TRIDENT WATER METER

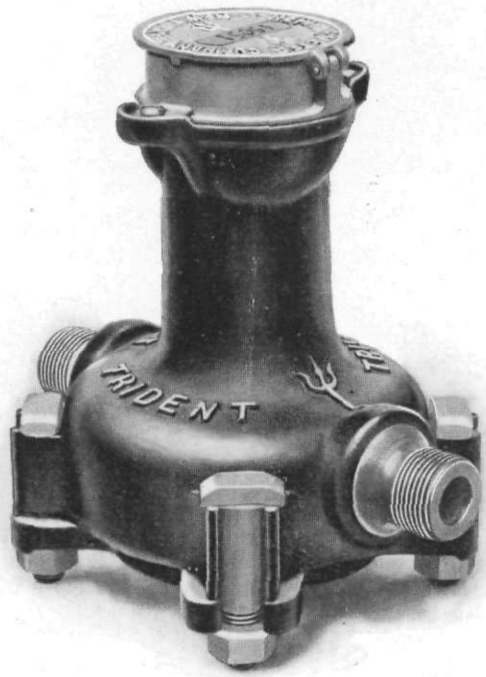
PRICE LIST

AND

DESCRIPTION

A D 1898

NEPTUNE · METER · COMPANY
POSTAL · TELEGRAPH · BUILDING
TWO · FIFTY · THREE · BROADWAY
NEW YORK



NEPTUNE METER COMPANY

Sole Manufacturers

NEW YORK

Designed and Patented by

JOHN THOMSON, M. Am. Soc. C. E.,

The Originator of the Modern Disk System of Water Meters.

May, 1898

Price List and Description

of the

Trident Water Meter

made by

Neptune Meter Company

main office:
253 Broadway
postal telegraph building
NEW YORK CITY.
Long Distance Telephone:
3080 CORTLANDT

chicago office and storage:
10 to 24 West Water Street
Telephone: MAIN 3136

mark all packages
Neptune Meter Company
Jackson Avenue, corner Crane Street
Long Island City, N. Y.
Thirty-fourth St. Ferry

Please address general correspondence to the Company at its Main Office

F C Dininny Jr President
John E McDonald Treasurer
W G Zick Secretary
John Thomson Vice-Pres't and Engineer

NET CASH PRICES

OF THE TRIDENT WATER METER
TO WATER DEPARTMENTS AND COMPANIES

Size, Inches	Weight, Pounds	Length	Diameter	Height	Safe maximum delivery, gallons per minute.	Price of Connections, Net	Price of Meter, Net	Size, Inches
5/8	12½	7½	6½	8¾	20	0.40	$8.00	5/8
¾	15	8⅝	7¼	9	35	0.60	12.00	¾
1	26	10½	9⅜	9¾	65	0.80	16.00	1
1½	80	11⅞	10½	11¾	100	0.00	30.00	1½
2	112	14½	12¼	13¼	165	0.00	50.00	2
3	330	24	20	21¾	300	0.00	85.00	3
4	555	29	24¼	26¼	600	0.00	190.00	4
6	1,480	38	30	32	1,000	0.00	380.00	6

EXTENSION DIALS, $1.50 each, from 5/8 to 1½ inch sizes, inclusive; $2.00 from 2-inch size up.

IN ORDERING EXTENSIONS, please specify if height is taken from centre of spud or seat of register. The usual practice is to measure from the spud to top of register box cover.

INSIDE STRAINERS FURNISHED FREE OF CHARGE.

FISH TRAPS FURNISHED IF REQUIRED:
3-inch, $10.00; 4-inch, $15.00; 6 inch, $20.00.

The above prices include Boxing and Delivery, free on board cars or steamer.

Telegraphic Code

To indicate how shipment should be made, the code word requires to be followed by EXPRESS, or FREIGHT, or STEAMER.

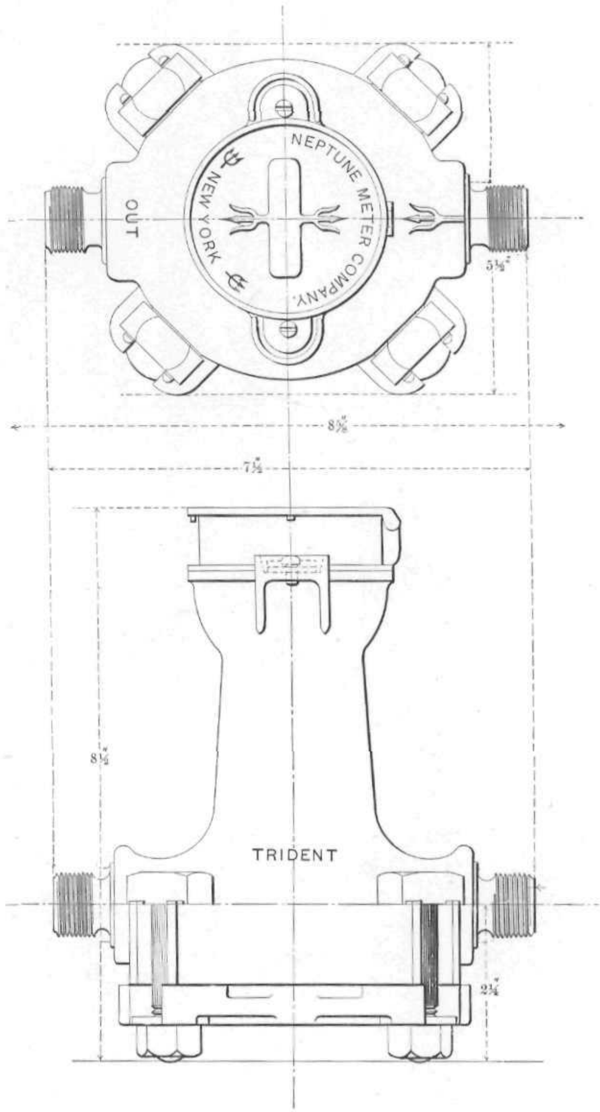
ANGLE	⅝-inch, without couplings.	
BEGIN	⅝-inch, *with* couplings.	
EMPIRE	¾-inch, without couplings.	
FROST	¾-inch, *with* couplings.	
INVITE	1-inch, without couplings.	
JUSTICE	1-inch, *with* couplings.	
LONG	1½-inch.	See illustrations and detailed description regarding connections.
NEXT	2-inch.	
PAST	3-inch.	
RUSH	4-inch.	
TRUST	6-inch.	

ILLUSTRATION OF CODE TELEGRAM:

Ship us *fifty* BEGIN *twenty* EMPIRE and *ten* JUSTICE freight.

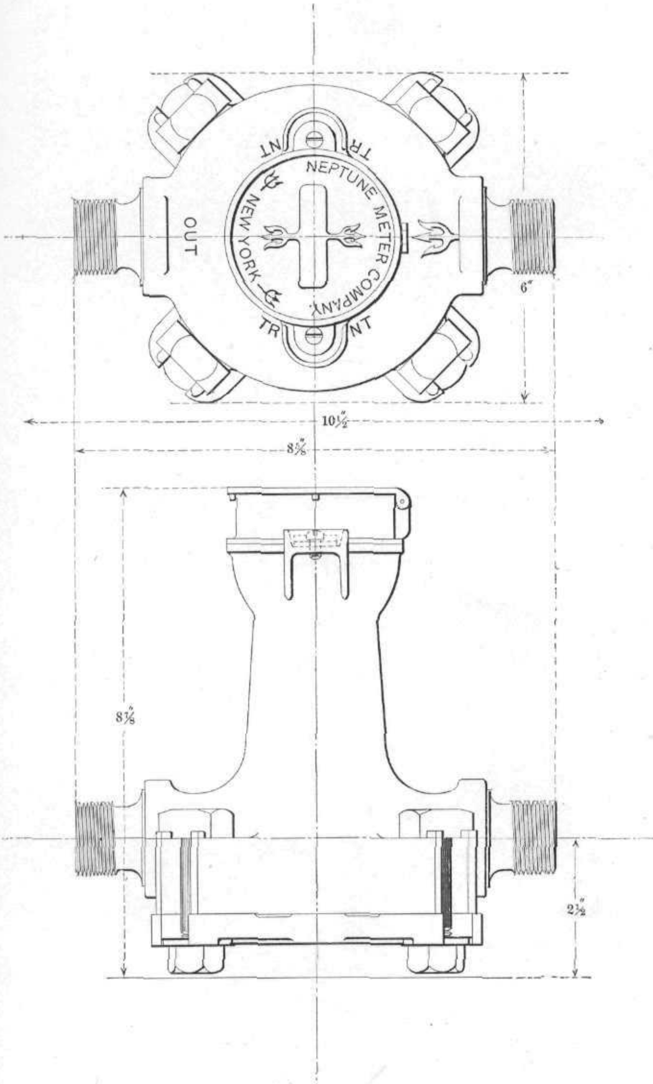
INTERPRETATION:

Ship us *fifty* five-eighth-inch TRIDENT Meters, with couplings; *twenty* three-quarter-inch, without couplings; and *ten* one-inch, with couplings, by freight.



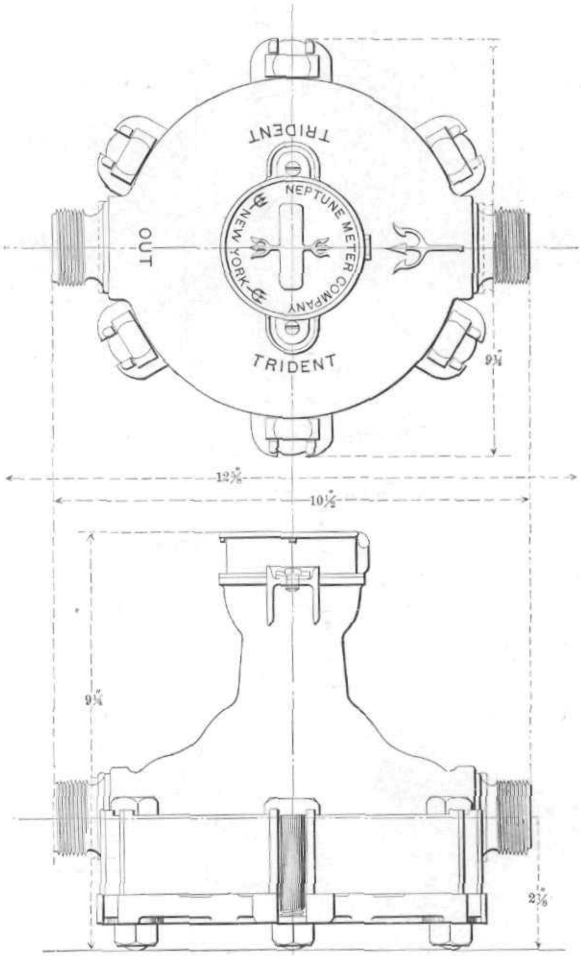
FIVE-EIGHTH INCH TRIDENT.

Price of meter, $8.00; of connections and leather washers, 40 cents; of extra frost bottom and gum rubber gasket, 25 cents. Weight, 12½ pounds. Delivery, equal to that of the pipe. Usual percentage of accuracy, at all rates of flow within 8 to 1500 gallons an hour, 98.5 to 101. Sensible at from two to four gallons an hour. Proof pressure, 250 pounds, frost bottoms "go" at about 550 pounds to the square inch.



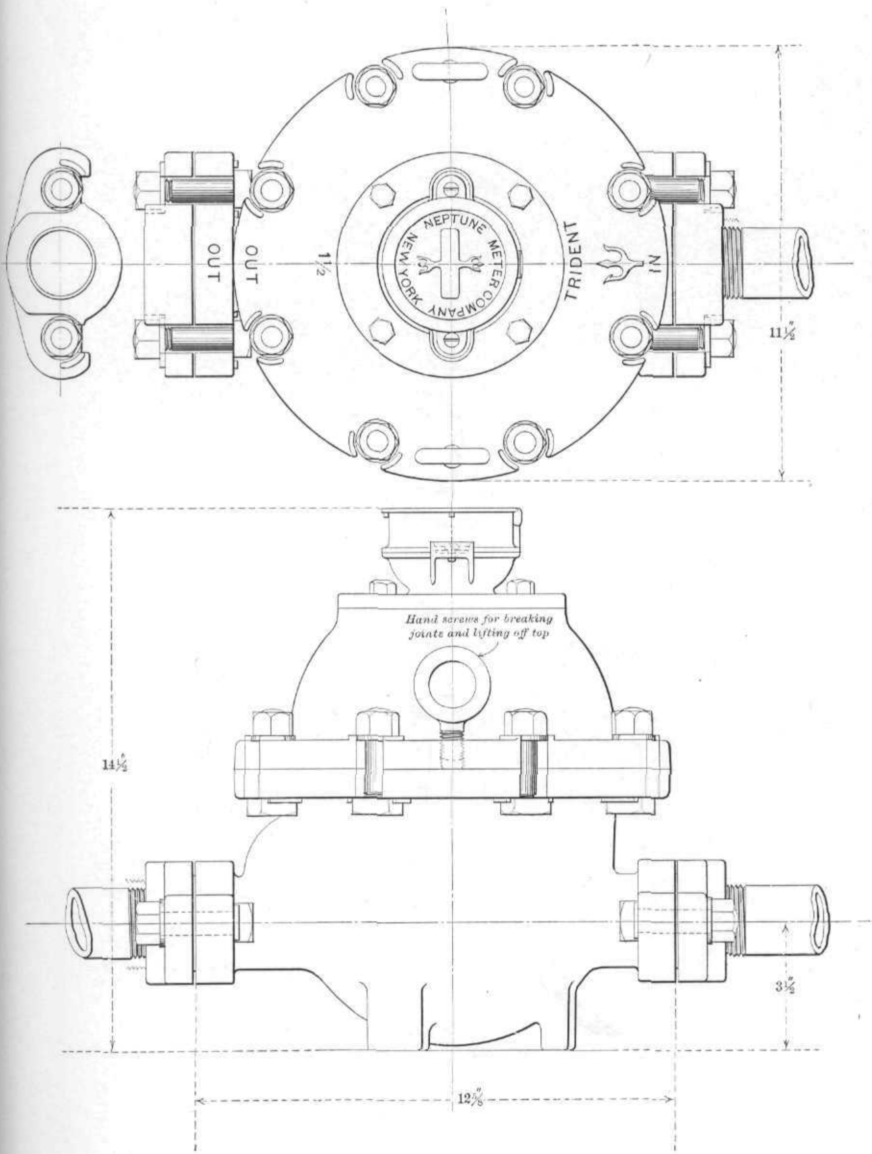
THREE-QUARTER INCH TRIDENT.

Price of meter, $12.00; of connections and leather washers, 60 cents; of extra frost bottom and gum rubber gasket, 35 cents. Weight, 15 pounds. Delivery, equal to that of the pipe. Usual percentage of accuracy, at all rates of flow within 10 to 2250 gallons an hour, 98.0 to 101.0. Sensible at from three to five gallons an hour. Proof pressure, 250 pounds; frost bottoms "go" at about 550 pounds to the square inch.



ONE-INCH TRIDENT.

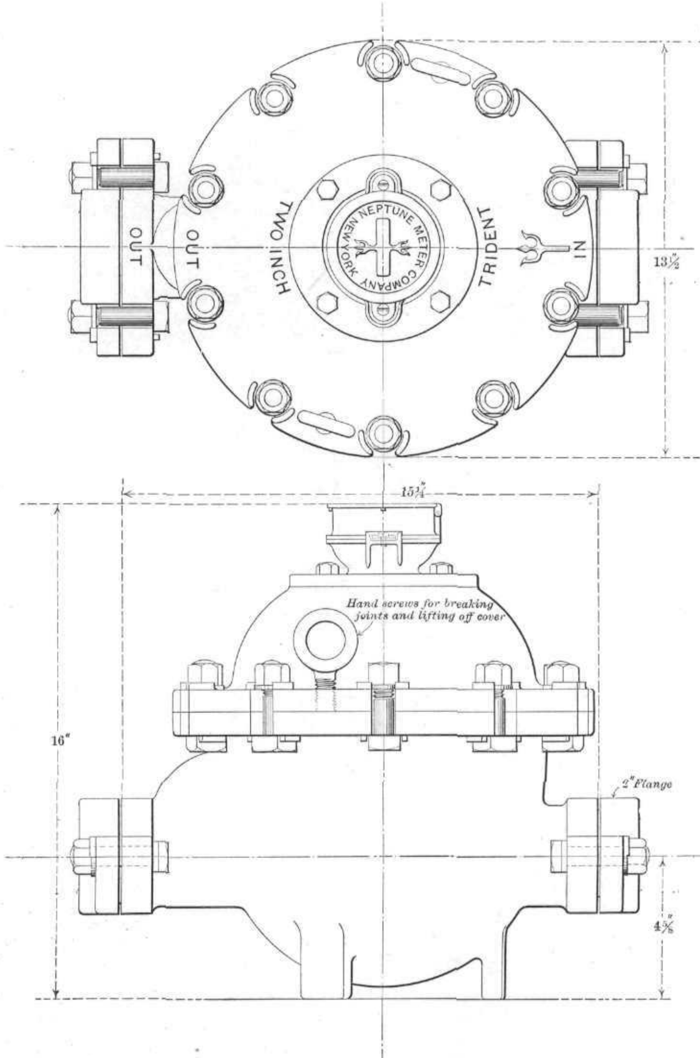
Price of meter, $16.00; of connections and leather washers, 90 cents; of extra frost bottom and gum rubber gasket, 50 cents. Weight, 26 pounds. Delivery, equal to that of the pipe. Usual percentage of accuracy, at all rates of flow within 15 to 3750 gallons an hour, 87.5 to 101.0. Sensible at from five to eight gallons an hour. Proof pressure, 250 pounds; frost bottoms "go" at about 550 pounds to the square inch.



ONE-AND-A-HALF INCH TRIDENT.

Price of meter, including threaded flanges and gum rubber gaskets, $30.00. Weight, 80 pounds. Delivery, equal to that of the pipe. Usual percentage of accuracy, at all rates of flow within 25 to 5500 gallons an hour, 97.0 to 101.0. Proof pressure, 250 pounds to the square inch.

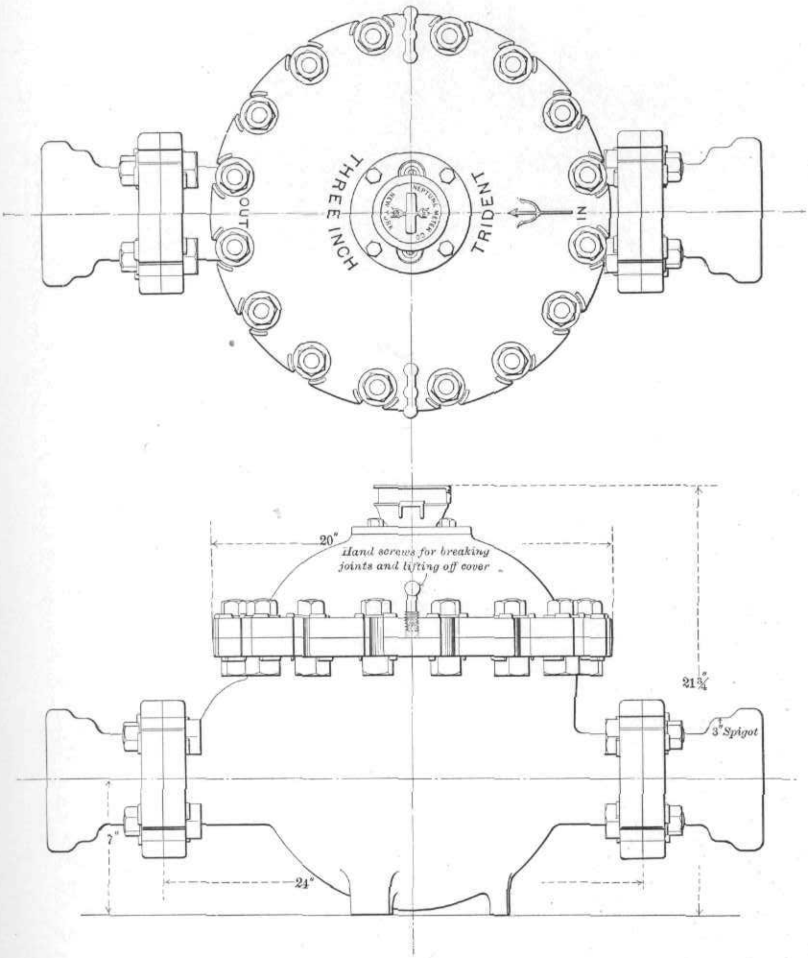
This size can be adapted and calibrated for HOT WATER service without extra charge



TWO-INCH TRIDENT.

Price of meter, including threaded flanges and gum rubber gaskets, $50.00. Weight, 112 pounds. Delivery, equal to that of the pipe Usual percentage of accuracy, at all rates of flow within 30 to 9000 gallons an hour, 97.0 to 101.0. Proof pressure, 250 pounds to the square inch.

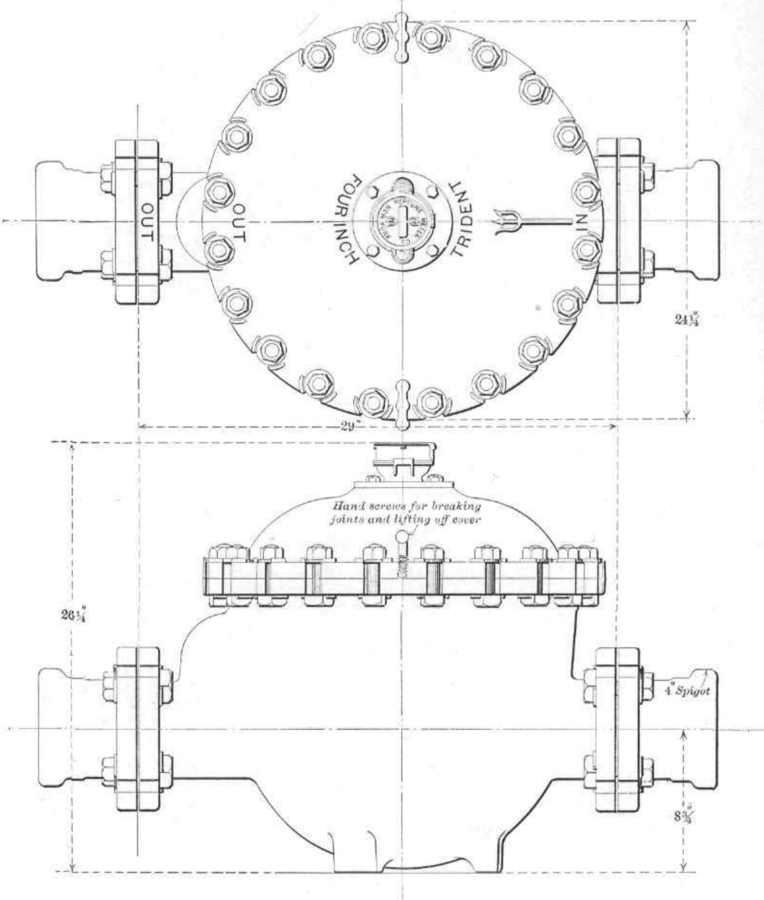
This meter can be adapted and calibrated for HOT WATER service without extra charge.



THREE-INCH TRIDENT.

Price of meter, including flanges, complete for either wrought or cast-iron pipe, $85.00. Weight, 330 pounds. Delivery, equal to that of the pipe. Usual percentage of accuracy, at all rates of flow within 40 to 18,000 gallons an hour, 97.0 to 101.0. Proof pressure, 250 pounds to the square inch.

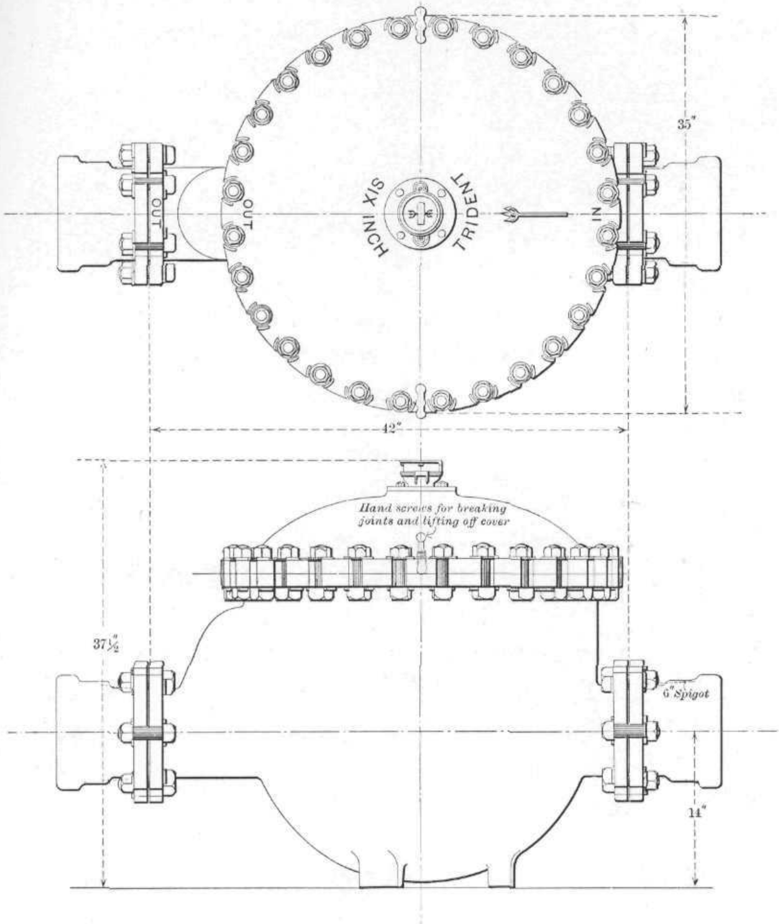
This meter can be adapted and calibrated for HOT WATER service without extra charge.



FOUR-INCH TRIDENT.

Price of meter, including flanges, complete for either wrought or cast-iron pipe, $190.00, Weight, 555 pounds. Delivery, equal to that of the pipe. Usual percentage of accuracy, at all rates of flow within 50 to 36,000 gallons an hour, 97.0 to 101.0. Proof pressure, 250 pounds to the square inch.

This meter can be adapted and calibrated for HOT WATER service without extra charge.



SIX-INCH TRIDENT.

Price of meter, including flanges, complete for either wrought or cast-iron pipe, $380.00. Weight, 1,480 pounds. Delivery, equal to that of the pipe. Usual percentage of accuracy, at all rates of flow within 75 to 65,000 gallons an hour, 97.0 to 101.0. Proof pressure, 250 pounds to the square inch.

This meter can be adapted and calibrated for HOT WATER service without extra charge.

Suggestions

REGARDING THE SETTING, OPERATION AND READING OF THE TRIDENT WATER METER

A *Trident* the form of a three-tongued spear is cast upon the inlet side of the meter. This side should go *towards* the supply pipe.

The supply pipe should be blown out before coupling up, by letting on several quick *gushes* to eject lead, filings, gravel and the like.

In starting up, first turn the outlet wide open, then let the water on slowly—very slowly—until the air is ejected and the meter is completely filled with water.

It is preferable to set the meter approximately level, especially if the water is gritty; nevertheless the Trident will operate satisfactorily in other positions, as its action is positively controlled.

If red or white lead or paste is used in making joints, *never* apply it to the interior of the coupling nut or sleeve, but smear it upon the *exterior thread* of the spud or pipe; in this wise the lead is less likely to be carried into the meter.

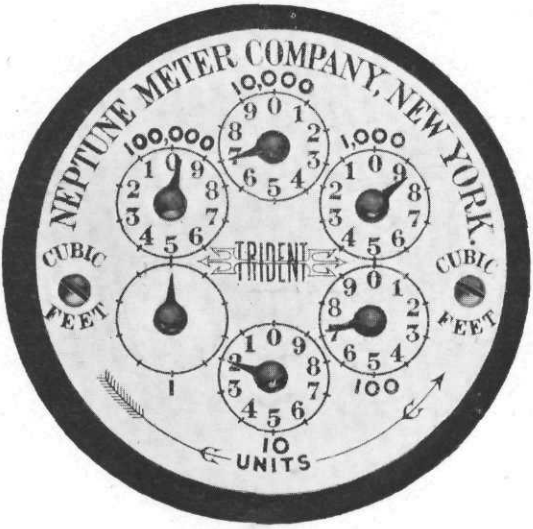
When liable to back-pressure from *hot water*, the ⅝, ¾, and 1-inch sizes should be protected by a well-fitted check-valve. This precaution often saves much extra expense and annoyance.

Quite often meters smaller than the service pipe may be used; but, occasionally, meters larger than the pipe should be employed. The only certain method of determining this is to set a meter in circuit, open up all the faucets likely to be used simultaneously, and then *time the register* to obtain the *rate* in cubic feet a minute. If this rate materially *exceeds* that specified in the column of table, page 6, then a larger meter ought to be substituted.

When a meter is set to discharge into a tank, some portion of the outlet-pipe should be carried *higher* than the meter. The object of this is to maintain back-pressure upon the meter; else it is liable to operation while its upper portion is empty.

The illustration on this page shows the register, counter, index, or dial—as variously termed—of the ⅝ and ¾-inch Trident Water Meters. It reads in the same way as the register of a gas meter. In the United States, the uniform unit of measurement, adopted both in gas meters and in water meters, is a cubic foot. In all commercial cases, 1 cubic foot of water is computed as equal to 62.5 pounds and to 7.5 U. S. gallons. Hence, to transpose cubic feet into U. S. gallons, multiply the reading in feet by 7.5.

The reading of the register as shown is 96,872 cubic feet, which, multiplied by 7.5, equals 726,540 gallons.



The circular trident-arrow, on the margin of the dial, indicates the most certain method of reading, that is, from low to high. The word "units" signifies that each figure of this indice is a single foot and that its total reading is 10, or the sum of 10 units. Hence, the next indice, to the right hand, reads in single sums of 10; the third in single sums of 100; the fourth in single sums of 1000, and the fifth in single sums of 10,000.

When a hand or pointer is between two figures, the lesser of the two must be taken. If there is any doubt as to the correct indication of any indice refer back to the one next lower. Thus, if the hand in the 100 indice should appear to stand exactly on the naught, refer back to the 10 indice (units), and if this hand has *not* reached the naught the correct reading would then be 99, and so on.

The lower left-hand indice, without figures, is graduated to tenths of a foot. This is used for close testing and by inspectors to quickly ascertain if the meter is working; but in all ordinary readings it is disregarded.

The 100,000 register, as here shown, is applied to the ⅝-inch and ¾-inch sizes. In the 1-inch this reading is multiplied by 10 to indicate 1,000,000; in the 1½ and 2-inch sizes the latter is again multiplied by 10 to indicate 10,000,000.

It may be well to call attention that a register marked 100,000 can only be positively read to 99,999.9. When the hands *all* pass the naughts, the complete reading, the single sum of 100,000, should be added to any subsequent reading. Thus, if the first reading of a register were 96,872, and the next reading, that following the first, *appeared* to be 6,872, then the actual reading should be recorded as 106,872, the difference, 10,000, being the net quantity passed during the interim.

Types of Water Meter Registers

"The Trident register is of the *constant moving* type, like that applied to gas meters. We regard this as being much preferable to the intermittent system—that is, as in the instance of the so-called straight-reading dials, actuated by mutilated gearing or ratchet devices.

The opinion here expressed has the concurrence of European experts; and, as the result of years of actual experience, one of the largest meter manufacturers in Great Britain has discarded the intermittent and substituted the constant acting system.

Not only is there more liability of the intermittent mechanism to become stuck and inoperative; but—and this is of even greater importance—the stop-and-start systems present such varying degrees of friction as to seriously *decrease* the sensibility of the meter.

As the strength of a chain is that of its weakest link, so the sensibility of a meter is that of *the period of its greatest resistance*."

The foregoing statement was published by us in 1896. We stand by it now. It has been fully justified by the experiences of many American Experimenters, who in disregard, or without knowledge, of the principles involved have had but annoyance and loss of revenue for their pains. There is no reason why we should not make such registers, and even a gong might be attached, as in standard street car practice. But we are strongly averse to retrograde movements. There is no question about the correctness of our premises, as any mechanician worthy of the name will admit. And yet we cannot hope that the long-continued effort to overcome gravity by one's pulling on his boot-straps, and such analogous "inventions," will become a lost art; for, if it should, the hawker's "occupation would be gone."

Information for Clients and Critics.

In dismounting the meter, if the tapered disk-casing does not drop out freely, it may be forced or driven out by rapping the meter on the bench, open side down, or by a few sharp blows from a mallet or hammer, delivered upon and around the bottom of the main casing. So, too, it can be blown out, either in circuit or on the bench, by removing the Frost Bottom and turning on water pressure. Again, by slightly heating the exterior of the main casing, expanding it, the disk-casing will drop out like a marble from a hat.

To practical men, the flange bolts will appeal with favor, because of their unusually large section. We have yet to hear of a broken bolt. Lugs are provided, top and bottom, so that the bolt cannot revolve when the nut is turned down, nor can it slip out sidewise when under tension. The washers bridge the slots and furnish first-class bearings for the nuts. The bolts, nuts and washers are tinned.

The number of bolts used in our smaller meters have been criticised (competitively) as being insufficient. As already noted, we have never had to replace a broken bolt; for the reasons that the pressure-area of the frost bottom is equal to that of the disk-casing only; hence, with bolts of large diameter and head of small diameter, should not the combination be about right? It is; and here are the figures, that you may judge for yourself: In a ⅝-inch Trident, assuming so high as 1,000 pounds pressure to the square inch, the gross load on the bolts would be 8,900 lbs., or equal to about 11,000 lbs. to each square inch of net bolt-section. As the stock in our bolts is good for about 60,000 lbs. per square inch, and the load cannot exceed about 6,500 lbs., we think the "factor of safety" is equal to cope with this "practical" criticism, or even, as intended, with a 12-inch monkey wrench operated in a keen atmosphere. At any rate, as "seeing is believing," the heads do not nip off; the threads do not strip; the bodies do not part; they stand.

How to Ascertain

THE MAXIMUM RATE OF DELIVERY OF ANY SERVICE AND THE APPLICATION OF SUCH KNOWLEDGE IN THE SELECTION OF THE PROPER CAPACITY OF METER.

The only certain method of determining this is to set a meter in the circuit, open up all the faucets or valves likely to be used simultaneously, and then *time the register* to obtain the *rate* in cubic feet or gallons per minute or hour. By making a few experiments of this kind in, say, different sections of a town, a superintendent will thereafter be able to decide off-hand what *capacity* of meter should be applied in this or that location. No amount of figuring, according to the most imposing formula, will equal this simple but practicable way of "finding out" by actual measurement. The superintendent who will do this will be *boss* of the subject in his domain.

BENCH TESTING.

In our calibration, we assume a cubic foot as equal to 62.5 pounds. Bench tests are usually run for 1, 2, 5 or 10 feet; that is, 62.5, 125, 312.5 and 625 pounds. The usual practice, and which we follow, is to run by the register; that is, run until the aforesaid 1, 2, 5 or 10 feet are *indicated by the pointers*, then find the actual quantity in the tank. Thus, if 1 foot by the register is found to be 63 pounds by the tank, then the meter "under-registers;" if 62 pounds were found, then it would "over-register." The general preference is, that the meter, even when new, shall under-register; that is, be in favor of the consumer. We don't quite agree with this preference; but we follow orders.

A handy, quick and fairly accurate sensibility test can be made by discharging into a vessel of known capacity until the first pointer of the register indicates 0.1 of a revolution ; which is approximately equal to 3 quarts. If this quantity is run in 3 minutes, the rate of the flow is 2 cubic feet an hour ; if in 4.5 minutes, the rate is 1.5 feet ; if in six minutes, the rate is 1 foot.*

The following is a simple and yet thoroughly reliable way to determine the obstruction of any meter to the flow : Suppose the meters to be compared are of the ¾-inch size. Place the first meter in circuit and run at full flow into the trial tank for, say, exactly five minutes. Note the quantity. Then substitute the second meter, using the same connections, and the same packing washers, and run for the same time. Again note the quantity. Thus, if the first meter delivered 18 cubic feet and the second 20, then the capacity for delivery of the first would be ($\frac{18}{20}$) 90 per cent. of the second. So, too, by inserting a piece of pipe equal in length to that of the meter, the relation of the retardation of the meter to the pipe may also be ascertained.

*For more complete data we refer to the paper entitled "Uniformity of Methods in Testing Water Meters," by our Mr. John Thomson ; published in the Journal of the New England Water Works Association, Vol. X, No. 2.

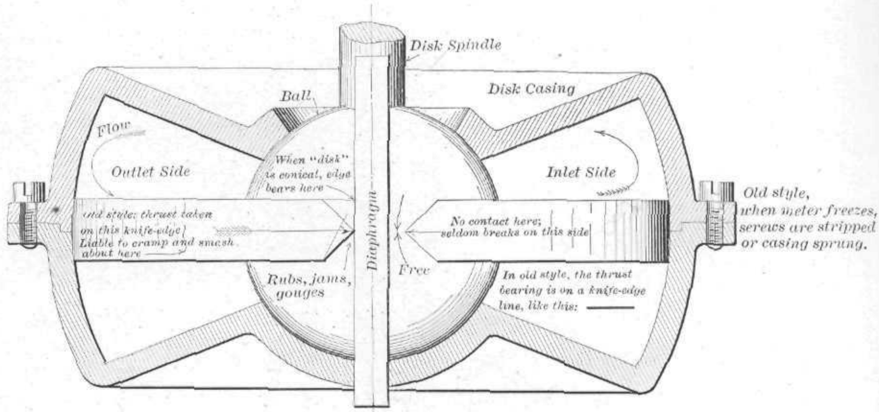
Large Size

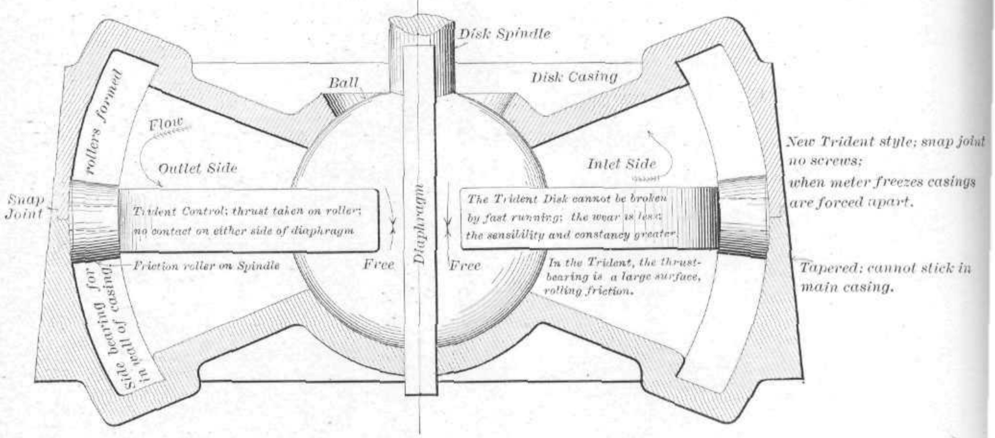
DISK WATER METERS.

Some of the experiences in disk water meters, especially in the larger calibres, have justified a feeling of hesitancy regarding their adoption, because of the frequent failures of the disks and the excessive cost of their repair when so damaged. Heretofore, the disks of the larger sizes, as well as the smaller, have been constructed from hard rubber. Such failures have been almost if not entirely due to two causes: namely, warping of the disk from introduction of hot water, or smashing from operation under high rates of delivery. Three methods have been employed, aiming to avoid breakages from over-running: First, throttling the meter—thereby cutting down its delivery and reducing the speed of its operation; second, cutting away the edge of the disk-casing; and third, to reinforce the rubber by the insertion of metal rings or plates; the latter (and much the better) method, however, being now inapplicable as the consequence of a judicial ruling in a recent patent cause.

With this brief introduction, we will now point out the *reason why* disks have broken in the past and will continue to do so in the future, irrespective of their material, in all disk meters other than the Trident, and why the percentage of failures are more frequent as the sizes increase. We will then point out how this fundamental defect has been overcome; an accomplishment which we assert, without fear of successful contradiction, is by far the most important in its results of any that have been made in the adaptation of the old-time disk device to the purpose of water measurement.

Having reference to the diagrams here presented, it will be seen that the water, as it flows around through the disk chamber, tends not only to cause the disk to oscillate but also





In these diagrams, the upper represents the old style; the lower being the new style—the Trident.

The principles here illustrated have equal reference to "disks" of either flat or conical form.

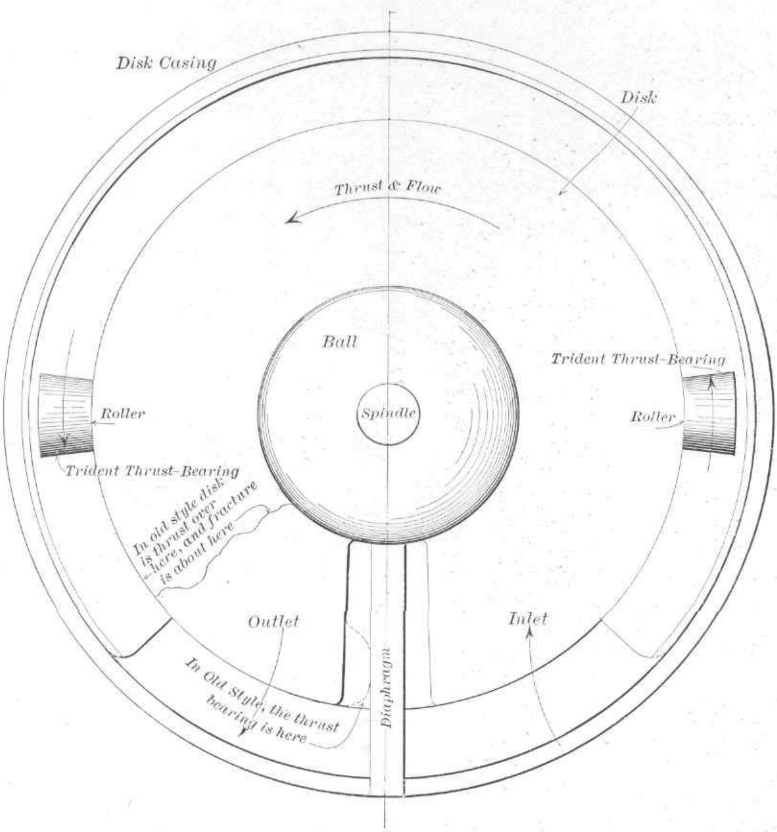


Diagram Showing How the Patent Roller Thrust Bearing of the Trident Prevents the Disk from Cramping Between the Diaphragm and the Casing.

Examine any other disk meter, and you will see that the greatest wear is on the diaphragm, and on the outlet portion of the disk and its casing. Also examine the disks broken in service, and you will find that the fracture almost invariably takes place as indicated above. Rubber pistons reinforced with steel saw plates have thus been broken. Hence, it is not so much the material as the defect in principle. The Trident disk will not fail; the principle is correct.

produces a secondary effect—namely, to cause it to move with the current, like a chip floating on a stream. This secondary effect, *if unrestrained,* would produce rotation of the disk—the ball and socket acting as a journal bearing; or if there were no ball and socket then the disk would be thrust over against the wall of the disk-casing and in that portion thereof contiguous to the outlet port.

This effort to *displace the disk,* to thrust it into the outlet port, increases, firstly, as the square of the velocity of the flow, and, secondly, directly as the sectional area of the disk chamber.

In the old-style method, this thrust is virtually taken on a *knife-edge,* that is, the face of the disk-slot, which rubs back and forth on a side of the diaphragm. Thus, if the area of a ⅝-inch disk chamber is 0.75 square inch and the hydraulic friction, that is, the loss in head due to the velocity of the flow, is equal to four pounds' pressure to the square inch, then $0.75 \times 4 = 3.00$ pounds, the load on the knife-edge during each swing through an arc of forty degrees. Again, if it were a four-inch meter having twenty square inches of disk chamber area, and the same difference in head due to hydraulic friction, then $20 \times 4 = 80$ pounds, the load on the knife-edge; the only difference in the bearing surfaces, in these two cases, being in the length of the *edge.*

Now, in an action of the character just described, while it may appear all right, when new, or when the conditions are favorable, as at low rates of flow, it yet has the elements within itself which may cause its own destruction. It's like an engine, or a printing press with core-sand in the bearings; once let them be operated under such conditions and the almost certain result is to cut, score and "ring up." And precisely so here; for the inadequate bearing surface of the knife-edge soon yields under the rapid motion and heavy pressure; this produces a new condition of friction; wear of the ball and socket follows ; the disk is then without axial control ; its edge will then be driven over against the outlet wall of the casing ; the duty is thus greatly increased ; as the resistance increases, this involves an increase of water-pressure to continue the operation ; and the certain consequence is either to decrease the sensibility of the meter, by wear of its parts, or to render it inoperative by smashing the disk.

Our remedy for this, the fundamental defect of the old-style disk device, is to take the thrust of the flow upon friction rollers mounted upon and moving with the disk, acting in milled recesses, formed in the wall of the disk-casing—*the bearing surfaces being proportionate to the pressure to be resisted ;* which expression, when taken with the diagrams, would appear to tell the whole story.

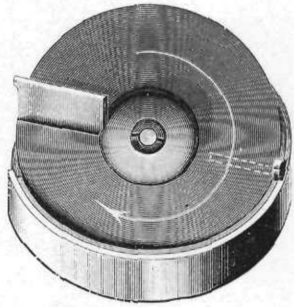
That the foregoing statements may not be regarded as overdrawn, the writer has made careful measurements and calculations, with the view of determining the extent of wearing surface afforded by the thrust rollers of our Trident Meter, and the greatest area which could be obtained were the edge of the slot to bear upon the diaphragm as in the old-style practice. The result of this investigation shows that the bearing surface of the new Trident control is at least *sixteen* times greater in the ⅝-inch and *thirty* times in the 2-inch over that of the old ; the latter relation being represented by these lines :

The disks in all of our larger sizes, from the 1½-inch up, are simple flat plates of hard-rolled brass ; the balls and spindles being of composition. Two thrust rollers are applied, as shown in diagrams, thus balancing the strains and doubling the wearing surfaces. But in the smaller sizes, with hard-rubber disks, a single roller-stud has been found ample in the hardest services.

Instead of cutting down the dimensions, we have *greatly increased* the areas of waterways, which in every case are equal to or larger than the area of the pipe ; besides which, material additions have been made to the weight, the strength and the stiffness of the casings. On the other hand, the number of oscillations of the disk (its " speed ") when operating at full flow, have been materially reduced. And we presume to say, that this has not been done simply for the sake of making a change, a *mere* change, but because we now more correctly estimate the severity of the conditions to be overcome. The correct diagnosis of a disease is the indication to the remedy.

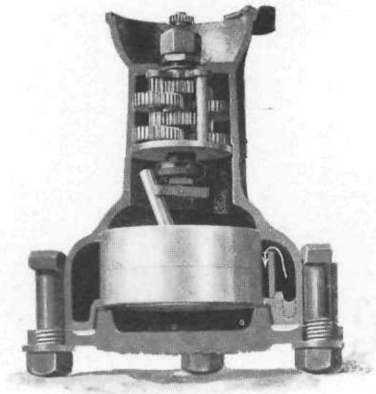
In the 1½-inch size, up, strainer plates are furnished. The entire hemispherical cavity of the main casings provide dirt spaces of unusual capacity.

The interior of all sizes of Trident Meters can readily be examined without removal from the service mains. Simply *loosen* the flange bolt nuts ; slip bolts, with washers and nuts attached, out sidewise ; break joints by means of the hand screws, lift off cover, lift out the disk-casing, lift out the strainer-plate ; then examine at leisure. And all of which can be done with this " kit "—a Trident wrench.



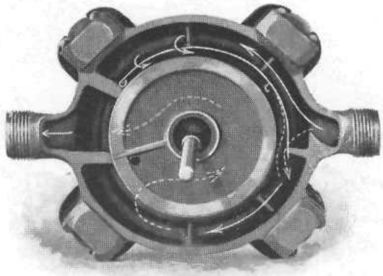
PERSPECTIVE ILLUSTRATION OF DISK, BALL, DIAPHRAGM, ONE SECTION OF DISK-CASING AND THE PATENTED DISK-THRUST CONTROLLING ROLLER, AS APPLIED TO THE ⅝, ¾ AND 1-INCH SIZES OF "TRIDENT" WATER METERS.

The arrow in this view denotes the direction of the flow and also the trend of the thrust of the disk.



VERTICAL CENTER SECTION OF THE $\frac{5}{8}$-INCH TRIDENT, THROUGH THE MAIN-CASING AND ENCLOSING HEAD, ON THE LINE OF THE BOLTS, EXPOSING THE DISK-CASING AND INTERNAL GEAR TRAIN IN PERSPECTIVE.

The arrow indicates how the inflowing water is caused to rise and pass over the top of the intercepting shield or strainer, through the narrow circular slit, before passing around to the larger chamber on the left hand, and thence to the inlet port, thus preventing any matter of large calibre from reaching the interior of the disk chamber.



HORIZONTAL SECTION, $\frac{5}{8}$-INCH TRIDENT, TAKEN ON THE CENTER LINE OF SPUDS.

This view looks downward into the receiving space and shows the disk-casing and also the T-heads of the bolts in full lines. The arrows at the top indicate the normal course of the water through the meter ; the stream, after being first deflected towards the right hand, rises and passes over the intercepting shield or strainer, and thence, reversing, flows back to the inlet port. The course of the current through the disk chamber is denoted by the curved dotted arrows. In this circuit the water is caused to pass over a series of entraining dirt pockets. The dotted lines denote how the shield is blown over should the right-hand dirt space become filled, the stream then passing direct to the left-hand space, as shown by the broken arrow. But such deflection will not blow the matter, which has been accumulated in the upper dirt space, around into the disk chamber ; as the upper space then becomes a "dead end." This strainer offers but slight obstruction, and it can never become so clogged as to stop the delivery. Moreover, the receiving space may be fully cleansed by simply reversing the flow.

Our Trident

IS THE ONLY METER IN WHICH ANY PART, EXCEPT THE HEAD, DAMAGED BY FREEZING IS RENEWED FREE OF CHARGE.

The *three* conditions necessary to save the internal parts from obvious damage, when a meter is frozen solid, and its outer casing ruptured, are as follows: Firstly, that the head shall be driven out clean; secondly, that the internal casing shall be free to follow the head; and, thirdly, that the sections of the internal casing are *not* to be fixedly confined together, but shall be free to separate.

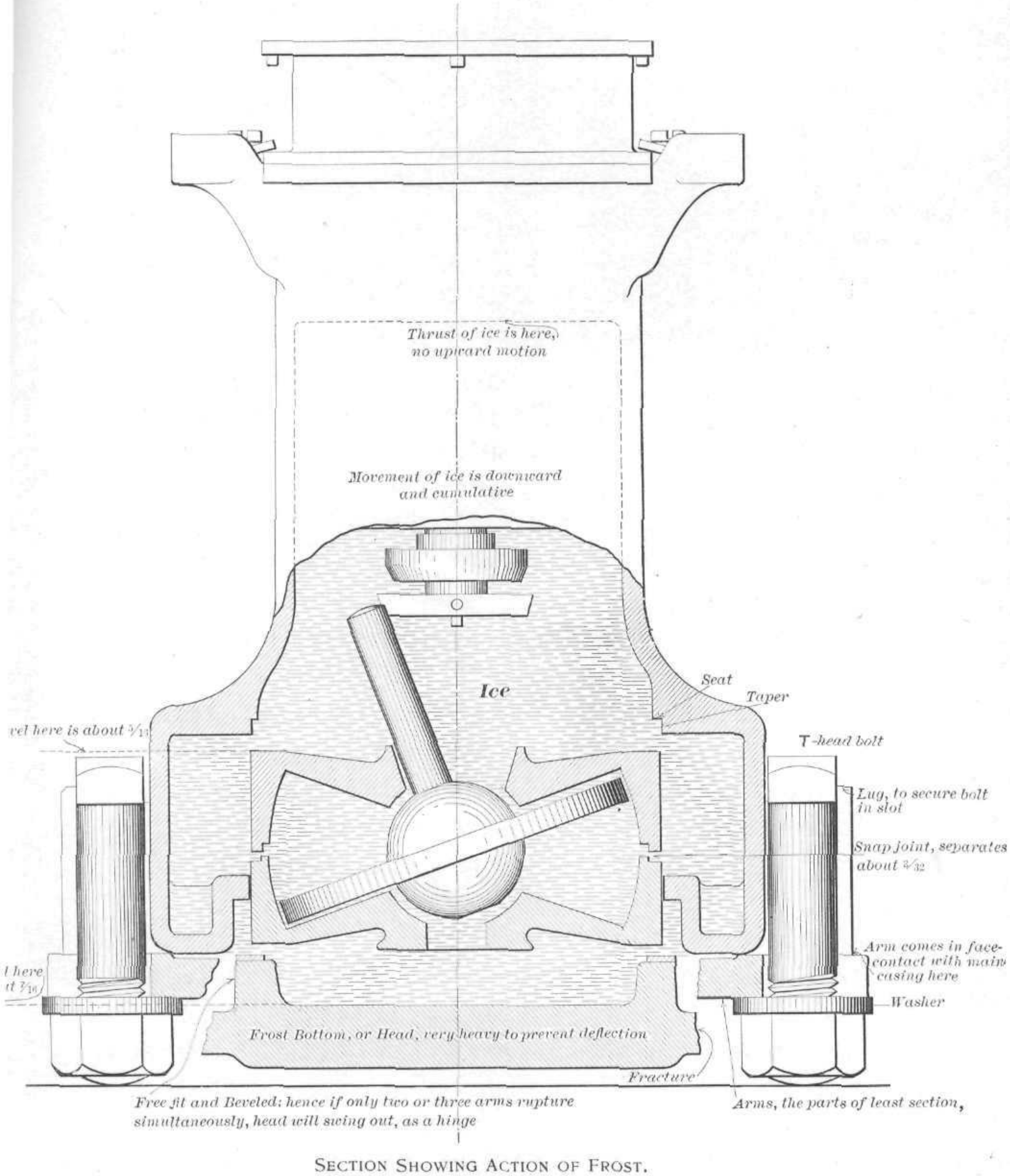
Are not these conditions completely met in the Trident Water Meter as here illustrated?

The *one* condition necessary to save the internal parts from hidden and unknown partial damage, as when a meter is heavily strained by partial freezing, is that the internal casing shall have sufficient strength and rigidity to withstand such treatment.

Is not this condition fully provided for in the form and thickness of the Trident disk-casing?

When water is frozen into solid ice its volume is increased about nine per cent. The energy of this expansion is practically irresistible.

In a ⅝-inch Trident Meter, the theoretical downward motion imparted to the several parts by the moving column of ice will be about as noted on the accompanying drawing. These figures, however, will vary somewhat in practice, depending upon the suddenness and completeness of the freezing process.



SECTION SHOWING ACTION OF FROST.

Part Vertical Center Section, ⅝-inch Trident Water Meter, on the diametral line of bolts, showing the actual relative positions, WHEN FROZEN, of the frost bottom, of the disk-casing and of the disk.

This drawing also illustrates the construction of the ¾ and 1-inch sizes.

The Trident's

CONTROLLING ADVANTAGES.

The sides of the disk-slot do not slide upon the diaphragm; the thrust being taken by a separate bearing. Thus the disk is first prevented from cramping and subsequently from *smashing*. This is the most important improvement ever made in the disk action. We were the first to discover the cause of and apply the only feasible remedy for avoiding the breaking of disks in disk water meters. The practical result is that where others *smash* the Trident will stand.

The damage from freezing is guaranteed not to exceed a fixed amount. If the expense is greater than this, we pay the excess. Then, too, the owner of a frozen Trident is not seriously discommoded; nor is the *tally* long stopped. The design which makes such a condition possible is broadly patented. We were the first to reduce the excessive expense of repairing frozen meters. Does not your own experience justify the assertion that prior to the advent of the Trident the repairing of frozen meters by manufacturers was regarded as "legitimate plunder;" the more the better?

The measuring casing and its parts are of such design that if but partially frozen the accuracy of registration will not be affected. This feature is entitled to more careful consideration than it ordinarily receives; *as many meters, when strained by partial freezing, but not ruptured, are practically useless at the lower rates of draught.*

The competitive admonition is: "Protect your meters from frost." And such protection may require a housing as costly as the meter, which, if frozen, is liable to be completely ruined. But in the Trident it is less expensive to take the chance, because, *if* frozen, the expense is *limited and nominal.*

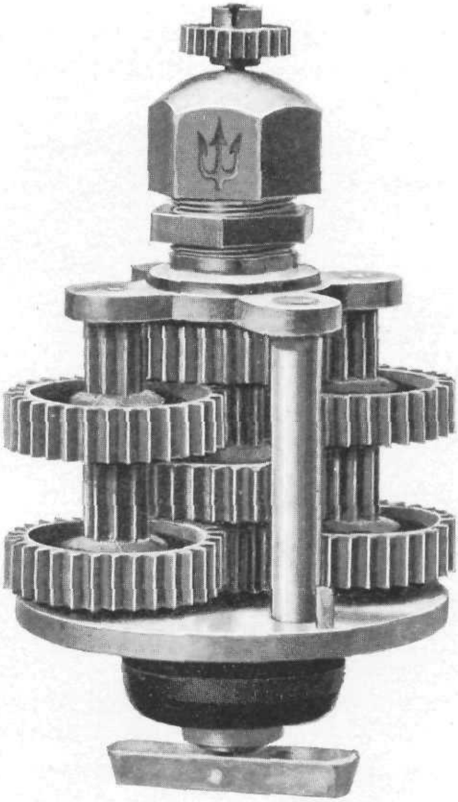
The working parts may be conveniently and quickly examined ; not a single pin or screw need be removed. As time is of value, this money-saving feature has been promptly recognized ; and for this we supply, free, the only tool required, a Trident wrench.

Stones, sticks, scale, nails, twine, shavings, grit, grass, lead or paste are *trapped;* and yet without possibility of stopping the flow, as in the instance of a strainer or screen. The direct consequences are : fewer complaints, less labor, fewer stops, more revenue.

The most uniform in registration at different rates of flow. This is a most important point to the consumer, as some meters, while correct at one rate of delivery, may "under-register" and "over-register" at other rates of flow.

The stuffing-box spindle is rolled in its bearing with theoretical accuracy from opposite diameters, avoiding side thrust, wear and friction ; consequently, there is almost complete immunity from leaks.

The internal gear train is compound. This is a distinctly new system, broadly patented. The principle is such (balanced impulse) as to obtain a high degree of sensibility and durability. Thus, in the usual single, or unbalanced, gear train, irrespetive of its material, or however well constructed, if compounded, as with us, its endurance would easily be doubled. As proof of our certainty respecting the matter of durability, it may be stated that we rivet the gear plates together ; hence, repair is not contemplated. If any train should fail, it will be caused by defective material or construction. In any such instance, simply return it or throw it in the scrap pile and we will supply a new one without charge. Moreover, in the first five sizes, it will interchange, that is, the train from any one size will apply to any one of the other sizes.



FULL SIZE PERSPECTIVE VIEW OF THE TRIDENT
COMPOUND SPUR GEAR TRAIN.

This design is a compound gear train, the driving strains to the central series being perfectly balanced, while those strains transmitted to the two outer series are but *half* that of the common (single series) train.

In this train, 256 revolutions of the driving-arm produce one revolution of the stuffing-box spindle, or about twice that of any train in the market. Consequently, the stuffing-box spindle makes but *half* as many revolutions as in prior practice.

The proportions have been carried out on a most liberal scale: face of teeth, ¼ inch; of pinions, ⅜ inch; length of each bearing, ⅝ inch; length of each pair of bearings, 1¼ inches.

The upper and lower plates are confined by two ¼-inch pillars, each riveted to a shoulder. Thus, the plates are not adapted to be separated. Should anything ever go wrong with one of these trains, send it back; we will supply a new one in its place *without charge.*

The standing has been *highest* in the many comparative practical tests made during the past few years by engineers and superintendents of water works departments, both public and private. Results of many of these records may be had for the asking.

The disks and balls in the first three sizes are made of hard rubber ; these are *not* hot-pressed from "dust," but are from special stock—tough, fibrous, machined. Aside, only, from hot water, they cannot be injured by fast operation ; as the disk *does not* rub and jam against the diaphragm, as in the case of all other disk meters.

The disks and balls in the 1½ inch sizes up, are of solid composition, and cannot be broken or damaged, either by heavy pressure or by hot water.

The delivery is almost entirely unimpeded, being nearly equal to that of the pipe.

The Trident is the ONLY *disk* water meter which is absolutely safe at high rates of flow. It is more than this, especially in the larger sizes, namely: It is *the safest of any meter of* ANY *kind or name.*

TRIDENT

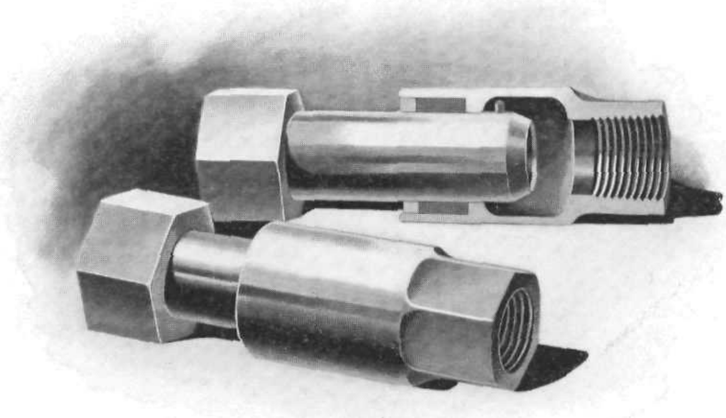
TRADE MARK

The Trident Telescopic Coupling

FOR CONNECTING WATER METERS TO IRON PIPES.

This device consists of a regular coupling inserted into a sleeve provided with plastic packing material. The extent of telescopic movement is about ¾-inch.

But one of these sleeves is required for each set. The sleeve and coupling are delivered pressed together. Hence, in cutting the pipe, it is simply required to remove say ¼-inch to ½-inch more than the space to be occupied by the meter.



When the meter is connected, the coupling will be drawn outwardly through the packing of the sleeve; thus avoiding any nicety of adjustment and ensuring a tight joint at the union without danger of over-straining the meter. Moreover, in breaking joints or changing meters, this slip-connection is a convenience to the man who does the work.

This coupling is made in three sizes, threaded for regular ½-inch, ¾-inch and 1-inch iron pipe. Price, in sets, ½-inch, 75 cents; ¾-inch, $1.00; 1-inch, $1.25.