					H	1	J	4 Bells	3 Bells	3 Bells	2 Bells
affc		A	В	С	D				Code Ibas	Code ibet	Code ibiv	Code Iboc
aftion        10       4         10       6        10       8        10       8        10       8        10       8        12       11.0.0       24       326       326       326       326       326       326       326       326       326       326       326       327       345         aclie        12       4       6       54        14       13.00       20       44       64       415       337       345         atum        12       10        54        14       13.00       20       465       533       492       490       338       337       345         acho        12       10        54        14       14.00       20       553       492       490       338       337       345         atute        16       6         16       52        30       634       633       533       492       490       338       571         andos	ame	4 6 8 8	4 4 6 4 6 8	.40 .43 .43 .45 .45 .45	•40 •43 •43 •43 •43 •43	8 8 10 10 10	8.00 8.00 8.00 10.00 10.00 10.00	20 20 20 22 22 22 22	143 178 199 230 262 291	136 171 191 221 253 281	108 143 153 195 211 225	101 135 145 185 201 215
atum       .	afft	10 10 10 10 12 12	4 .6 8 10 4 6	•49 •49 •49 •49 •54 •54	.40 .43 .45 .49 .40 .43	12 12 12 12 12 14 14	11.00 12.00 12.00 12.00 13.00 13.00	24 24 24 26 26	286 328 366 406 399 426	280 322 360 400 387 415	249 273 291 312 357 370	243 267 285 305 345 359
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	atum	12 12 16 16 16	8 10 12 6 8 <b>1</b> 0	• 54 • 54 • 62 • 62 • 62	•45 •49 •54 •43 •45 •49	14 14 17 17 17	13.00 14.00 14.00 15.50 15.50 16.00	26 26 29 29 29	465 503 557 651 694 734	454 492 545 629 671 712	390 409 435 593 614 635	378 398 424 571 592 612
buron       . <td>barot</td> <td>16 16 20 20 20 20</td> <td>12 16 6 8 10 12</td> <td>.62 .62 .68 .68 .68 .68</td> <td>•54 •62 •43 •45 •49 •54</td> <td>17 17 19 19 19</td> <td>17.00 17.00 16.00 16.00 17.00 17.00</td> <td>29 29 31 31 31 31</td> <td>794 920 878 930 984 IOII</td> <td>771 898 850 902 957 983</td> <td>664 728 824 850 8<b>77</b> 890</td> <td>642 705 796 822 850 863</td>	barot	16 16 20 20 20 20	12 16 6 8 10 12	.62 .62 .68 .68 .68 .68	•54 •62 •43 •45 •49 •54	17 17 19 19 19	17.00 17.00 16.00 16.00 17.00 17.00	29 29 31 31 31 31	794 920 878 930 984 IOII	771 898 850 902 957 983	664 728 824 850 8 <b>77</b> 890	642 705 796 822 850 863
deros       .       .       .       24       20      76      68       21       21.00       33       1632       1585       1372       1326         dicort       .       .       .        24       24      76      76      76       21       21.00       33       1632       1585       1372       1326         deaw       .         30       10      85      49       15       23.00       27       1480       1432       1383       1327         deur <td>buron        </td> <td>20 20 24 24 24 24 24</td> <td>16 20 8 10 12 16</td> <td>.68 .68 .76 .76 .76 .76</td> <td>.62 .68 .45 .49 .54 .62</td> <td>19 19 21 21 21 21 21</td> <td>19.00 19.00 19.00 19.00 20.00 21.00</td> <td>31 31 33 33 33 33 33</td> <td>1170 1248 1266 1314 1375 1452</td> <td>1143 1220 1219 1267 1328 1405</td> <td>970 948 1189 1213 1244 1252</td> <td>943 920 1143 1167 1197 1204</td>	buron	20 20 24 24 24 24 24	16 20 8 10 12 16	.68 .68 .76 .76 .76 .76	.62 .68 .45 .49 .54 .62	19 19 21 21 21 21 21	19.00 19.00 19.00 19.00 20.00 21.00	31 31 33 33 33 33 33	1170 1248 1266 1314 1375 1452	1143 1220 1219 1267 1328 1405	970 948 1189 1213 1244 1252	943 920 1143 1167 1197 1204
entis       . <th>deros deav deav deav deav deav deav deav deav</th> <th>24 24 30 30 30</th> <th>20 24 10 12 16</th> <th>.76 .76 .85 .85 .85</th> <th>.68 .76 .49 .54 .62</th> <th>21 21 15 15 19</th> <th>21.00 21.00 23.00 23.00 24.00</th> <th>33 33 27 27 29</th> <th>1632 1717 1489 1550 1842</th> <th>1585 1670 1432 1489 1786</th> <th>1372 1398 1383 1411 1646</th> <th>1326 1351 1327 1355 1590</th>	deros deav deav deav deav deav deav deav deav	24 24 30 30 30	20 24 10 12 16	.76 .76 .85 .85 .85	.68 .76 .49 .54 .62	21 21 15 15 19	21.00 21.00 23.00 23.00 24.00	33 33 27 27 29	1632 1717 1489 1550 1842	1585 1670 1432 1489 1786	1372 1398 1383 1411 1646	1326 1351 1327 1355 1590
gamos         . <th>entis</th> <th>30 30 30 36 36</th> <th>20 24 30 12 16</th> <th>.85 .85 .95 .95</th> <th>.68 .76 .85 .54 .62</th> <th>21 23 26 15 19</th> <th>24.00 24.00 26.00 25.00 20.00</th> <th>34 36 41 27 29</th> <th>2086 2306 2669 1934 2235</th> <th>2051 2271 2677 1872 2173</th> <th>1811 1964 2187 1808 2073</th> <th>1776 1929 2195 1746 2011</th>	entis	30 30 30 36 36	20 24 30 12 16	.85 .85 .95 .95	.68 .76 .85 .54 .62	21 23 26 15 19	24.00 24.00 26.00 25.00 20.00	34 36 41 27 29	2086 2306 2669 1934 2235	2051 2271 2677 1872 2173	1811 1964 2187 1808 2073	1776 1929 2195 1746 2011
Iculo	gamos igab lgar lculo	36 36 36 36	20 24 30 36	•95 •95 •95 •95	.68 .76 .85 .95	21 23 26 29	27.00 27.00 27.00 29.00	34 36 41 44	2571 2846 3239 3684	2538 2813 3253 3708	2298 2493 2779 3084	2265 2459 2804 3108

## Standard Special Castings for Gas-Continued

Standard Tees and Crosses for Gas. TABLE No. 90-Continued

	Nominal	(Philebeau	A Start	115-14	1.1	1.1	Weight,	Pounds	2
	Diameter Inches	Inches			32.3	Cro	sses	Т	ees
Code Terminal			_ н	I	J	4 Bells	3 Bells	3 Bells	2 Bells
	A B	C D				Code Ibas	Code Ibet	Code Ibiv	Code Iboc
ibus	42         16           42         20           42         24           42         36           42         36           42         42           48         16           48         24           48         36           48         34           48         36           48         36           48         36           48         36           48         48           48         48	I.07         .62           I.07         .68           I.07         .68           I.07         .65           I.07         .95           I.07         I.07           I.26         .68           I.26         .68           I.26         .68           I.26         .95           I.26         .95           I.26         I.26           I.26         I.27	19 21 23 26 29 32 19 21 21 23 26 29 32 32 35	30.00 30.00 30.00 30.00 32.00 33.00 33.00 33.00 33.00 33.00 33.00 33.00 33.00	29 34 36 41 47 29 34 36 41 47 50	2960 3169 3487 3875 4390 4923 3616 3916 4290 4768 5332 5966 6720	2878 3125 3443 3907 4427 4954 3471 3023 4296 4877 5440 6075 6829	2733 2912 3147 3454 3828 4203 3429 3680 3968 4359 4794 5262 5793	2651 2869 3103 3486 3859 4235 3283 3688 3975 4468 4902 5370 5901



P-7

Standard Y Branches for Gas

See notes on page 105

#### TABLE No. 91

Code	Tern	nina			Nom Dian Inc	ninal neter hes	Thiel Inc	kness hes	н	I	J	K	Weight, 3 Bells	Pounds 2 Bells
				-	A	В	с	D					Code Icat	Code Icev
ame .					4	4	.40	.40	11.15	11.15	3.16	7.16	106	87
aras .					6	4	-43	.40	15.50	15.25	4.25	8.25	157	131
atore .					6	6	-43	-43	15.50	15.50	4.25	8.25	174	148
anha .					8	4	.45	.40	19.30	18.80	5.31	9.31	218	184
atico .	- *			•	8	6	.45	•43	19.30	19.05	5.3I	9.31	238	203
avel .			+		8	8	+45	-45	19.30	19.30	5.31	9.31	259	225
ant .		*	*	. 1	0	4	-49	.40	22.75	22.00	0.75	10.75	290	250
anion .		*	*	. 1	0	0	-49	-43	22.75	22.25	0.75	10.75	310	209
anis .					0	8	-49	-45	22.75	22.50	0.75	10.75	333	293
arca .					0	10	-49	-49	22.75	22.75	0.75	10.75	350	310
ache .			*		2	4	.54	.40	20.75	20,00	7.25	11.75	400	352
atum			*			8	. 54	-43	20.75	20.25	7.25	11.75	452	300
acho			•		2	TO	.54	-45	20.75	20.30	7.25	11.75	453	400
aril		-				10	- 34		26.75	26.75	7.25	11.75	518	465
beran .					6	16	.62	.62	33.13	33.13	0.12	13.62	883	708
bril					10	20	.68	.68	38.53	38.53	11.03	15.53	1208	1184
discort					14	24	.76	.76	43.00	43.00	13.00	18.00	1879	1723
engra .				. 3	0	30	.85	.85	52.50	52.50	13.75	18.75	2800	2684
iculo .				. 3	16	36	.95	-95	60.38	60.38	18.37	23.37	4269	4006
leaba .					12	42	1.07	1.07	70.00	70.00	22.00	27.00	6244	5899
tigab .	1				8	48	1.26	1.26	80.00	80.00	25.00	30.00	9104	8704



## Standard Reducers. TABLE No. 92

	Non	inal	Thiel	kness			Small	End	Bell		Large	End i	Bell		Both I	Ends H	Bell
Code	Inc	hes	Inc	hes	н		Code V	Word,	lcib		Code N	Word,	lcoc	(	Code V	Vord,	leud
Terminar	A	В	С	D		I	J	K	Approx. Weight Lbs.	I	J	K	Approx. Weight Lbs.	I	J	к	Approx. Weight Lbs.
acile arme aras anha atico aris anha atico anis andros barot binai bio buron cire deros entis etra eces eret infer illus iras	4 6 6 8 8 10 10 12 12 12 12 12 12 12 12 12 12 12 12 12	3 3 4 4 6 6 8 6 8 10 12 16 16 20 24 24 30 30 6 36 36 20	.40 .43 .43 .45 .45 .49 .49 .54 .54 .54 .54 .54 .62 .62 .62 .68 .68 .68 .68 .68 .68 .76 .76 .85 .95 1.07 1.26	-39 -39 -30 -30 -30 -43 -45 -43 -43 -43 -43 -43 -43 -43 -43 -43 -43	7.0 12.0 7.0 7.0 23.0 15.0 7.0 23.0 15.0 7.0 23.0 15.0 32.0 32.0 32.0 32.0 32.0 32.0 32.0 30.5 14.5 39.0 24.0 48.0 24.0 48.0	16.0 21.0 16.0 24.0 16.0 32.0 24.0 33.0 25.0 17.0 34.0 24.5 50.0 41.5 50.0 41.5 50.0 50.5 35.0 50.0 55.0 59.0 35.0	2.5 2.5 2.5 2.5 2.5 3.0 3.0 3.0 3.0 2.5 3.5 3.5 3.5 3.5 3.5 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	6.5 6.5 6.5 6.5 6.5 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 7.0 8.0 8.0 8.0 8.0 8.0 8.0 8.0 8.0 8.0 8	39 55 57 81 112 116 172 162 162 162 162 162 162 162 162 162 16	16.0 21.0 24.0 24.0 32.0 24.0 32.5 24.5 16.5 33.5 24.5 33.5 24.5 41.5 24.5 41.5 50.0 50.0 55.0 55.0 59.0	$\begin{array}{c} 6.5\\ 6.5\\ 6.5\\ 6.5\\ 6.5\\ 6.5\\ 7.0\\ 7.0\\ 7.0\\ 7.0\\ 7.0\\ 7.0\\ 7.0\\ 8.0\\ 8.0\\ 8.0\\ 8.0\\ 8.0\\ 8.0\\ 8.0\\ 8$	2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.5	45 60 64 100 90 143 132 115 199 181 158 353 347 540 540 540 540 545 711 568 415 711 545 946 107 1271 2242 2047	$\begin{array}{c} 12.0\\ 17.0\\ 20.0\\ 28.0\\ 20.0\\ 28.0\\ 20.0\\ 28.5\\ 20.5\\ 12.5\\ 37.5\\ 37.5\\ 37.0\\ 45.5\\ 37.0\\ 21.0\\ 37.0\\ 21.0\\ 37.0\\ 21.0\\ 30.0\\ 54.0\\ 30.0\\ 30.0\\ 54.0\\ 30.0\\$	2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.5 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.5 3.5 3.5 3.5 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0	2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.5 2.5	57 81 150 150 225 216 168 388 368 368 368 368 561 501 796 682 1228 1101 1833 1477 2447 2447 2447 2447 3210
						33.5	310			35.0	0.0	3.0	~~/4	30.5	3.0	5.0	
				P-	-9 B				P-oA								P-9

P--9 A

P-9

## Standard Reducers. TABLE No. 93. Code Word, Idav



Concentric Reducers for Holder Drips, Vertical Lines in Works, etc.

See notes on page	IOS.
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Code Terminal	Diameter Inches	Thickness Inches	HI	J	K	Approx. Weight Pounds
	A B	C D				
avero	14 4 14 6 18 8 18 10	.57 .40 .57 .43 .64 .45 .64 .49	20.0         32.0           20.0         32.0           20.0         32.0           20.0         32.0           32.0         32.0	4.0 4.0 4.0 4.0	8.0 8.0 8.0 8.0	169 191 269 294
cift	24 12 30 16 30 20 30 24	.76 .54 .85 .62 .85 .67 .85 .76	26.0         37.5           26.0         37.5           26.0         37.5           26.0         37.5           26.0         37.5           26.0         37.0	3.5 3.5 3.5 3.0	8.0 8.0 8.0 8.0	495 716 809 932
eret	36 30 42 36 48 42 54 48	.95 .85 1.07 .95 1.26 1.10 1.35 1.26	32.0 32.0 32.0 32.0 32.0 43.0 32.0 43.0	3.0 3.0 3.0 3.0	8.0 8.0 8.0 8.0	1414 1862 2473 3090
All weights are at	poroximate.					P-oD

II2

Standard Special Castings for Gas-Continued



Split Sleeve, Complete with Bolts TABLE No. 94. Code Word, Ideb

Code	eine		0	ц		Be	olts	ght nds
Term'l	In.	In.	In.	In.	In.	No.	Diam. In.	Wei
aca	2	3.38	.38	8.0	2.75	4	-75	29
acet	3	4.80	.39	12.0	2.75	6	.75	53
ame .	4	5.80	.40	12.0	2.75	6	.75	62
atore .	6	7.90	.43	12.0	2.75	6	.75	82
avel	8	10.05	+45	15.0	3.00	8	.75	125
arca	10	12,10	.49	15.0	3.00	8	.75	150
arie	12	14.20	-54	15.0	3.00	8	.75	185
basse .	16	18.30	.62	18.0	3.75	IO	.875	323
bucu .	20	22.59	.68	18.0	3.75	IO	.875	417
deros .	24	26.77	.76	18.0	3.75	10	.875	540
etra	30	32.99	.85	18.0	3.75	IO	.875	709
igar	36	39.21	.95	18.0	4.50	IO	1.00	934
lapel .	42	45.45	1.07	18.0	4.50	10	1.00	1189
ocet	48	51.75	1.26	18.0	4.50	10	1.00	1480

P-16



"R" indicates size of pipe for which the hole is tapped.

Service Sleeve, Complete with Bolts TABLE No. 96. Code Word, Idoc

aca         .         2         3.38         2.35         .38         8         2.75         1.25         20           acet         .         3         4.80         3.40         .38         12         2.75         1.50         29           acet         .         3         4.80         3.40         .38         12         2.75         1.50         29           amis         .3         4.80         3.40         .38         12         2.75         1.50         54           amie         .4         5.80         3.85         40         12         2.75         1.50         54           ame         .         4         5.80         3.65         40         12         2.75         2.00         63           atore         .6         7.90         5.27         4.3         12         2.75         3.00         88           avel         .         8         10.05         6.37         -45         15         3.00         3.00         130	Code	Size	A	b	G	H	J	R	Wgt.
	Term'l	In.	In.	In.	In.	In.	In.	In.	Lbs.
	aca amus acet ani . ame atore . avel	2 2 3 3 4 6 8	3-38 3-38 4-80 4-80 5-80 7-90 10-05	2.35 2.35 3.40 3.40 3.85 5.27 6.37	.38 .38 .38 .38 .40 .43 .45	8 8 12 12 12 12 12 15	2.75 2.75 2.75 2.75 2.75 2.75 2.75 3.00	1.25 1.50 1.25 1.50 2.00 3.00 3.00	20 29 54 54 63 88 130







Hub Sleeve, Complete with Bolts TABLE No. 95. Code Word, Idic

Code	Size	A	B	G	H	J	S	Wgt.
Terminal	In.	In.	In.	In.	In.	In.	In.	Lbs.
arca agus asis basse bara bucu bonne . bunt	10 X 4 10 X 6 12 X 4 12 X 6 16 X 8 20 X 6 20 X 8 20 X 10	$\begin{array}{c} 12.10\\ 12.10\\ 14.20\\ 14.20\\ 18.30\\ 18.30\\ 22.59\\ 22.59\\ 22.59\\ 22.59\end{array}$	6.55 6.55 7.64 7.64 9.80 9.80 11.97 11.97 11.97	.49 .54 .54 .62 .62 .68 .68 .68	15 18 15 18 18 18 18 18 18	3.00 3.00 3.00 3.75 3.75 3.75 3.75 3.75 3.75	4.00 6.00 4.00 6.00 8.00 6.00 8.00 10.00	173 201 207 239 351 363 443 454 462

May be ordered Double Hub. Add terminal to code word, Idim.



#### Solid Sleeve



Code	Те	rmi	inal		Size In.	A In.	G In.	H In.	Wgt Lbs
aca .					2	3.38	.38	8	17
acet .					3	4.80	.39	12	35
ame .					4	5.80	.40	12	44
atore					6	7.90	.43	12	63
avel .					8	10.05	.45	15	97
arca .					IO	12.10	.49	15	119
arie .					12	14.20	.54	15	153
basse				1	16	18.30	.62	18	268
bucu					20	22.59	.68	18	359
deros	+	+		-	24	26.77	.76	18	478
etra .				1	30	32.99	.85	18	646
igar .		+			36	39.21	.95	18	848
lapel					42	45.45	1.07	18	1103
ocet .	-	•			48	.51.75	1.26	18	1391
	-	-	-	-					D.



### Plugs. TABLE No. 98. Code Word, Ifab

Code	Size	A	G	H	Q	Weight
Terminal	In.	In.	ln.	In.	In.	Pounds
acet ame atore avel arca arli beran . berli dicoft . engra . icujo leaba . tigab	3 4 6 8 10 12 16 20 24 30 36 42 48	3.80 4.80 6.90 9.05 11.10 13.20 17.20 21.34 25.52 31.74 37.96 44.20 50.50	.40 .43 .43 .49 .54 .62 .68 .76 .85 .95 I.07 I.26	5.25 5.25 5.25 5.25 5.25 5.25 6.00 6.50 6.50 6.50 6.50 6.50	4.00 4.00 6.00 8.00 10.00 22.00 36.00 60.00 78.00 90.00 120.00 120.00	6 9. 15 23 34 56 91 133 197 308 453 657 947

For Caps, see page 109.





Not machined.

P---14

Hat Flanges are adapted for connecting small line to large main already in use, or may be used in new work.

### TABLE NO. 100

## Bushings. Code Word, Ifid

Code	Size	A	B	C	H	Weight
Terminal	In.	In.	In.	In.	In.	Pounds
atore ame avel aclty aca abans . aril bell brll	6 x 3 6 x 4 8 x 4 8 x 6 10 x 6 10 x 8 12 x 6 12 x 8 12 x 10	4.60 5.80 5.80 7.90 7.90 10.05 7.90 10.05 12.10	6.65 6.65 8.80 10.85 10.85 12.95 12.95 12.95	6.90 6.90 9.05 9.05 11.10 13.20 13.20 13.20	4.50 4.50 4.50 4.50 4.50 4.50 4.50 5.00 5.00 5.00	21 12 32 16 44 19 64 61 26

P-10





#### Standard Flanged Pipe for Gas



#### TABLE No. 104. Code Word, Igit

Code	Code Terminal Inches		Flange Diameter	Flange Thickness	Diameter Bolt	No. of	Size of Bolts	Weig Pounds	ght s per	Weight Pounds
Terminar	Inches	Inches	Inches	Inches	Inches	Bonts	Inches	Foot	Length	Single Flange
ame	4	.40	9.00	. 72	7.13	4	. 625	17.22	224	8.94
atore	6	.43	11.00	.77	9.13	4	625	27.27	351	12.14
avel	8	.45	13.50	.81	11.13	8	.625	34.94	489	17.38
arca	IO	.49	16.00	.86	13.75	8	. 625	50.95	659	24.29
aril	12	- 54	19.00	- 93	15.75	8	. 625	67.02	876	36.61
beram	16	. 62	22.50	I.00	20.00	12	• 75	100.38	1296	44.49
bril	20	.68	27.00	1.00	24.50	16	.75	137.72	1766	57.79
dicort	24	. 76	31.00	I.13	28.50	16	- 75	184.45	2358	73.38
engra	30	.85	37.50	1.25	35.00	20	.875	257.34	3294	104.57
iculo	36	• 95	44.00	1.38	41.25	24	. 875	344.60	4417	142.31
lien	42	1.07	50.75	1.56	47.75	28	1,00	452.34	5828	201.86
tras	48	1.26	57.00	1.75	54.00	32	1.00	608.02	7801	254.02

 $P_{-75}$ NOTES—Pipe made in 12-foot lengths and faced  $\frac{1}{10}$  inch short for gaskets. All dimensions in inches. Above are neat finished weights. Allowance must be made for variation and finish.





Code, Ilad



Code, Ilef



Short sections of flanged pipe for gas with lengths as shown in Tables Nos. 44, 45 and 46, will be furnished for gas with flange and other dimensions, as shown in above table. Use same code terminal as given in Tables Nos. 44, 45 and 46.



				<b>]</b>	Star	ndaro g	d Flai	nged S	special	Cast	tings	s fo	r Gas				
				- c -	<b>3</b>	— C		ŝ	Standar See Te	dF 7	lang ABL 0. 104 C	ed E N for F	Tees No. 10 lange D s, etc.	and 08 ,	Cros	ses	
Code	Non Dian Inc	ninal neter hes		Thic	kness hes		Approx Poi	Weight	Cada	Nom Dian Inc	inal neter hes		Thick	ness hes		Approx Por	. Weight inds
Term'l	A	В	С	t1	t <sub>2</sub>	R	Tees Code Meg	Crosses Code Mil	Term'l	A	В	С	t1	t <sub>2</sub>	R	Tees Code Meg	Crosses Code Mil
ame . aras . atore atico . avel . anlon . arca . atum . arca . aril . andos . barot . beran . blo .	4 6 8 8 10 10 10 12 12 12 12 12 12 16 16 16 20 20	4 6 6 8 10 8 10 12 10 12 16 12 16	6 8 8 10 11 11 12 12 12 12 14 14 14 18 18	.40 .43 .43 .45 .45 .45 .49 .49 .54 .54 .54 .54 .62 .62 .68 .68	.40 .43 .43 .45 .43 .45 .43 .45 .49 .45 .49 .54 .62 .54 .62	$\begin{array}{c} 2.00\\ 3.00\\ 3.00\\ 3.00\\ 3.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 4.00\\ 5.00\\ 5.00\\ 5.00\\ \end{array}$	49 79 82 125 130 174 187 246 262 269 375 399 396 644 667	63 98 104 155 204 232 237 286 317 330 429 476 470 715 809	bril . cire deros . dicort . entis . etra . igab . igar . iculo . lard . lapel . leaba . oltoe . ocet . tigab .	20 24 24 30 30 36 36 36 36 36 42 42 42 42 48 48 48 48	20 16 20 24 20 24 30 36 30 36 42 36 42 48	18 20 20 24 24 29 29 29 29 32 32 32 35 35 35	.68 .76 .76 .85 .85 .85 .95 .95 .95 .95 .95 1.07 1.07 1.26 1.26	.68 .62 .68 .76 .85 .76 .85 .95 .95 .95 .95 1.07 1.26	$\begin{array}{c} 5.00\\ 5.00\\ 5.00\\ 5.00\\ 5.00\\ 5.00\\ 5.50\\$	653 874 923 897 1393 1466 1442 2171 2302 2272 3118 3262 3193 4447 4570 4544	$\begin{array}{c} 779\\ 980\\ 1086\\ 1044\\ 1556\\ 1698\\ 1654\\ 2291\\ 2660\\ 2660\\ 3442\\ 3704\\ 3585\\ 4842\\ 5099\\ 5041 \end{array}$

CAST IRON PIPE

16 1 x

UNITED

STATES

## Standard Flanged Base Tees TABLE No. 109. Code Word, Mold

P-76

AND FOUNDRY COMPANY

Code Term'l	No Dian	m'I 1., In.	с	Thicl Inc	ness hes	R	Н	Approx. Weight	Code Term'l	No Dian	om'l 1., In.	с	Thiel Inc	kness hes	R	н	Approx. Weight
	A	В		t <sub>1</sub>	t <sub>2</sub>			Pounds		A	В	1944	t <sub>1</sub>	t <sub>2</sub>			Pounds
ame .	- 4	4	6	.40	.40	2.00	7.00	63	bril .	20	20	18	.68	.68	5.00	16.75	880
aras . atore .	6	4	8	-43	.40	3.00	8.00	103	deres .	24	10	20	.76	.62	5.00	18.75	1203
atico .	8	6	IO	-45	.43	3.00	9.25	161	dicort .	24	24	20	.76	.76	5.00	18.75	1226
avel .	8	8	IO	• 45	•45	3.00	9.25	168	entis .	30	20	24	.85	.68	5.00	22.00	1921
anis .	10	8	11	.49	•45	4.00	10.50	243	engra .	30	30	24	.85	.85	5.00	22,00	1970
arca .	10	10	II	•49	•49	4.00	10.50	248	lgab .	36	24	29	.95	.76	5.50	25.50	2979
acho .	12	10	12	• 54	•45	4.00	11.00	323	iculo .	36	36	29	.95	.95	5.50	25.50	3080
avil .	12	12	12	-54	•54	4.00	11.00	346	lard .	42	30	32	1.07	.85	5.50	29.00	4309
barot .	16	10	14	.62	•49	4.00	15.25	520	leaba .	42	42	32	1.07	1.07	5.50	29.00	4453
beran .	16	16	14	.62	.62	4.00	15.25	549	oltoe .	48	36	35	1.26	.95	5.50	33.00	6272
buron .	20	16	18	.68	.62	5.00	16.75	. 894	tigab .	48	42	35	1.26	1.26	5.50	33.00	6379
A11 x	veight	s are	appro	vimate	2						1		1				P-77

IIS

See Table No. 104 for Flange Diameters, Bolt Circles, etc.

UNITED	STATES C	AST 1	ROM	N PIP	E A	ND F	OUN	DRY	CON	IPANY
Cast Iron Pipe Columns. TABLE No. 110										
	Code Terminal for Length	D	4-In Code W Base Casting Squar 65 I	ch Pipe Vord, Mone and Top 5, 10 Inches e, Weight Pounds	6-In Code W Base Casting Squar roo	ch Pipe Yord, <b>Mopa</b> and Top 7, 12 Inches e, Weight Pounds	8-In Code W Base Casting Squar 145	ch Pipe Vord, <b>Mulo</b> and Top 7, 14 Inches e, Weight Pounds	Base Casting Squar 200	nch Pipe Vord, <b>Mumi</b> and Top 5, 16 Inches e, Weight Pounds
- <i>D</i>	cions cure jaison jarius dation dator dear debit demus descas sbalg	6'0" 6'6" 7'0" 7'-6" 8'-0" 8'-0" 9'-0" 9'-0" 10'-0" 10'-6" 11'-0"	Wght, 160 171 183 194 206 217 229 240 251 262 274 285	Load 56070 54130 52190 50250 48320 46440 44590 42800 41050 39360 37730 36160	Wght. 245 262 280 298 316 333 351 368 386 404 421 439	Load 100100 98310 96270 94100 92040 89820 87620 85450 83260 81040 78840 76700	Wght. 359 385 410 436 462 487 513 539 564 590 615 642	Load 164410 162400 160350 158200 158200 153600 153600 151200 148760 148760 146260 143700 141160 138570	Wght. 428 464 500 535 571 607 643 678 714 750 785, 821	Load 224200 222300 220300 218300 218300 216200 213900 213900 213900 209300 209300 204500 204500 202200 199800
	smuff	12 —0" 12'—6"	297 308	34070 33220	457 474	74580	692	135920 133340	857 893	197400

Add weight of base and top castings for complete weight of column. Load based on Gordon's formula. Factor of safety, 8. Ends of pipe are machined. Tops and bases furnished without bolt holes unless otherwise ordered. When required, top and base castings arranged with central holes for long bolt for tying to floors or roof.

#### Standard Screw Plugs for Gas and Water Mains (Patented June 4, 1901)

### TABLE No. 111. Code Word, Myrt

Code Terminal	Size	Weight, Pound			
alon	3	7			
ame	4	IO			
atore	-6	18			
avel	- 8	26			
arca	ю	43			
aril	12	56			

All weights are approximate.

T



### Capacity of Cast Iron Pipe

Diameter in Inches	Diameter in Feet	United States Gallons of 231 Cubic Inches	Weight of Water Pounds	Square Root of Diameter in Feet	Diameter in Inches	Diameter in Feet	United States Gallons of 231 Cubic Inches	Weight of Water Pounds	Square Root of Diameter in Feet
I	.0833	. 0408	. 3395	.289	25 .	2.083	25.50	212.20	I.443
2	. 1667	.1632	1.358	.408	26	2.167	27.58	229.51	I.472
3	.2500	. 3672	3.055	. 500	27	. 2.250	29.74	247.51	I.500
4	• 3333	.6528	5.432	.579	28	2.333	31.99	266.18	1.528
5	.4167	1.020	8.488	.645	29	2.417	34.31	285.53	I.555
6	. 5000	1.469	12.223	. 707	30	2.500	36.72	305.57	1.581
7	. 5833	I.999	16.636	. 764	31	2.583	39.21	326.27	I.607
8	.6667	2.611	21.729	. 817	32	2.667	41.78	347.66	1.633
9	.7500	3.305	27.501	.866	33	2.750	44.43	369.74	1.658
ю	.8333	4.080	33.952	.913	34	2.833	47.16	392.48	I.683
II	.9167	4.937	41.082	.957	35	2.917	49.98	415.90	1.708
I 2	Ι.	5.875	48.891	I.000	36	3.	52.88	440.00	I.732
	-								
13	1.083	6.895	57.379	1.041	37	3.083	55.86	464.80	1.756
14	1.167	7.997	66.545	1.080	38	3.167	58.92	490.24	I.779
15	1.250	9.180	76.392	1.118	39	3.250	62.06	516.40	1.803
16	1.333	10.44	86.916	1.155	40	3.333	65.28	543.24	1.825
17	1.417	11.79	98.121	1.190	41	3.417	68.58	570.72	1.849
18	1,500	13.22	IIO.	I.224	42	3.500	71.97	598.92	1.871
19	1.583	14.73	122.56	1.258	43	3.583	75.44	627.81	1.894
20	1.667	16.32	135.81	1.291	44	3.667	78.99	657.32	1.915
21	1.750	17.99	149.73	1.323	45	3.750	82.62	687.56	1.937
22	1.833	19.75	164.33	1.354	46	3.833	86.33	718.40	1.958
23	1.917	21.58	179.60	1.384	47	3.917	90.13	750.06	1.979
24	2.	23.50	195.56	1.414	48	4.	94.00	782.24	2.000

Table of contents in cubic feet and United States gallons, and weight of water (at 62½ pounds per cubic foot) contained in one foot lengths of different internal diameters of pipe, and square root of diameter in feet

For larger diameters than those given, take one-half the size required from the table, and multiply by 4; so also with gallons and weights.

#### Capacity of Cisterns

#### Capacity of Cisterns of different diameters and different depths in United States gallons, 231 cubic inches

Diameter Feet	Depth, Feet	United States Gallons, 231 Cubic Inches	Cubic Feet	Diameter Feet	Depth, Feet	United States Gallons, 231 Cubic Inches	Cubic Feet
12 14 16 18 20 22	8 9 9 10 10 10 11	6769 10359 13535 19034 23499 31277	905 1385 1810 2545 3142 4181	24 26 28 30 32 34	12 13 14 15 16 17	40607 51628 64481 79310 96253 115451	5429 6902 8621 10603 12868 15435

#### COMPANY STATES CAST IRON PIPE AND FOUNDRY UNITED

						I	,000	Fee	et of	Lei	ngth								
ons	ons per our	4-	inch Pi	pe	6-1	inch Pi	pe	8-i	nch Pij	pe	10-İ	nch P	ipe	12-1	nch P	ipe	14-	inch I	Pipe
S. Galla harged finute	S. Gall harged enty-fo Hours	city eet	Fric.	Head	Fric. Head		city	Fric.	Head	city	Fric.	Head	city	Fric.	Head	city	Fric.	Head	
U. S Disc	U. S Discl	Velo in F	Feet	Lbs.	Velo in F	Feet	Lbs.	Velo in F	Feet	Lbs.	Velc in F	Feet	Lbs.	Velo in F	Feet	Lbs.	Velc in I	Feet	Lbs.
25 50	36,000 72,000	.64 1.28	.59 2.01	.26 .87	.28 .57	.11	.05 .14	. 16 . 32	.04 .10	.02 .04	.10	.02 .04	.01 .02	.07	.01 .02	.01	. 10	.01	
100 150	144,000 216,000	2.55	7.30	3.19 6.95	1.13	1.08	·47 ·99	.96	.29	.13	.41	.11	.05	- 43	.05	.02	.31	.03	.01
200	288,000	5.11	28.09	12.17	2.27	3.92	1.70	1.28	1.01	.44	.82	.36	.16	•57	.16	.07	-42	80.	.04
300	432,000	7.66	62.20	26.94	3.40	8.52	3.69	1.91	2.13	.92	1.23	.75	'32	.85	.32	.14	.63	. 16	.07
350	504,000	8.91	84.26	36.50	3.97	11.48	4.97	2.23	2.85	1.24	1.43	.99	•43	.99	•43	.18	.73	.21	,09
400	576,000	10.21	109.68	47.50	4.54	14.89	6.45	2.55	3.68	1.59	1.63	1.27	.55	1.13	.54	.23	.83	.27	.12
450	720,000	11.49	138.43	59.90	5.67	23.01	9.97	3.19	5.64	2.44	2.04	1.93	.84	1.42	.81	.35	1.04	·35 .40	.14
600	864,000	15.32	244.76	106.02	6.81	32.89	14.25	3.83	8.03	3.48	2.45	2.72	1.18	1.70	1.14	•49	1.25	.55	.24
700	1,008,000	17.87	332.36	143.98	7.94	44-54	19.08	4.47	10.83	4.69	2.86	3.66	1.58	1.98	1.52	.66	1.46	.73	.32
800	1,152,000				9.08	57.95	31.67	5.09	14.05	7.60	3.68	4.73	2.05	2.27	2.45	1.06	1.88	.94 1.17	.41 .51
1,000	1,440,000				11.35	90.05	38.99	6.38	21.74	9.41	4.08	7.28	3.15	2.84	3.00	1.30	2.08	1.43	.62
1,200	1,728 000				13.61	129.20	55.96	7.66	31.10	13.47	4.90	10.38	4.50	3.40	4.26	1.85	2.50	2.02	.88
1,400	2,016,000				15.88	175.38	75.97	8.94	42.13	18.25	5.72	14.02	6.07	3.97	5.74	2.49	2.91	2.72	1.18
1,800	2,592,000				20.42	288.90	125.14	11.47	69.22	29.98	7.35	22.96	9.95	5.11	9.36	4.06	3.75	4.41	1.91
2,000	2,880,000				22.60	356.22	154.30	12.77	85.27	36.93	8.17	28.25	12.34	5.67	11.50	5.00	4.17	5.41	2.34
2,500	3,600,000							15.96	132.70	57.49	10.21	43.87	19.00	7.09	17.82	7.72	5.21	8.35	3.62
3,000	4,320,000						-					ourge.	-/3		-3.3-		01-5		3.4
3,500	5,040,000				*****									9.93	34.58	14.98	7.29	10.14	0.99
4,500	6,480,000																9.38	26.49	11.47
		16	-inch P	ipe	18	-inch I	Pipe	20-	inch P	ipe	24-	inch F	Pipe	30-	inch P	ipe	36	-inch	Pipe
Em	720.000	.80	.00	.00	.63	.13	.06	.51	.08	.04	.35	.04	.02	.23	.01	.00	. 16	10.	.00
1,000	1,440,000	1.60	.76	-34	1.26	.44	.19	1.02	.27	.12	.71	.12	.05	.45	.04	.02	.32	.02	.01
1,500	2,100,000	2.39	1.03	.71.	2.52	1.60	.40	2.04	.50	.42	1,42	.24	.10	.00	.15	.04	.63	.04	.02
2,500	3,600,000	3.99	4.34	1.88	3.15	2.45	1.06	2.55	1.47	.64	1.77	.62	.27	1.13	.22	.09	.79	.09	.04
3,000	4,320,000	4.79	6.19	2.68	3.78	3.48	1.51	3.06	2.09	.90	2.13	.87	.38	1.36	.30	.13	.95	.13	.06
3,500	5,040,000	5.59	8.37	3.03	4.41	4.70	2.03	3.57	3.64	1.58	2.40	1.10	.50	1.59	.40	.17	1.10	.17	.07
4,500	6,480,000	7.18	13.70	5.93	5.67	7.67	3.32	4.59	4.58	1.98	3.19	1.88	.82	2.04	.64	.28	1.42	.27	.12
5,000	7,200,000	7.98	16.85	7.30	6.30	9.43	4.08	5.11	5.62	2.43	3.55	2.31	1.00	2.27	.78	.34	1.58	.33	.14
5.500	7,920,000	8.78	20.33	8.71	0.93	11.38	4.92	5.02	8.03	2.93	3.90	3.28	I.20 I.42	2.50	.94 I.II	.41	1.73	·39 •46	.17
7,000	10,080.000							7.15	10.86	4.71	4.96	4.43	1.92	3.18	1.49	.65	2.21	.62	.27
8,000	11,520,000										5.67	5.75	2.49	3.63	1.93	.84	2.52	.80	.35
9,000	12,960,000										6.38	7.25	3.14	4.08	2.43	1.05	2.84	1.00	-43
11,000	15,840,000													5.00	3.59	1.55	3.46	1.47	.64
12,000	17.280.000													5.44	4.25	1.84	3.78	1.74	.75
13,000	18,720,000													5.90	4.97	2.15	4.09	2.03	.88
14,000	20,100,000													6.80	6.58	2.85	4.73	2.69	1.17
16.000	22.040.000		1.16														5.05	3.04	1.32
17,000	24,480,000																5.36	3.43	1.49
18,000	25,920,000																6.30	4.71	2.04
1											1	1		1			1	1	

Frictional Heads at Given Rates of Discharge in Clean Cast Iron Pipes for Each

See text on page following.

The application of this table is fourfold. It may be used to ascertain the *maximum* discharging capacity of a pipe under a given head, or to ascertain the diameter of a pipe for a given discharge and head. It may also be used to ascertain loss of pressure for a given rate of discharge, or to determine the volume of water flowing through a pipe from the reduction of pressure. Velocity and entrance head are not included in the figures for frictional head and may be omitted for ordinary mains, but should be added for high velocity. Discharge and velocity will be affected somewhat by the condition of the mains, number of specials and valves in the line, etc.

As an example of the *maximum quantity* of water an 8-inch pipe will discharge, take 7,500 feet of 8-inch straight cast iron pipe, under a head of 160 feet, which, divided by 7.5, gives 21.33 as the frictional head per 1,000 feet of pipe. The table shows 1,000 feet of 8-inch pipe under 21.74 feet head will give a flow of approximately 1,000 United States gallons per minute.

To ascertain the *diameter* of *pipc* for a given flow, we may take as an example a delivery of 1,900,000 gallons in twenty-four hours through a line of pipe 25,000 feet in length, under pressure due to 150 feet head, from which we figure a frictional resistance of 6 feet per 1,000 feet of pipe. By reference to the table, we find that under a frictional head of 5.74 feet per 1,000 feet, a line of 12-inch pipe will discharge 2,016,000 gallons in twenty-four hours, which approximates the desired delivery close enough for ordinary use.

If we would ascertain the extra work or *loss* due to friction in a line of pipe, we must know the diameter, flow and head pumped against. Take a 10-inch line, 4,000 feet long, which is delivering 900 gallons of water per minute at a point 100 feet above the pump. By reference to the table, we find the frictional head per 1,000 feet of 10-inch pipe delivering 900 gallons per minute is 5.93 feet or 23.72 feet loss due to friction for 4,000 feet of pipe; so that the pump must work against a pressure due to 123.72 feet head.

The *quantity* of water *flowing* may be determined by noting the loss of pressure per 1,000 feet of pipe. Thus, allowing for difference in level, if the frictional loss be  $2\frac{1}{2}$  pounds in 1,000 feet of 10-inch line, we find by the table the flow is 900 gallons per minute. If this frictional loss amounted to  $1\frac{1}{2}$  pounds we would have a flow of 700 gallons per minute.

#### Friction Heads for Elbows

Heads required to overcome the resistance of ninety-degree circular bends

Feet	Radius of Bend in Diameters of Pipe									
city in er Seco	0.5	0,75	1.00	1.25	1.5	2.0	3.0	5.0		
Velo				Head,	in Feet					
1	.016	.005	.002	.002	.001	.001	. 001	.001		
2	.062	.018	.009	.007	.005	.005	.004	.004		
3	.140	.041	.020	.015	.012	.011	.010	.009		
4	. 224	.072	.036	.026	.021	.019	.017	.016		
5	.388	.113	.056 -	.041	.033	.029	.027	.025		
6	- 559	.162	.081	.059	.048	.042	.038	.036		
7	.761	.221	.110	.080	.066	.057	.052	.050		
8	.994	.288	.114	. 104	.086	.074	. 069	.065		
9	1.260	.365	.182	.132 '	. 108	.094	.086	.082		
10	1.550	.450	. 225	. 163	. 134	.116	. 106	. 101		
12	2.340	.649	. 324	.236	. 192	.167	.153	.145		

The above table has been calculated by the well known Weisbach formula, for pipe or bends of circular cross section, i.e., round water pipe specials.

	Let R	= radius of curve or bend in inches
-	г	= radius of section of pipe in inches
	K	= coefficient of resistance
	v	= velocity of flow in feet per second
	a°	= angle embraced by curve or bend (a right angle bend = $90^{\circ}$
	h	= friction head in feet or decimal of foot
	g	= acceleration due to gravity $=$ 32.2
	K	$= 0.131 + 1.847 \sqrt{\frac{r}{R}} \sqrt{\frac{2}{2}}$
		v <sup>2</sup> a <sup>°</sup>
	h =	= K - x - x
		2g 180

Then

And

Suppose a 90° bend of circular cross section, 20 inches diameter (r = 10) and 25 inches radius of curvature (= R.) what friction head is developed by a velocity of flow of 27,896 feet per second?

And

 $K = 0.131 + 1.847 \left\{ \frac{10}{25} \right\} \frac{7}{2} = 0.206$ h. = .206  $\frac{2.7896^2}{64.4} \times \frac{90}{180} = 0.01245$  feet

Motion of Gas in Pipe

The following tables are computed by the formula given below, in which

Q = Quantity of gas in cubic feet per hour. L = Length of pipe in yards lineal. D = Diameter of pipe in inches. H = Head of water pressure in inches. G = Specific gravity of gas = .400.

$$Q = 1350 \text{ D}^2 \sqrt{\frac{\text{H D}}{\text{G L}}}$$
$$D = .056^{\text{B}} \sqrt{\frac{Q^2 \text{ G L}}{\text{H}}}$$

If it is desired to ascertain the quantities discharged of gas of any other specific gravity, multiply the quantities indicated in the following tables by the square root of .4, and divide the product by the square root of the specific gravity of the other gas.

If the length of the pipe is one-fourth of the lengths given in the table, the discharge of gas will be doubled.

If the length of the pipe is four times greater than the lengths in the table, the discharge of gas will be only one-half.

Four times the pressure doubles the discharge of gas.

Pressure of Water in Inches, 1, 1.5, 2, 2.5. Specific Gravity, .400

Length in Yards		4 1nche	s Diameter		Length	6 Inches Diameter				
	I	1.5	2	2.5	in yards	I	1.5	2	2.5	
100	6,831	8,370	9,658	10,800	100	18,820	23,050	26,600	29,770	
150	5,580	6,830	7,888	8,817	150	15,370	18,820	21,700	24,300	
200	4,829	5,920	6,826	7,674	200	13,310	16,400	18,800	21,000	
300	3,944	4,829	5,577	6,233	300	10,870	13,310	15,370	17,180	
500	3,055	3,740	4,320	4,829	500	8,418	10,310	11,940	13,310	
750	2,420	3,055	3,522	3,944	750	6,872	8,418	9,720	10,870	
I,000	2,160	2,646	3,052	3,413	I,000	5,950	7,290	8,420	9,410	
1,250	1,932	2,366	2,732	3,052	1,250	5,340	6,320	7,540	8,415	
1,500	1,761	2,160	2,490	2,789	I,500	4,860	5,970	6,860	7,672	
1,750	1,634	2,000	2,310	2,582	I,750	4,500	5,500	6,366	7,115	
2,000	1,530	1,870	2,150	2,415	2,000	4,200	5,155	5,970	6,655	

Table Showing the Discharge of Gas in Cubic Feet per Hour, through Pipe of Different Diameters and Various Lengths in Yards LinealPressure of Water in Inches, 1, 1.5, 2, 2.5. Specific Gravity, .400—Continued

Length		8 Inches	Diameter		Length	10 Inches Diameter				
in Yards	I	1.5	2	2.5	in Yards	I	I.5	2	2.5	
100	38,650	47,350	54,640	61,100	500	30,100	37,100	42,600	47,700	
150	31,550	38,640	44,600	49,940	750	24,650	30,190	34,800	39,000	
200	27,340	33.460	38,600	43,200	1,000	21,640	26,150	30,100	33,750	
300	22,310	27,340	31,550	35.270	1,500	17,400	21,300	24,760	27,560	
500	17,280	21,170	24,400	27,340	2,000	15,050	18,500	21,300	23,850	
750	14,100	17,280	19,800	22,310	2,500	13,175	16,136	18,632	20,880	
1,000	12,220	14,960	17,280	19,320	3,000	12,027	14,561	17,008	19,016	
1,250	10,940	13,650	15,520	17,280	4,000	10,413	12,756	14,729	16,468	
1,500	9,900	12,200	14,040	15,800						
1,750	9,237	11,300	13,040	. 14,600		1.1.4	and the second	121.5	11.11	
2,000	8,640	10,585	12,200	13,670						

Length		12 Inches	Diameter		Length	r6 Inches Diameter				
in Yards	I	1.5	. 2	2.5	in Yards	I	I.5	2	2.5	
500	47,600	58,320	67,200	75,240	500	98,000	120,200	138,240	154,560	
750	38,800	47,600	55,000	61,470	750	79,770	97,740	113,200	128,020	
1,000	33,660	41,200	47,600	53,240	1,000	69,120	84,670	98,000	109,260	
1,500	27,500	33,600	38,880	43,515	1,500	56,600	69,120	79,800	89,230	
2,000	23,800	29,250	33,600	37,620	2,000	49,000	60,100	69,120	77,280	
2,500	21,190	26;100	30,116	33,631	2,500	43,680	53,540	61,824	69,120	
3,000	19,440	23,800	27,500	30,740	3,000	39,885	48,870	56,600	64,000	
4,000	16,830	20,600	23,800	26,620	4,000	34,560	42,340	49,000	54,630	

Table Showing the Discharge of Gas in Cubic Feet per Hour, through Pipe of Different Diameters and Various Lengths in Yards Lineal

Pressure of Water in Inches, 1, 1.5, 2, 2.5. Specific Gravity, .400-Continued

Length		20 Inches	Diameter		Length	24 Inches Diameter				
	I	1.5	2	2.5	in Yards	I	1.5	2	2.5	
500	170,600	204,600	241,000	270,000	500	271,200	326,000	375,000	425,800	
750	139,600	170,600	197,600	222,400	750	217,200	271,200	310,000	344,000	
1,000	120, 744	147,900	170,600	191,000	I,000	189,200	233,280	271,200	301,160	
1,500	98,800	120,700	139,600	155,800	I,500	155,000	190,500	217,200	245,800	
2,000	85,300	102,300	124,500	135,000	2,000	135,600	163,000	187,600	212,900	
2,500	76, 500	93,500	108,000	120, 744	2,500	119,000	145,500	168,000	194,400	
3,000	69,800	\$5,300	98,800	110,200	3,000	108,600	135,600	155,000	172,000	
4,000	60,370	73,950	85,300	95,500	4,000	95,350	116,640	135,600	150,580	

Length		30 Inches	Diameter		Length	36 Inches Diameter				
IN YARds	I	I.5	2	2.5	in Yards	I	1.5	2	2.5	
500	468,000	574,000	664,000	744,200	500	744,000	912,000	121,200	1,256,400	
750	384,000	468,000	558,900	607,600	750	606,000	744,000	\$56,000	1,032,000	
1,000	332,000	406,000	468,000	526,000	1,000	530,000	644,000	744,000	832,000	
1,500	272,070	332,760	384,140	457,600	1,500	428,500	524,860	606,000	677,630	
2,000	234,000	287,000	332,000	372,100	2,000	372,000	456,000	524,880	628,200	
2,500	210,000	257,000	298,000	332,000	2,500	332,000	408,000	468,000	530,000	
3,000	292,000	234,000	270,000	303,800	3,000	303,000	372,000	428,000	516,000	
4,000	166,000	203,000	234,000	263,000	4,000	265,000	322,000	372,000	416,000	

# Code

For sizes, dimensions, weights, see table, pages 138, 139, 140. For quantities in lengths, feet, net tons, see table, pages 138, 139, 140. For shipments, see pages 134, 135, 136. Dates, see page 137. For telegrams, letters, invoices, etc., see pages 131, 132-137. For orders, see page 133.

## Inquiries

Nachbacken		Quote by mail
Nachbar .		Quote by mail to reach here by
Nachbarin		Quote by mail in care of
Nachbarweg		Quote by wire
Nachbefehl		Quote by wire to reach here by
Nachbehelf		Quote by wire in care of
Nachbeizen		Quote on dock
Nachbild .		Quote alongside dock
Nachbilden		Quote alongside vessel
Nachobhren		Quote f. o. b. this city —
Nachdem .		How soon can you furnish
Nachdenken		How soon can you furnish and at what price
Nachdruck		How soon can you furnish and at what price delivered f. o. b.
Nacheifern		Will you renew offer of
Nachen .		Will you extend time for acceptance of your offer to
Nachfahren		Will you extend option for one day
Nachfeier .	•	Will you extend option for two days
Nachfolgen		Will you extend option for three days
Nachform .		Will you extend option for four days
Nachfragen		Will you extend option for five days
Nachfrucht		Will you extend option for seven days
Nachfuegen		Will you extend option for ten days
Nachgaffen		Have you in stock
Nachgeben		Have you in stock, if not, how long will it take you to make
Nachgeholt	•	How much of the following have you in stock
Nachgekaut		How much of the following have you in stock, and when can you ship
		balance
Nachgellen		When can you make
Nachgenuss	•	When can you make per your specifications
Nachgerade		How long after receiving order will it take you to make

## Inquiries—Continued

Nachgiebig		Can you furnish at
Nachgluth		Please send more definite information
Nachgrasen		Please send more definite information in reference to
Nachgucken		Please specify sizes, weights and quantities wanted
Nachguss .		Can you obtain any information from
Nachhall .		Can you obtain any information
Nachhauen		Can you obtain any information concerning
Nachheften		Have your representative call regarding pipe inquired for
Nachherbst	1.	Have your representative call regarding pipe inquired for on or before
Nachhobeln		Mail me copy your specifications
Nachholen		Mail copy your specifications to
Nachhuelfe		Mail me copy your catalogue
Nachjagen		Mail copy your catalogue to
Nachjahr .		This price is desired for estimate

## Answers to Inquiries

Subject to strikes, accidents and other causes beyond our control. Any casting developing an inherent defect when placed in service will be replaced f. o. b. agreed point of delivery. No claims for damages allowed. Price subject to change without notice in one week.

Narrabamus .	We quote, subject to above clause, on
Narraban	We quote, subject to above clause, f. o. b.
Narrabitis .	We quote, subject to above clause, f. o. b. our works
Narradora .	We quote, subject to above clause, f. o. b. our works for shipment to
Narragione .	We quote, subject to above clause, for export
Narrais	We quote, subject to above clause, for export to
Narramus .	We quote, subject to above clause, on dock
Narrandos .	We quote, subject to above clause, alongside dock
Narrantium .	We quote, subject to above clause, alongside vessel
Narrarem	We quote, subject to above clause, f. o. b. this city
Narrarono .	We are quoting by mail
Narrasemos .	We are quoting by mail to reach you by
Narrasses	We are quoting by mail in care of
Narrassiez .	We suggest you quote —
Narrassimo .	We can make
Narrateur	We can make per our specifications
Narrations .	We can make material specified by you
Narrativi	We can make material specified by you from our standard specifications
Narrativos .	We cannot make
Narrativum .	We cannot make material specified by you
Narratore	We have in stock
Narratorio .	We have none in stock
Narratrice .	Of the material specified by you, we have in stock
Narraturi	Of the material specified by you, we have part in stock and can ship balance
Narraturos .	Engagements prevent our making material
Narraturum .	Engagements prevent our making material specified by you
Narravimus .	Engagements prevent our making material specified by you before
Narravisti .	We will renew offer for
Narravit	We will extend time for acceptance of our offer to
Narren	We will extend option for one day
Narrenader .	We will extend option for two days
Narrenbel	We will extend option for three days
Narrenfest .	We will extend option for four days
Narrenhaus .	We will extend option for five days

## Answers to Inquiries-Continued

Narrenkap	We will extend option for seven days
Narrenkopf	We will extend option for ten days
Narrenkuur	We cannot furnish at
Narrenlust	We cannot furnish for less than
Narrenpak	We will make delivery
Narrenpots	We will get more definite information
Narrenrede	We will get more definite information concerning
Narrenseil	We will get more definite information and advise
Narrentanz	We are mailing copy our specifications
Narrenthum	We are mailing copy our specifications to
Narrenwelt	We are mailing copy our catalogue
Narrenwort	We are mailing copy our catalogue to
Narrenzeit	Our representative will call
Narrenzeug	Our representative will call on
Narrerais	Our representative unable to reach you as requested, will call
Narreremo	Our representative unavoidably detained, will call

## Telegrams

Natabamus	See our telegram
Natabat .	See our telegram of
Natabilite	See your telegram of
Natabilium	 Have not received your telegram
Natabulum	Answering your telegram
Natabundi	Answering your telegram of
Natabundos	Answering your telegram of even date
Natafelen .	Without answer to our telegram
Natale	Without answer to our telegram of
Natalia .	Telegraph answer
Natalibus .	Telegraph answer to
Natalicios .	Telegraph answer in care of
Natalicium	We do not understand your telegram
Natalities .	There is a mistake in our telegram, it should read
Natalizio .	Telegram came too late
Nataloine .	Telegram received, will advise upon hearing from
Natant	Telegram received, will advise upon hearing from works
Natantes .	Telegram received, will advise upon securing freights
Natantium	Telegram received, we are working upon this and will advise
Natantly .	Telegraph briefly, sending full particulars by mail

## Letters

Nascamini	We are writing
Nascebamur	We have written
Nascedouro	We will write
Nascemmo	Answering your letter
Nascenca .	Answering your letter of
Nascendo	Answering your letter of even date
Nascent .	Your letter received
Nasceranno .	Have not received your letter
Nascerebbe	See our letter
Nascevamo	See our letter of
Nascevate	See your letter
Naschdose	See your letter of
Naschelden	Send answer
Naschhaft	Send answer to
Naschijnen	Send answer in care of
Naschimpen	We do not understand your letter
Naschkatze	We do not understand your letter, advise us
Naschmarkt	Write full particulars
Naschmaul	Explanatory letter following
Naschoppen	Will write advising further
Naschouw	Answering your letter, we are working upon this and will advise
Naschouwen	There is a mistake in our letter, it should read
Naschrift .	Our letter missent
Naschsucht	Our letter missent, mailing copy to-day
Naschudden	. Letters came too late

.

## Orders

Naticier	Enter order for
Naticoide	Enter order per your quotation
Naticuto	Enter order for shipment within
Natifs	Enter order for shipment to
Natiguay	Have you received order without acknowledgments
Natijd	Revise order to read
Natillas	Advise by wire if order has been entered
Natimmeren .	We are mailing confirming order
Natinabor .	Our order in error. Await to-day's order
Natinantem .	Will you increase order at same price
Natinantis .	Have not received
Natinemur .	Have not received order from you
Natinor	Have not received order from you for
Nation	Telegram received, have revised order to read as you direct
Nationum .	Letter received, have revised order to read as you direct
Native	Will enter order
Nativement .	Will enter order per quotation of
Nativeness .	We will increase order at same price
Natividade .	We will not increase order at same price

UNITED STATES CAST	IRON PIPE	AND	FOUNDRY	COMPANY
	Shinment	0		
	ompinent	5		
All references to time relate	to time of shipn	nent fro	m works.	
, Inquiries		An	iswers	
Nava Can you ship	Nea.	• • •	We can ship	
Nawi Please ship	Nebe		We will ship	
Naxe Do not ship	Neca		We cannot sh	ip
lasche As promptly as pos	sible			
Ibank As required				
lbild Faster				
Iblind Without delay				
ldunst Advising by wire c	ar number and i	nitials		
lfleck Advising by mail c	ar number and i	nitials		
lglanze Tracing through to	destination			
lgrau Until further advise	ed			
lgrund During				
lhut During next month				
lkappe During month after	next			
lkreis During spring				
lland During summer				
llos During fall				
lloser During winter				100 M
lluft After navigation op	ens			
Imeer Within time promis	ed			
lmonat In time named			A PARTIE	
lnacht As soon as cars are	placed			
lreich Balance of order	N. 199 4			
lring Balance of order sh	ortly			
Isaum Balance of order fro	om stock			
lsitz Order No.				
Istern From stock				
ltag Part from stock, ma	aking balance pro	omptly		
Itagen Part from stock, ma	aking balance in	two we	eks	
Ithal Part from stock, ma	aking balance in	three w	reeks	
Itrueb Part from stock, ma	aking balance in	four we	eeks	
Ituch Part from stock, ins	aking balance ill	five we	eks	
Ivoli A carload daily				
Iwinu I wo carloads daily	PL 15			
Four carloads daily	y			
izig Four carloads daily				

UNITED STATES CAST IRON PIPE AND FOUNDRY COMPANY	7
Shipments—Continued	
Izures Five carloads daily	
nab Six carloads daily	
nachse Seven carloads daily	
nallee Eight carloads daily	
namtes Nine carloads daily	115
nan	
narm At present rate	1.17
narzt Increasing present rate of shipment	
nbahn An increased quantity	
nbaues In one week	
nding In two weeks	
nerbe In three weeks	1
nfall In four weeks	1
nfluss In five weeks	
nform In six weeks	
nfrage In two months	18.0
ngang In three months	
ngeist In four months	1
ngeld In five months	18
nglied In six months	1
ngott In three months, about equal monthly proportions	
ngut In four months; about equal monthly proportions	
ngutes In five months, about equal monthly proportions	
nhaus In six months, about equal monthly proportions	
nner In seven months, about equal monthly proportions	
nnine In eight months, about equal monthly proportions	15.1
nhoi In nine months, about equal monthly proportions	
nidee By vessel	
nioch By rail and water	
nkanal	
nkarte From New York	
nklang From Philadelphia	
nkraft From Mobile	
nkrone From New Orleans	
nlade From Pensacola	
nlaut From Savannah	
nlicht From Addyston Works	
nlinie From Anniston Works	

UNI	TED :	STATES	CAST IRC	ON PIPE A	ND FC	DUNDR	Y COMPANY
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## Shipments-Continued

nmagd .	 From Bessemer Works
nmauer	 From Buffalo Works
nmesse .	 From Burlington Works
nmond .	 From Chattanooga Works
nmotiv .	 From Cleveland Works
nofen .	 From Columbus Works
nort .	 From Louisville Works
npegel .	 From Scottdale Works
npfad .	 From Superior Works
nplatz .	 On account of car shortage, see letter
npreis .	 On account of labor troubles, see letter
npunkt	 On account of accidents, see letter
nquell .	 Without definite advices
nrad .	 Without formal order
nraum .	 By express
nrebe .	 By express to
nrohr .	 By freight eollect
nrolle .	 By freight prepaid

Not to be used with stem words above

Nectabamus		Cash thirty days, New York funds
Nectabis .		Cash against documents, New York funds
Nectabitis		At what rate are you shipping
Nectabo .		Are you shipping at rate promised
Nectaire .		What portion of order has been shipped
Nectanabis		What portion of order has not been shipped
Nectandre		If you cannot ship at once, please telegraph us
Nectar	•	Send shipping instructions at once by mail
Nectarbron		Send shipping instructions at once by wire
Nectareous		Are sending shipping instructions to-day
Nectarial .		Have sent shipping instructions
Nectaribus		Will send shipping instructions shortly
Nectarines		Notify us when shipment is ready, and we will send shipping instructions
Nectarteug		Hold shipments until further advised
Nectenebin		Shipment went forward prior to receipt of order to hold
Necthebis .		By what route was shipment made
Nectiberes		Trace shipment by mail
Nectique .		Trace shipment by wire
Nectocalyx		We are tracing shipments

	Invoices			
Negabais	Refer to our invoice			
Negabamos .	Refer to your invoice		1.00	
Negabelha .	Send invoice			
Negabilita .	Send invoice to			
Negabuntur .	Send copy of invoice			
Negacao	Send copy of invoice to			
Negaceiro'.	Send invoices and bill of lading			
Negaciones .	Have received invoice			
Negador	Have received invoice for			
Negadores .	Have not received invoice			
Negalho	Have not received invoice for			
Negandorum .	Have sent invoice			
Negandum .	Have sent copy of invoice			
Neganopeau .	Invoice omitted from letter, mailed to-day			
Negaramini	What is the amount of invoice			
Negarian	The amount of invoice is			

Time

Nege Ultimo	Neir Instant	Nela Proximo
and the second second	· · · · · · · · · · ·	
Nemi January	Nome May	Nubi September
Neno February	Noni June	Nuco October
Nepu March	Nopo July	Nusa November
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dness 5th	nkopf 16th	remmo 26th
dop 6th-	nlimin	reste 27th
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kern 10th	nrecht 21st	schil 31st
nblatt 11th		

#### Amounts Pach . Pail . . Pounds . Tons of 2000 pounds Palm . . Pieces Pard . . Inches Pant . . Feet agogos . . . . . . aba τ 37 antry . . . . 73 aban . 2 aient 38 ar . . 74 aim abas . . 3 . . 39 arada 75 abile . aire areis . 4 40 76 abitur ait arene 5 41 77 . able 6 aje aresci 42 78 abo ajista . aretus 7 . . . . . . 43 79 8 al abunt ariais 80 44 acana ale arian . 81 0 45 . . . . . . aleza acci 46 arigo . 82 10 alform accio . II 47 arla 83 alibus aceous 48 aron 84 12 acino alium aroso . 85 13 . 49 alla acion 14 50 arpia . 86 acite . alon 51 arpos . 87 . . 15 . . . . ack as . 16 52 artes . 88 . . . . . acles amere arum . 80 17 53 aco 18 amina 54 ary 90 acosm amos asan . . . 10 . 55 91 actyle amus 20 56 asch 92 ada anaio . 2 I 57 asov 93 adas anaje . 22 58 assi 94 adella anal asteis 59 23 . . . . 95 ades . anas 60 asto 24 96 adica anchin . 61 asum. 25 97 . . adilla ando . 62 atily . 26 . 08 . . . . . ador . andra 63 ation . 27 . . . . . . . . . . 99 adora andum 64 28 atis 100 . adres . anhar 65 ativo . 105 20 . . . . . . . adure 66 anite . atma . 30 . . . . 110 aflora atmis annes 67 31 . . . . . 115 . . . agem . 68 atura ano . 120 32 . . aggio . anoso 60 atwas . 125 33 . . . . . agog ant auz 34 . . 70 . 130

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UNITED STATES CAST IRON PIPE AND	FOUNDRY COMPANY				
Amounts-Continued					
avel 145 bique 824	buil 1100				
avero Iso birne 875	bulis 2450				
avoga Ist bis 000	bulum 3500				
bahn 160 bitis 017	bundi 2550				
bak 165 blaft 050	bunt 2550				
ban	bury				
bank	busy				
bant	buys				
bar 180 bling 1084	cal				
bare	canda 2850				
barin 190 blok 1150	cao 2900				
baris 195 blume 1167	carpe 2950				
base	cassi				
basic	cata 3100				
bat	ceae				
batis	celle				
bau	cico				
baues	cillo				
bauwd	<b>cina</b>				
bavo	cinis				
bawi	cite				
baxu	сга				
baza 400 bonsd 1600	crane 4000				
bebat 417 boom 1650	crat 4500				
beden	cris 5000				
beef	croma 6000				
bein 500 borgd 1750	crum 7000				
belos	cular 8000				
belum	cule 9000				
beukt	eanu 10000				
beure	ear 10500				
bilag	edel				
biles 607 brie	ede 12000				
bilet 66a brita	eiro 12000				
bilum roo brond race	elha 12000				
bimur 700 brose 2250	elle				
bimus 750 bruch 2200	em				
bios 800 bis 2350	emus				

### Amounts-Continued

enca	5000 erga 17500	ers 19500
enos	5500 erie 18000	es 20000
ensi 10	6000 erly 18500	ette 25000
eo	6500 eroe 19000	eur
erem	7000	

Also to be used without above stem words

Parsley . . Per ton of 2000 pounds Pathogenic . . Per ton of 2240 pounds


(ADVERTISEMENT)



### ADDYSTON, OHIO, WORKS

THE Addyston Works, of which partial views are given, are located about twelve miles west of Cincinnati, on the Ohio River, and on the lines of the "Big Four" and the B. & O. S. W. railways. The plant is one of the largest and most complete owned by the Company. Cast iron pipe in sizes 3 to 84 inches are made at these works, and the output figures to a large tonnage

annually. Shipments of pipe are not infrequently made in train loads, as is shown in the photograph. The main pipe foundry is nearly 500 feet in length,

the loam foundry nearly 400 feet and the jobbing foundry about 225 feet long, which is also the length of the power house. The plant is complete with ample pattern shop and



Train load of pipe from Addyston Works



Addyston, Ohio, Works-End of Main Pipe Shop

storage, machine shop, cleaning, coating and testing facilities, and has been kept up to the most modern practice in pipe making. A complete laboratory makes it possible to check all material received and to carefully follow up the output.



Addyston Works-Cleaning Shed, Power House, Machine Shop, General and Loam Foundries

(ADVERTISEMENT)

### ANNISTON, ALA., WORKS

THE Anniston Works are located on the outskirts of the city of Anniston, Ala., about one hundred and four miles west of Atlanta, and sixty-four miles east of Birmingham. The plant occupies a tract of about forty-five acres, and consists of a main foundry, something over five hundred feet in length by about ninty-five feet in width, and is complete with power house, machine shop, general special castings foundry, pattern shop and storage, cleaning, coating and testing sheds, laboratory, etc., and has ample trackage facilities which connect with the lines of the Southern Railway and of the Louisville & Nashville Railway. Pipe are now made at Anniston in sizes 4 to 36 inches diameter, and the plant is one of the largest owned by the Company in the South.

(ADVERTISEMENT)



BESSEMER, ALA., WORKS

THE photograph shows a partial view of the main pipe and machine shops of the Bessemer Works, with the coke plant in the distance to the right, which, with the power house, large pipe yard, etc., occupy about seventy-five acres. The plant has some five and a half miles of standard gauge track and sidings, operated by the company's locomotives, and which are connected with the various railroads centering at Bessemer, affording excellent facilities for shipping. The main pipe shop is a building 410 feet long by 100 feet wide, in which are made pipe ranging from 4 to 72 inches in diameter. The plant includes a complete electric light and pumping station, etc., and in connection with the works there are numerous houses for employes, a hotel, etc., owned by the company. Improvements now (1906) in progress at Bessemer will materially increase our facilities at this plant.



### BUFFALO WORKS

THE above photograph is a view of the main pipe shop of the Buffalo Works, a building some 320 feet in length. The plant is located on the Belt Line of the New York Central & Hudson River R. R., through which connection is obtained with all railways centering at Buffalo. The works are complete with machine shop, pattern shop and storage, cleaning, coating and testing sheds, etc. At this plant pipe are made in sizes 4 to 54 inches, and the plant has recently been reconstructed and modernized, the new equipment including the machine ramming of pipe of the smaller sizes, the practice being similar to that followed at our Burlington Works. Power is obtained from Niagara Falls.



BURLINGTON, N. J., WORKS (from Delaware River)

THE Burlington Works are located on the Delaware River, at East

Burlington, about twenty miles above Philadelphia, and occupy about twenty-five acres out of a tract of some two hundred acres owned by the Company at East Burlington. The plant has facilities for the manufacture of cast iron pipe 3 to 60 inches in diameter, and for making loam and green



sand special castings. The equipment for specials has been augmented by the recent addition of a new and modern jobbing foundry of steel construction.



A train load of 60-inch pipe leaving Burlington

The Burlington Works are thus also able to supply heavy loam castings with or without machining to the designs of engineers. Inquiries should be addressed to the company's nearest sales office. The works are connected with the Amboy division of the Pennsylvania Railroad, and being on tidewater,



A glimpse of the Pipe Yard at Burlington, N. J., Works

have ample facilities for rail and water shipments, as well as for receiving of iron and other supplies, which are carefully checked in the laboratory, as is also the output. Cargo lots of cast iron pipe are frequently sent by sailing vessel to New England ports, while Philadelphia, Baltimore, New York and Hudson River points may be readily reached by barge or lighter.





Burlington Works, looking out Pearl Street, which divides Plant. New Jobbing Foundry is located beyond Machine Shop on the right

Vessel loading with Cast Iron Pipe at Burlington Works



### CHATTANOOGA, TENN., WORKS

THE above plate gives an excellent view of the Chattanooga plant, which consists of two pipe shops, the larger 472 feet long by 111 feet wide, and the smaller about 203 feet long by 81 feet wide, in which pipe are made in sizes ranging from 4 to 36 inches inclusive. The plant occupies something

over thirty-one acres, and, as may be seen, is so located as to have excellent facilities for shipment via rail or river. The works are modern and well equipped, the cranes and machinery being electrically driven. Included in the plant are a substantial power house, machine shop, pattern shop, pattern storage, etc.



Rear View of part of Main Shop and Skids of Chattanooga Works



### LOUISVILLE, KY., WORKS

THE above photograph gives a view of a portion of the Fulton Street Plant, which is located between Preston, Jackson, Water and Fulton Streets, in the city of Louisville. In addition the "Ninth Street Plant" affords facilities for general foundry and special castings work. Both plants have ample facilities for rail shipments, either through lines connecting with the works or through a belt line with all the railways centering at Louisville. The works have facilities for making pipe of 3 to 60 inches diameter, and afford a large annual output.

#### (ADVERTISEMENT)



### SCOTTDALE, PA., WORKS

THE Scottdale Works (and the Charlotte Furnace, owned by this Company) are located at Scottdale, Westmoreland County, Pennsylvania, a short distance north of Connellsville, and not far from Pittsburgh. Including the new pipe shop now (1906) building, which is 532 feet long by 100 feet wide, the works include three foundries, with power house, machine shop, pattern shop, rope house, etc., a complete plant for the manufacture of cast iron pipe from 3 to 60 inches diameter, inclusive. The plant, including pipe storage yard, occupies about fifty acres, and is connected up by something over three miles of standard gauge railroad tracks, over which cars are handled by our own locomotives. These tracks are connected with the Pennsylvania R. R. and the Baltimore & Ohio R. R., while the New York Central lines (Monongahela & Youghiogheny division) are easily reached. Thus the plant has excellent facilities for the shipment of its product.

(ADVERTISEMENT)

# STANDARD SPECIAL CAST-INGS AND ODD SPECIALS

WHILE the exclusive use of standard specials in laying out work is most desirable, there are locations where it is not possible to do so for the entire work. We are prepared to supply to engineers' designs the heaviest and largest class of such odd castings.

The photographs show two examples of large special castings of this class, made at our Addyston



60 x 60 x 48 x 36 inch Special Cross



60 x 60 x 30 x 84 inch Flanged Special Casting. Weight, 31,500 pounds

Works to the designs submitted by purchasers.

Our loam foundry and machine shop facilities are unequaled for meeting this demand; and when desired, we shall be pleased to submit sketches for large castings required for special locations.







Heavy Machined Castings to Engineer's Designs

## Index

				1	age
Addyston, Ohio, Works .				141,	142
Adjustable valve boxes .					77
Advertisements				141-	-153
Air chambers			1.		87
American Gas Light Associat	tion			21,	105
Amounts, code			4.	138-	-140
Anniston, Ala., Works					143
Answers to inquiries-code				129,	130
Approximate weights				36,	105
Aqueducts					11
Base curves, B. & S. for wate	er.				54
" " flanged for wate	er.				87
Base tees, B. & S. for water				6	1-63
" " flanged for water				92	, 93
" " high pressure, flan	ged				104
" " flanged for gas					118
Bessemer, Ala., Works .					144
Bellmouth					78
Bell and spigot standards .		I	8-21.	13-15.	106
Bends, B. & S. for water .				52	. 53
" B. S. for gas				107-	-100
" flanged for water .				. 8	7-80
" flanged for gas .					117
" high pressure, B. & S					08
" high pressure, flange	đ.				103
Blank flanges					06
Blow-off branches, B. & S.		-			66
w	ith r	nanł	ole.		67
Bored logs in Philadelphia .					16
Branches, high pressure .					00
Bridgeport, Ala., Works .					5
Buffalo, N. Y., Works					145
Burlington, N. J., Works .				146,	147
Bushings for gas					114
Capacity of cast iron pipe .					120
" of cisterns					120
Caps for B. & S. water pipe					75
" for B. & S. gas pipe .					100
Castings of iron	÷.				12
Cast iron pipe					g
" " in modern cond	uits	and	rese	rvoirs	12
" " length of .					17
" " life of					16
" " green vs. drv s	and				17
0					

		Page
Cast iron pipe vs. steel pipe	•	25
Cement joints		. 22
" " B. & S		. 23
" " in winter		. 24
Chattanooga, Tenn., Works		. 148
Cleveland, Ohio, Works		. 5
Coal chutes		SI
Code, general		127-140
Columbus Ohio, Works		5
Columns		. 110
Concentric reducers		112
Condensed specials		70 80
Contracta		79, 00
Contracts		• • 5
Croton dam		12
Crosses and tees, B. & S. for water .	•	. 55-60
" B. & S. for gas .		110, 111
" " flanged for water .		90, 91
" flanged for gas .		118
Culverts and drains		31
Curve with bases, B. & S. for water .		54
Curves, B. & S. for water		52, 53
" B. & S. for gas .		107-109
" high pressure, B. & S.		
" high pressure, flanged .		103
" with full length B. & S. pipe		20, 21
Cylinders		. 86
Cylinder rolls	10	87
Description of pipe		01
Discharge of gog		
Discharge of gas		125, 120
Drips	•	115
Dry vs. green sand pipe	•	17
Earliest pipe	•	9
Embankment materials	•	31
Expansion joints	•	97, 101
Feet, code		138-140
Fish trap		78
Flange pipe for water		82
" " short length, double flang	e for	water 83
" " short length, bell and flang	re for	water 84
" " short length, flange and	spige	ot for
water		85
" " high pressure		102
" " tongue and groove		102
it it tongue and record		
tongue and recess .	•	. 102

## Index-Continued

Plange pipe for gas116Line drips115Planged special castings for water87-97Lugs149Planged special castings for water87-97Lugs51Flexible joint pipe47,48Manfold, flanged97Prictional heads in pipe121, 122Modern conduits12""in elbows123Bordgin fundrities5Newport, Ky, Works5"shipments5Newport, Ky, Works5"shipments22Orders, code135""with lead joints22Orders, code135""with turned and bored joints22Orders, code135""with turned and bored joints23Philadelphia pipe lines15, 58Gas pipe standard105, 106Pices, code13576Hard chold, bends with117"B. & S. gas pipe114Hat flanges for gas114"gas tapping115High pressure pipe45, 46Piddle collars76""free systems27"eccentric B. & S. for gas112Holder drips115""concentric B. & S. for gas112""franged for water66-73"franged for gas117"high pressure, B. & S. low""franged for water""franged for water. </th <th></th> <th>Page</th> <th></th> <th>Page</th>		Page		Page
""for gas, short lengths110Planged special castings for water $87-97$ Lugs.149Planged special castings for water $87-97$ Lugs.51Plume gate77Manhole heads and covers.77Princtional heads in pipe121, 122Motion of gas in pipe.124""in elbows.123Motion of gas in pipe""in elbows124Gas mains with cement jointsGas pipe standard<	Flange pipe for gas	. 116	Line drips	. 115
Planged special castings for water $8_7-97$ LugsLugs $\cdot$ $5$ Plexible joint pipe $47, 48$ Manhole heads and covers $77$ Prictional heads in pipe $121, 122$ Monter conduits $12$ Foreign inquiries $5$ Munible fanged $97$ * " in elbows $123$ Motton of gas in pipe $124$ Foreign inquiries $5$ Numbers, code $135-140$ Gas mains with cement joints $222$ Offsets $51, 95$ * " with lead joints $221$ Offsets $53, 95$ * " with turned and bored joints $225$ Orders, code $135-140$ Gas pips standard $105, 106$ Pieces, code $135-140$ Gate house and reservoir connections $13$ Pilugs for B. & S. water pipe $76$ Hard hold, bends with $117$ " B. & S. gas pipe $114$ Haft fanges for gas $114$ " gas tapping $115$ High pressure pipe $45, 46$ Pilugs, screw $110$ Hub sleeves for gas $113$ " B. & S. long length $70-73$ Holder drips $113$ " B. & S. long length $70-73$ Increasers for gas, S. & B. $112$ " High pressure, B. & S. for water $94, 95$ " high pressure fire systems $27$ " fanged for gas $113$ " high pressure, fire systems $27$ " scottale, Pa., Works $150$ " nower sto code $127, 128$ Service sleeve for gas $113$ " high pressure fire systems $27$ Scottale, Pa., Works $150$	" " for gas, short lengths	. 116	Louisville, Ky., Works	. 149
Flexible joint pipe47. 48Manhole heads and covers77Plume gate78Manhole heads and covers77Prictional heads in pipe72121, 122" " in elbows123Motion of gas in pipe124, 124" " in elbows123Motion of gas in pipe124, 124" " with lead joints22Offsets5" " with turned and hored joints22Offsets51, 95" " with turned and hored joints22Offsets51, 95Gate house and reservoir connections13Philadelphia pipe lines15, 45High pressure pipe45, 46" " B, & S, gas pipe114Haft flanges for gas114" gas tapping115High pressure pipe45, 46Puddle collars76Hubskeves for gas113Plugs, screw119Hubskeves for gas113" " specials98-104" " specials98-104" B, & S, S, org gas112Hubskeves for gas113" " answers to code127, 126" answers to code129, 150" flanged for gas117Independent high pressure fire systems27Screter plage103" answers to code129, 150" plugs.119Jointa, leakage26" plugs.119Independent metals9Screter of gas113Intermediate weights, pipe36, 37Server fages113Intermediate weights, pipe36, 37Server fages113Independent metal	Flanged special castings for water	87-97	Lugs	. 51
Flume gate	Flexible joint pipe	47, 48	Manhole heads and covers	. 77 .
Frictional heads in pipe121, 122Mottern conduits12" " in elbows123Mottern conduits124Poreign inquiries5Newport, Ky., Works5" shipments5Numbers, code135-r40Gas mains with cement joints222Orders, code143" " with lead joints22Orders, code15, 58" " with turned and bored joints25Philadelphia pipe lines15, 58Gas pipe standard105, 106Plugs for B. & S. water pipe76Gate house and reservoir connections13Plugs for B. & S. water pipe76Hand-hold, bends with117" B. & S. gas pipe114Haft flagves for gas114" gas tapping115High vs. how pressure gas mains24Plugs crew119Holder drips115Plugs, crew110" " fine systems27" concentric B. & S. for gas112Hub sleeves for gas113" B. & S., long length70-73Hydraulic clinders68-73" flanged for gas113" power mains30" flanged for gas113Independent high pressure68-73" return bends, flanged103" answers to code127, 128Scottale, Pa., Works159Induries, code127, 128Scottale, Pa., Works130" answers to code127, 128Scottale, Pa., Works131Intake lines35Sipinents, code134-156" answers to code127, 128Sc	Flume gate	. 78	Manifold, flanged	. 97
"""In elbows123Motion of gas in pipe124Foreign inquiries5Newport, Ky., Works5" shipments5Numbers, code135-140Gas mains with cement joints22Orders, code135" " with turad and bored joints22Orders, code133" " with turad and bored joints22Orders, code133" " with turad and bored joints22Orders, code133Gate house and reservoir connections13Pluga for B. & S. water pipe76Hand-hold, bends with117B. & S. gas pipe114Hat fanges for gas114" gas tapping115High pressure pipe45, 46" eccentric B. & S. for gas112" " fire systems27" eccentric B. & S. for gas112Holder drips113B. & S. long length70-73Hydmalic cylinders86" flanged for gas113" power mains30" flanged for gas113" bigh pressure for gas, S. & B.112" high pressure, flanged103" spigot and bell for water70-73Sottale, P.A., Works159Independent high pressure fire systems27Sottale, P.A., Works159Sottale, P.A., Works133Ser	Frictional heads in pipe	121, 122	Modern conduits	. 12
Foreign inquiries5Newport, Ky., Works5" shipments5Numbers, code138-140Gas mains with cement joints22Orders, code133" with lead joints22Orders, code133" with turned and bored joints25Philadelphia pipe lines15, 28Gate house and reservoir connections13Plees, code138-140Gate house and reservoir connections13Plees, code138-140Hand-hold, bends with117" B. & S. gas pipe114Hat flanges for gas114" gas tapping115" * specials98-104Reducers, B. & S. for water68-73" * specials98-104Reducers, B. & S. for gas112Holder drips115" concentric B. & S. for gas112Hub sleeves for gas113" B. & S., long length70-73Hydraulic cylinders30" flanged for water70-73'' S. & B. long length for water70-73Scottdale, Pa., Works150'' S. & B. long length for water70-73Scottdale, Pa., Works150'' S. & B. long length for water70-73Scottdale, Pa., Works113Indernediate weights, pipe36, 37Sewers31Intermediate weights, pipe36, 37Sewers31Intermediate weights, pipe103Sijpments, code113Joints, Leakage20Silphon, Rosemary144Joints, Leakage at joints20Silphon, Rosemary143Lea	" " in elbows	. 123	Motion of gas in pipe	. 124
" shipmentsNumbers, code $13^{36-140}$ Gas mains with cement joints <td< td=""><td>Foreign inquiries</td><td>. 5</td><td>Newport, Ky., Works</td><td>. 5</td></td<>	Foreign inquiries	. 5	Newport, Ky., Works	. 5
Gas mains with cement joints22Offsets53. 95"" with lead joints22Orders, code133"" with turned and bored joints25Pildelphia pipe lines15. 28Gas pipe standard105, 106Pilogs for B. & S. water pipe76Gate house and reservoir connections13Pilogs for B. & S. water pipe76Hand-hold, bends with117" B. & S. gas pipe114Hat fanges for gas114" gas tapping115High pressure pipe45, 46Puddle collars78" " fire systems27" concentric B. & S. for gas112Holder drips	" shipments	. 5	Numbers, code	138-140
" " with lead joints22Orders, code133" " with turned and bored joints25Philadelphia pipe lines15, 26Gas pipe standard105, 106Pieces, code138-140Gate house and reservoir connections13Pilugs for B. & S. water pipe76Hand-hold, bends with117" B. & S. gas pipe114Hat flanges for gas114" gas tapping115High yressure gas mains24Plugs, screw119High pressure pipe45, 46Puddle collars78" " fire systems27" eccentric B. & S. for gas112Holder drips" eccentric B. & S. for gas112Hub sleeves for gas" B. & S. long length70-73Hydraulic cylinders	Gas mains with cement joints	. 22	Offsets	53. 95
" " with turned and bored joints25Philadelphia pipe lines15, 28Gas pipe standard105, 106Pices, code $13^{5-140}$ Gate house and reservoir connections13Pices, code $13^{5-140}$ Hand-hold, bends with117" B. & S. water pipe76Hand-hold, bonds with117" B. & S. gas pipe114Hat fanges for gas114" gas tapping115High pressure pipe45, 46Plugs, screw119Hub severs for gas217" eccentric B. & S. for gas112Holder drips113" B. & S. long length70-73Hydraulic cylinders216" finged for water94, 95" power mains300" finged for gas117Ihcerasers for gas, S. & B.112" high pressure, B. & S. 100" spigot and bell for water70-73Scottdale, Pa., Works150Independent high pressure fire systems27Screw fanges96" answers to code129, 130" plugs.113Intermediate weights, pipe36, 37Sewers313Invoices, code137Shipments, code134-136Joints, leakage200" standard for gas113I turned and bored109" standard for gas113" turned and bored109Sipherssure pipe98Leady pipe113Secrite ratios, STANDARD36-41Leakage at joints220" for high pressure service98-104Life of pipe106138-	" " with lead joints	. 22	Orders, code	. 133
Gas pipe standard105, 106Pieces, code138-140Gate house and reservoir connections13Piugs for B. & S. water pipe76Hand-hold, bends with117B. & S. gas pipe114Hat fianges for gas114" gas tapping115High vs. low pressure gas mains24Plugs, screw119High pressure pipe45, 46" eccentric B. & S. for water68-73" " specials95-104" eccentric B. & S. for gas112Holder drips113" B. & S. for gas112Holder drips113" B. & S. for gas112Hub sleeves for gas113" B. & S. long length70-73Hydraulic cylinders86" flanged for water94-95" bigh pressure100" flanged for gas117Increasers for gas, S. & B.112" high pressure, flanged103" spigot and bell for water68-73" return bends, flanged97Sottdale, P.a., Works150Screen pot78Independent high pressure fire systems27Screev for gas113Intermediate weights, pipe36, 37Server flanges96" undet metals9Survice sleeve for gas113Intermediate weights, pipe76Siphon, Rosemary14Siphon, Rosemary143Standard for water pipe74" turned and bored136Sig leeves, standard for gas113" bigh pressure pipe98Smoke flue8" bigh pressure pipe<	" " with turned and bored joints .	. 25	Philadelphia pipe lines	15, 28
Gate house and reservoir connections13Plugs for B. & S. water pipe76Hand-hold, bends with117" B. & S. gas pipe114Hat flanges for gas114" gas tapping115High vs. low pressure gas mains24Plugs, screw119High vs. low pressure gas mains24Pludle collars $78$ " " specials98-104" eccentric B. & S. for gas112Holder drips113" concentric B. & S. for gas112Holder drips113" B. & S., long length70-73Hydraulic cylinders86" flanged for water94, 95" power mains30" flanged for gas117Ihcreasers for gas, S. & B.112" high pressure, flanged103" spigot and bell for water70-73Scottalale, Pa., Works150Independent high pressure fire systems27" crutur bends, flanged97Sottalae, Pa., Works153Screen pot78Inquiries, code127, 128Server flanges96" answers to code129, 130" plugs113Intermediate weights, pipe36, 37Sewers313Intermediate weights, pipe136Siphon, Rosemary143" b. & S.119Siphon, Rosemary143Sid beeves for gas113" standard for water pipe74" answers to code136-140Sid seevers for gas113Intermediate weights, pipe36, 37Sewers314Siphon, Rosemary143<	Gas pipe standard	105, 106	Pieces, code	138-140
Hand-hold, bends with <td>Gate house and reservoir connections .</td> <td>. 13</td> <td>Plugs for B. &amp; S. water pipe</td> <td>. 76</td>	Gate house and reservoir connections .	. 13	Plugs for B. & S. water pipe	. 76
Hat flanges for gas   114   "gas tapping   115     High vs. low pressure gas mains   24   Plugs, screw   119     High pressure pipe   45, 46   Pludle collars   78     "specials   08-104   Reducers, B. & S. for water   68-73     "fre systems   27   "eccentric B. & S. for gas   112     Holder drips   113   "B. & S., long length   70-73     Hydraulic cylinders   86   "flanged for water   94, 95     "power mains   30   "flanged for water   94, 95     "high pressure   100   "flanged for water   96-73     "spigot and bell for water   70-73   Scottdale, Pa., Works   110     "answers to code   127, 125   Screen pot   78     Independent high pressure fore systems   27   Screw fanges   96     "answers to code   129, 130   "plugs   113     Intermediate weights, pipe   36, 37   Service sleeve for gas   113     Invoices, code   137   Shipments, code   134-136     Sipton, Rosemary   44   Sleeves, standard for gas   113 <tr< td=""><td>Hand-hold, bends with</td><td>. 117</td><td>" B. &amp; S. gas pipe</td><td>. 114</td></tr<>	Hand-hold, bends with	. 117	" B. & S. gas pipe	. 114
High vs. low pressure gas mains24Plugs, screw119High pressure pipe45, 46Puddle collars78" " specials $0^{S-104}$ Reducers, B. & S. for water68-73" " fire systems27" eccentric B. & S. for gas112Holder drips115" concentric B. & S. for gas112Hub sleeves for gas113" B. & S. long length70-73Hydraulic cylinders86" flanged for water94, 95" power mains30" flanged for gas117Increasers for gas, S. & B.112" high pressure, B. & S.100" high pressure100" high pressure, B. & S.100" spigot and bell for water70-73Scottdale, Pa., Works150Independent high pressure fire systems27Screen pot78Inquiries, code129, 130" plugs.119Intake lines35Service sleeve for gas113Intermediate weights, pipe36, 37Service sleeve for gas113Invoices, code137Shipments, code134-136Siphon, Rosemary14Sleeves, standard for gas113" in pipe joints495Smoke fine81" joints20Special castings, and standard special151" datage di joints20Special castings, and standard special151" in pipe joints20Special castings, and standard special151" in pipe joints20Special castings, and standard special <td< td=""><td>Hat flanges for gas</td><td>. 114</td><td>" gas tapping</td><td>. 115</td></td<>	Hat flanges for gas	. 114	" gas tapping	. 115
High pressure pipe45, 46Puddle collars78"specials98-104Reducers, B. & S. for water68-73"" fire systems27" eccentric B. & S. for gas112Holder drips	High vs. low pressure gas mains	. 24	Plugs, screw	. 119
""specials $9^{8-104}$ Reducers, B. & S. for water $6^{8-73}$ ""fire systems $27$ "eccentric B. & S. for gas $112$ Holder drips $115$ "concentric B. & S. for gas $112$ Hub sleeves for gas $113$ "B. & S. for gas $112$ Hub sleeves for gas $113$ "B. & S. for gas $112$ Hub sleeves for gas $30$ "flanged for water $94$ , 95"power mains $30$ "flanged for gas $117$ Increasers for gas, S. & B $112$ "high pressure, B. & S. $100$ "high pressure $100$ "high pressure, flanged $103$ "spigot and bell for water $70-73$ Scottdale, Pa., Works $150$ Independent high pressure fire systems $27$ Screen pot $78$ Inquiries, code $129$ , $130$ "plugs $113$ Intermediate weights, pipe $36$ , $37$ Service sleeve for gas $113$ Intermediate weights, pipe $36$ , $37$ Service sleeve for gas $113$ Joints, leakage $134-136$ Siphon, Rosemary $143$ Joints, leakageSiphon, Rosemary" $142$ Joints, leakage $113$ <	High pressure pipe	45, 46	Puddle collars	. 78
""" fire systems   27   " eccentric B. & S. for gas   112     Holder drips	" " specials	98-104	Reducers, B. & S. for water	68-73
Holder dripsIISConcentric B. & S. for gasII2Hub sleeves for gasII3" B. & S. long length70-73Hydraulic cylinders86" flanged for water94, 95" power mains30" flanged for gasII7Increasers for gas, S. & B.II2" high pressure, B. & S.II03" spigot and bell for water68-73" return bends, flanged07" S. & B., long length for water70-73Scottdale, Pa., WorksI50Independent high pressure fire systems27Screen pot78Inquiries, code129, 130" plugsI19Intake lines35Service sleeve for gasI13Intermediate weights, pipe36, 37Sewers31Invoices, code137Siphon, RosemaryI44Joints, leakage20Sleeves, standard for gasI13" in pipe joints49Solid sleeves for gasI13" in pipe joints49Solid sleeves for gasI13" joints, code138-140Smoke flue81Solid sleeves for gas113Solid sleeves for gas113" in pipe joints20Siphon, Rosemary113Leakage at joints20" for high pressure service98-104Ship code138-140SrectPICATIONS, STANDARD36-14Life of pipe16138-140SrectPICATIONS, STANDARD36-14Life of pipe16130131Intermediate weights138-140SrectPICATIONS, STANDAR	" " fire systems	. 27	" eccentric B. & S. for gas	, II2
Hub sleeves for gas <t< td=""><td>Holder drips</td><td>_115</td><td>" concentric B. &amp; S. for gas .</td><td>. II2</td></t<>	Holder drips	_115	" concentric B. & S. for gas .	. II2
Hydraulic cylinders <th< td=""><td>Hub sleeves for gas</td><td>. 113</td><td>" B. &amp; S., long length</td><td>70-73</td></th<>	Hub sleeves for gas	. 113	" B. & S., long length	70-73
" power mains	Hydraulic cylinders	. 86	" flanged for water	94, 95
Increasers for gas, S. & B.112" high pressure, B. & S.100" high pressure100" high pressure, flanged103" spigot and bell for water68–73" return bends, flanged97" S. & B., long length for water70–73Scottdale, Pa., Works150Independent high pressure fire systems27Scottdale, Pa., Works150Independent high pressure for exystems27Scottdale, Pa., Works150Induiries, code129, 130" plugs119Intake lines35Service sleeve for gas113Intermediate weights, pipe36, 37Sewers31Invoices, code137Shipments, code134–136Joints, leakage20Siphon, Rosemary113" B. & S.109" high pressure pipe98Lead pipe111Smoke flue81" in pipe joints22Solid sleeves for gas113" joints222Solid sleeves for gas113" in pipe joints220" for high pressure service98-104Leakage at joints220" for high pressure service98-104Leakage at joints220" for high pressure service98-104Leaters, code138-140Special castings, and standard special151Life of pipe13613214Life of pipe1613236-41Life of pipe1613236-41Life of pipe161336-41Life of pipe	" power mains	. 30	" flanged for gas	. 117
"high pressure <t< td=""><td>Increasers for gas, S. &amp; B</td><td>. II2</td><td>" high pressure, B. &amp; S</td><td>. 100</td></t<>	Increasers for gas, S. & B	. II2	" high pressure, B. & S	. 100
"spigot and bell for water68-73"return bends, flanged97"S. & B., long length for water70-73Scottdale, Pa., Works150Independent high pressure fire systems. 27Screen pot78Inquiries, code. 127, 128Screen pot. 78"answers to code. 129, 130"plugs. 119Intake lines	" high pressure	. 100	" high pressure, flanged	. 103
"S. & B., long length for water70-73Scottdale, Pa., Works150Independent high pressure fire systems27Screen pot78Inquiries, code129, 130" plugs96" answers to code129, 130" plugs119Intake lines35Service sleeve for gas113Intermediate weights, pipe36, 37Sewers31Invoices, code137Shipments, code134-136Joints, leakage20Sleeves, standard for gas113" turned and bored19" high pressure pipe98Lead pipe111Smoke flue81" joints20Sleeves for gas113" turned and bored19" high pressure pipe98Leakage at joints20Sleeves for gas113" joints22Special castings, and standard special151Leakage at joints20138-140SPECIFICATIONS, STANDARD36-41Life of pipe132134136-41Life of pipe161323236-41	" spigot and bell for water	68-73	" return bends, flanged	. 97
Independent high pressure fire systems27Screen pot78Inquiries, code127, 128Screen pot96"answers to code129, 130"plugs96Intake lines35Service sleeve for gas113Intermediate weights, pipe36, 37Sewers31Invoices, code137Shipments, code134-136Iron and other metals9Siphon, Rosemary14Joints, leakage20Sleeves, standard for gas113" B. & S.19"standard for water pipe74" in pipe joints111Smoke flue81" joints222Special castings, and standard special151Leakage at joints20"" for high pressure service98-104Lengths, code138-140Special castings, and standard special151Life of pipe138-140Allowable variation in diameter of pipe36-41Allowable variation in diameter of pipe3637	S. & B., long length for water .	70-73	Scottdale, Pa., Works	. 150
Inquiries, code127, 128Screw flanges96" answers to code129, 130" plugs119Intake lines35Service sleeve for gas113Intermediate weights, pipe36, 37Sewers31Invoices, code137Shipments, code134-136Iron and other metals9Siphon, Rosemary14Joints, leakage200Sleeves, standard for gas113" B. & S.19" standard for water pipe98Lead pipe111Smoke flue81" in pipe joints222Special castings, and standard special113" joints220" for high pressure service98-104Leakage at joints200" for high pressure service98-104Lengths, code138-140SPECIFICATIONS, STANDARD36-41Life of pipe13216and sockets37	Independent high pressure fire systems .	. 27	Screen pot	. 78
" answers to code129, 130" plugs119Intake lines35Service sleeve for gas113Intermediate weights, pipe36, 37Severs31Invoices, code137Shipments, code134-136Iron and other metals9Siphon, Rosemary14Joints, leakage20Sleeves, standard for gas113" B. & S.19" standard for water pipe74" turned and bored19" high pressure pipe98Lead pipe11Smoke flue81" in pipe joints49Solid sleeves for gas113" joints222Special castings, and standard special151Leakage at joints20" " for high pressure service98-104Lengths, code138-140SPECIFICATIONS, STANDARD36-41Life of pipe1616and sockets37	Inquiries, code	127, 128	Screw flanges	. 96
Intake lines	" answers to code	129, 130	" plugs	. 119
Intermediate weights, pipe36, 37SewersSewers31Invoices, code137137Shipments, code134-136Iron and other metals9Siphon, Rosemary14Joints, leakage20Sleeves, standard for gas113"B. & S.19"standard for water pipe74"turned and bored19"standard for water pipe98Lead pipe11Smoke flue81"in pipe joints22Special castings, and standard special113"joints220"for high pressure service98Leakage at joints220"for high pressure service98Lengths, code138-140SPECIFICATIONS, STANDARD36-41Life of pipe16132Allowable variation in diameter of pipeLife of pipe1616and sockets37	Intake lines	. 35	Service sleeve for gas	. II3
Invoices, code<	Intermediate weights, pipe	36, 37	Sewers	. 31
Iron and other metals	Invoices, code	. 137	Shipments, code	134-136
Joints, leakage	Iron and other metals	. 9	Siphon, Rosemary	. 14
"B. & S.   Image: Standard for water pipe   74     "turned and bored   Image: Standard for water pipe   74     "turned and bored   Image: Standard for water pipe   98     Lead pipe   Image: Standard for water pipe   98     Lead pipe   Image: Standard for water pipe   98     Lead pipe   Image: Standard for water pipe   98     Image: Standard pipe   Image: Standard for water pipe   98     Image: Standard pipe   Image: Standard for water pipe   98     Image: Standard pipe   Image: Standard for water pipe   98     Image: Standard pipe   Image: Standard for water pipe   98     Image: Standard pipe   Image: Standard for water pipe   98     Image: Standard pipe   Image: Standard for water pipe   98     Image: Standard pipe   Image: Standard for water pipe   113     Image: Standard for water pipe   Image: Standard for water pipe   113     Image: Standard for water pipe   Image: Standard for water pipe   113     Image: Standard for water pipe   Image: Standard for water pipe   113     Image: Standard for water pipe   Image: Standard for water pipe   113 <t< td=""><td>Joints, leakage</td><td>. 20</td><td>Sleeves, standard for gas</td><td>. II3</td></t<>	Joints, leakage	. 20	Sleeves, standard for gas	. II3
"turned and bored <td>" B. &amp; S</td> <td>. 19</td> <td>" standard for water pipe</td> <td>. 74</td>	" B. & S	. 19	" standard for water pipe	. 74
Lead pipeIISmoke flueSI" in pipe joints<	" turned and bored	. 19	" high pressure pipe	. 98
"in pipe joints	Lead pipe	. II	Smoke flue	. 81
"joints   . </td <td>" in pipe joints</td> <td>. 49</td> <td>Solid sleeves for gas</td> <td>. 113</td>	" in pipe joints	. 49	Solid sleeves for gas	. 113
Leakage at joints   .	" joints	. 22	Special castings, and standard special .	. 151
Lengths, code   .   <	Leakage at joints	. 20	" " for high pressure service .	98-104
Letters, code   .   <	Lengths, code	138-140	SPECIFICATIONS, STANDARD	36-41
Life of pipe	Letters, code	. 132	Allowable variation in diameter of p	ipe
	Life of pipe	. 16	and sockets	. 37

### Index-Continued

Page . 5 33 115

ł	age		Page
Specifications, Standard—Continued		Superior, Wis., Works	. 5
Allowable variation in thickness	37	Taper joint pipe	• 33
Allowable percentage of variation in weight	38	Tapping, alternate for drip plugs .	. 115
Casting of pipe	39	Tee bases, B. & S. for water	61-63
Castings to be delivered sound and perfect	41	" " flanged for water	92, 93
Cleaning and inspection	39	" " flanged for gas	. 118
Coating of pipe	39	" " high pressure, flanged .	. 104
Contractor to furnish men and materials .	40	Tees and crosses, B. & S. for water .	55-60
Cutting defective spigots	37	" flanged for water .	90, 91
"Engineer," definition of word	41	Tees and crosses, B. & S. for gas .	110, 111
General dimensions of pipe, Tables Nos. 1		" flanged for gas .	. 118
and 3 43	3-45	" high pressure, flanged	. 104
Hydrostatic test	40	Tees, high pressure, B. & S.	. 99
Inspector to report	41	" with flanged branch	. 101
Marking pipe	38	Telegrams	. 131
Power of engineer to inspect	40	Terms, code	136
Quality of castings	39	Tidal gate	. 78
Quality of iron	38	Time, code	. 137
Special castings	37	Tongue and groove, flange joint	. 102
Testing materials	39	" " recess, flange joint	. 102
Split sleeves for gas	113	Tons, code	138-140
" " with and without branch outlet		Tons, feet, lengths, code	138-140
for water	97	Valve boxes, adjustable	. 77
Standard thickness and weights of pipe . 43	3-46	Wachusett dam	. 13
" flexible joint pipe, Tables 5 and 6 47,	48	Water supply conduits	. 10
" gas pipe and special castings . 105-	-118	Works	. 5
" pipe and specials for gas	21	Y branches, B. & S. for water	64, 65
" special castings for water 50	0-76	" all hub, for gas	. 111
Steel pipe	26	" high pressure, flanged .	. 104
Submerged pipe	32	Yard drips	. 115



320

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