C. & G. M. WOODWARD,

ENGINEERS

AND MANUFACTURERS OF

WROUGHT IRON PIPE,

AND EVERY DESCRIPTION OF

Steam, Gas and Croton Water Fixtures,

STEAM AND WATER GAUGES, TUBULAR BOILERS, HEATERS FOR STEAM ENGINES.

☞ ORDERS RECEIVED FOR STEAM ENGINES AND LATHES.

NO. 77 BEEKMAN STREET, BETWEEN GOLD & CLIFF,

NEW-YORK CITY.

WROUGHT AND CAST IRON FITTINGS.

CALIBRE	4	3½	3	2½	2	1½	1¼	1	¾	½	⅜	¼	⅛
Wrought Iron Pipe, per foot,	$2 25	1 50	1 25	85	45	26	20	13	10	9	8	7½	6½
Tees, each	3 00	2 25	1 80	1 50	85	65	50	35	25	20	18	15	
Crosses, each	3 25	2 50	2 25	1 90	1 10	80	60	45	33	28	23	20	
Elbows, "	2 50	2 00	1 50	1 10	75	55	40	28	18	15	12	10	
Iron Unions,	5 50	4 50	3 50	2 50	1 50	1 25	90	70	50	37	33	25	
Heaters,				100 00	65 00	35 00	25 00	1800	1700	900			
Cast Iron Flanges Com.,	1 50	1 00	90	75	40	30	25	20	15	13	12	10	
" " Ex. "	2 25	1 75	1 50	1 00	60	50	45	40	35	25	20	20	
Iron Cocks,	22 50	16 50	11 00	9 00	5 00	3 00	2 25	1 50	1 00	80	65	55	
Return Bends,					80	60	45	35	25				
Cast Iron Hooks,								5	4				
Wrought Iron Hooks,				12	10	8	6	4	3	2	2		
" " Bends,					1 00	70	45	30	24	15	12	10	
Ex. Strong Pipe,								25	17				
Malleable Cock Wrenches,					44	38	30	25	20	15	12		
Pipe Tongs,	5 50	4 50	3 50	2 75	2 25	1 75	1 38	1 12	1 00	75	60	60	
Branch Tees, 8							4 00	3 00	2 00				
" " 6							3 00	1 40	1 25				
" " 5							2 50	1 25	1 00				
" " 4							2 00	1 10	90				
" " 3							1 50	85	75				
" " 2							1 00	80	60				
Plugs, Reducers, Couplings, Bushings, Locknuts, Nipples,	1 50	1 00	88	63	40	25	20	13	10	9	8	7	7
Condensers,						30 00	20 00	15 00	13 00	9 00			
Pumps on frames,					100 00	75 00	60 00	50 00	40 00				
Force Pumps,					35 00	25 00	20 00	15 00	12 00				
Taps,		10 00	8 00	6 00	3 00	2 50	1 75	1 50	1 25	1 00	90	75	50
Whole Dies,		15 00	13 00	10 00	5 00	4 00	3 00	2 50	2 00	2 00	1 75	1 75	1 50
Half "					1 75	1 60	1 50	1 30	1 20	1 10	85	75	60
Screw Plates,					25 00			15 00		10 00			

STEAM METAL.

CALIBRE	4	3½	3	2½	2	1½	1¼	1	¾	½	⅜	¼	⅛
Stop Valves,	35 00	25 00	18 00	12 00	8 00	5 00	4 00	3 00	2 00	1 50	1 25	1 00	
Check "	25 00	20 00	16 00	10 00	7 00	4 00	3 50	2 50	1 50	1 00	80		
Safety "	40 00	30 00	25 00	18 00	10 00	7 50	5 50	5 00	4 00	3 50	2 50		
Foot "					5 00	4 00	3 50	3 00	2 50				
Pump Chambers,				18 00	12 00	8 00	7 00	6 00	5 00				
Unions,	10 00	8 00	6 00	5 00	3 00	2 00	1 75	88	63	50	42	38	
Stop Cocks,	45 00	35 00	28 00	16 00	7 00	4 50	3 50	2 75	1 75	1 25	1 00	75	
Soldering Unions,	6 00	4 50	3 00	2 25	1 50	1 25	1 00	62	50	38	31		
" Nipples,	3 75	3 00	2 00	1 50	75	50	40	30	25	20	16		
Expansion Joints,								2 75	2 00				
Steam Whistles,						25 00	15 00	10 00	8 00	6 00	4 00		

JOHN A. GRAY, PRINTER, 54 GOLD, CORNER OF FULTON ST.

WALWORTH, NASON & GUILD'S

ILLUSTRATIVE AND DESCRIPTIVE

CATALOGUE

OF

WROUGHT IRON PIPES,

AND

IRON AND BRASS FIXTURES

FOR

STEAM, GAS, WATER, &c

No. 79 JOHN-STREET,

NEW-YORK,

SECOND EDITION.

NEW-YORK:

1851.

NORRIS, GREGG & NORRIS,

MANUFACTURERS AND DEALERS IN

WROUGHT-IRON PIPES,

AND FITTINGS OF ALL KINDS

FOR

STEAM, WATER, GAS, &c.

No. 62 & 64 GOLD-STREET,

BETWEEN BEEKMAN AND FULTON STREETS,

NEW-YORK.

CALIBRE........	4	3½	3	2½	2	1½	1¼	1	¾	½	⅜	¼	⅛
Wrought-Iron Pipe, per foot		150	125	85	45	26	20	13	10	9	8	7¼	6½
Tees ....each		225	180	150	85	65	50	35	25	20	18	15	
Crosses .... "		250	225	190	110	80	60	45	33	28	23	20	
Elbows................ "		200	150	110	75	55	40	28	18	15	12	10	
Nipples, Caps, Plugs, Couplings, Locknuts, Bushings		100	88	63	40	25	20	13	10	9	8	7	
Iron Unions............ "		450	350	250	150	125	90	70	50	37	33	25	
Brass " .... "								88	63			38	
Composition Stop-Cocks "					700	450	350	275	175	125	100	75	
" " Valves...	3500	2500	1800	1200	800	500	400	300	200	150	125	100	
" Safety " ...		3000	2500	1800	1000	750	550	500	400	300			
" Check " ...			1600	1000	700	400	350	250	150	100	80		
" Valve Chests...				1800	1200	800		500					
" Vertical Check Valves					500								
" Soldering Union					150	125	100	62	50	38	31		
" " Nipple			200	150	75	50	40	30	25	20	16		
" Expansion Joints								275	200				
" Steam Whistles									800				
Cast-Iron Flanges.........		100	90	75	40	30	25	20	15	13	12	10	
Pipe Tongs..............			350	275	225	175	138	112	100	75	60	60	
Return Bends..............						60	45	35	25				
Malleable Cock Wrenches..					44	38	30	25	20	15	12		
Heaters..................					6500	3500	2500	1800	1300	900			
Branch Tees........... 8									200				
" " 6								140	125				
" " 5								125	100				
" " 4								110	90				
" " 3								85	75				
" " 2								80	60				
Cast-Iron Hooks..........								5	4				
Wrought-Iron do..........				12	10	8	6	4	3	2	2		
Force Pumps............			3500	2500	1500								
Wrought-Iron Bends.......					100	70	45	30	24	15	12	10	
Extra Strong Pipe.........								25	17				

Oliver & Brother, Steam Printers, 89 Nassau-street. N.Y.

INTRODUCTORY.

Walworth, Nason & Guild—(apart from the desire to advertise their manufactures)—have prepared the following pages in order to enable their numerous customers to readily inform themselves of all the varieties of work that are kept constantly on hand.

It frequently occurs that a difficulty is experienced in comprehending the orders of customers transmitted by mail, express, &c., owing to the almost infinite variety of articles that belong to the business, and to the fact of those making the orders not understanding the proper names and numbers of the articles they desire. By an examination of the following illustrations, and the accompanying remarks, the purchaser will be made acquainted with the name, number and size, of all the different patterns of pipe and fittings, as well as of the other articles for sale.

Walworth, Nason & Guild are the originators of the plan of warming buildings, heating, drying, &c., by steam, through the means of wrought iron pipes. Their experience is very great in this department, and their apparatus perfect. They beg leave to call particular attention to the merits of this form of warming and heating.

Their Gas Apparatus, for public buildings, factories, &c., is the result of many years of practice, and may be considered a perfect one for either Rosin or Asphaltum Gas. The numerous references they are enabled to make, as regards their apparatus for Lighting, Heating, Drying and Ventilation, are flattering proofs of the excellence of their plans and of their work. They will be found under the appropriate heading.

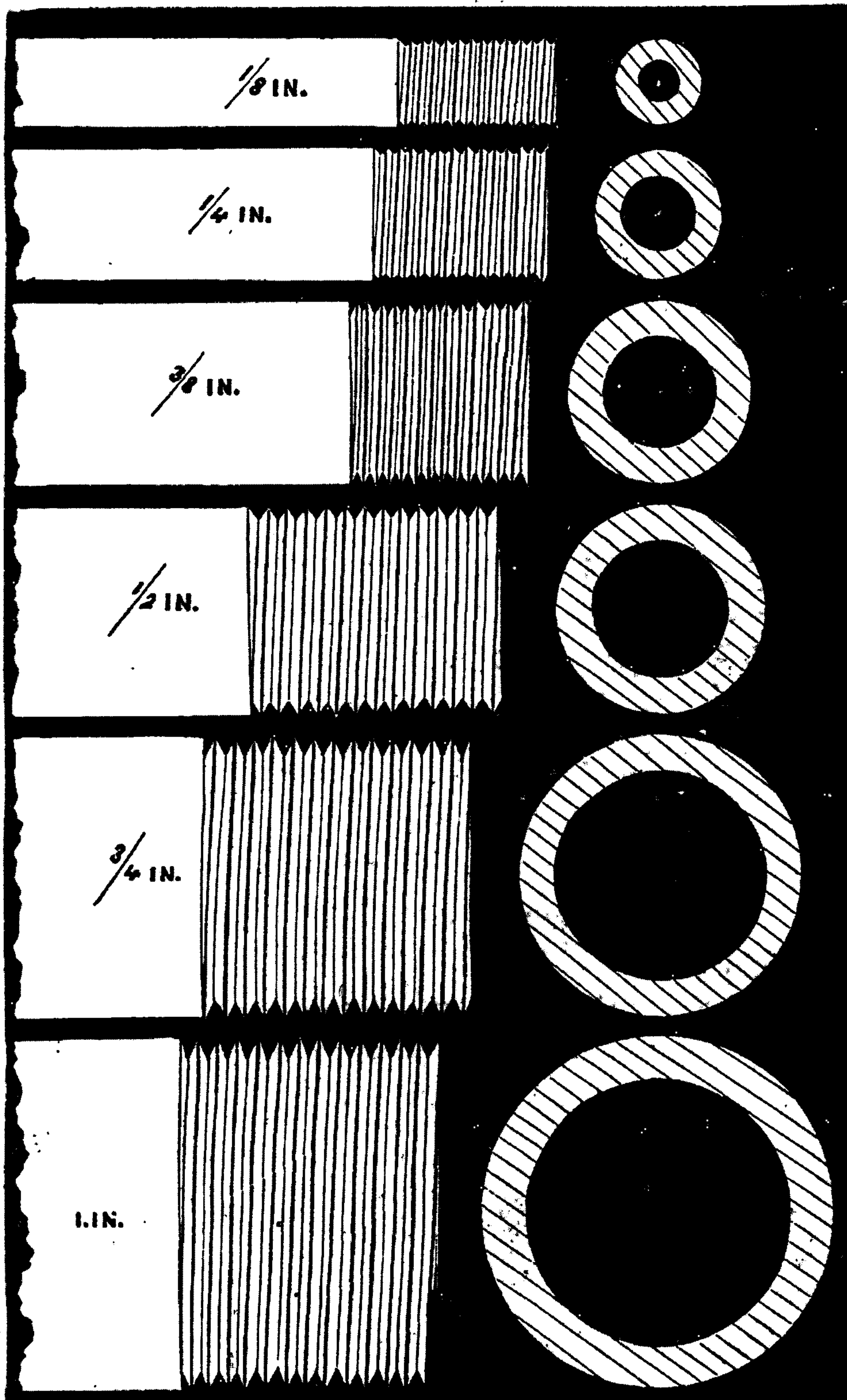
It is, perhaps, unnecessary to state, that the wood-cuts here given, are intended as samples of some of the different kinds kept on hand. They show only one specimen of each variety; had the whole set of sizes, in all their changes of combination, been given, an immense number of cuts would have been required, as more than 1,000 patterns are in use.

A price list, together with a form of order, will be found in the succeeding pages, special attention to which is solicited.

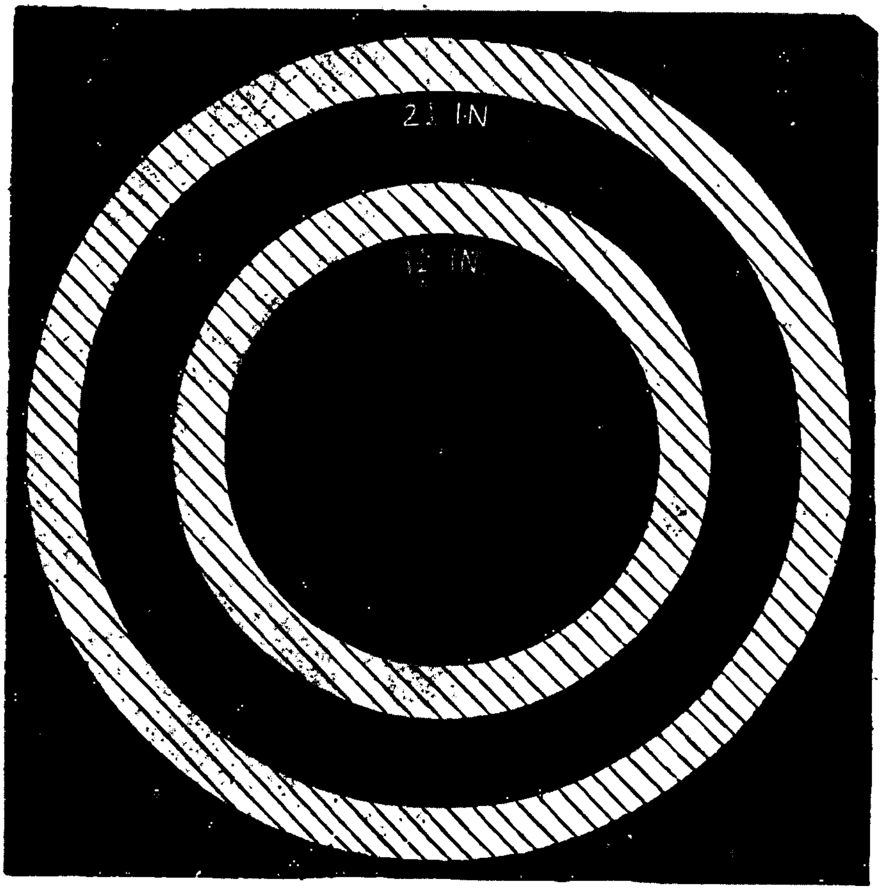
In order to render this book more acceptable to their friends and customers, W., N. & G. have added a few pages of useful and appropriate tables, original and selected, together with practical remarks and suggestions upon subjects connected with their business.

WELDED WROUGHT IRON PIPE,

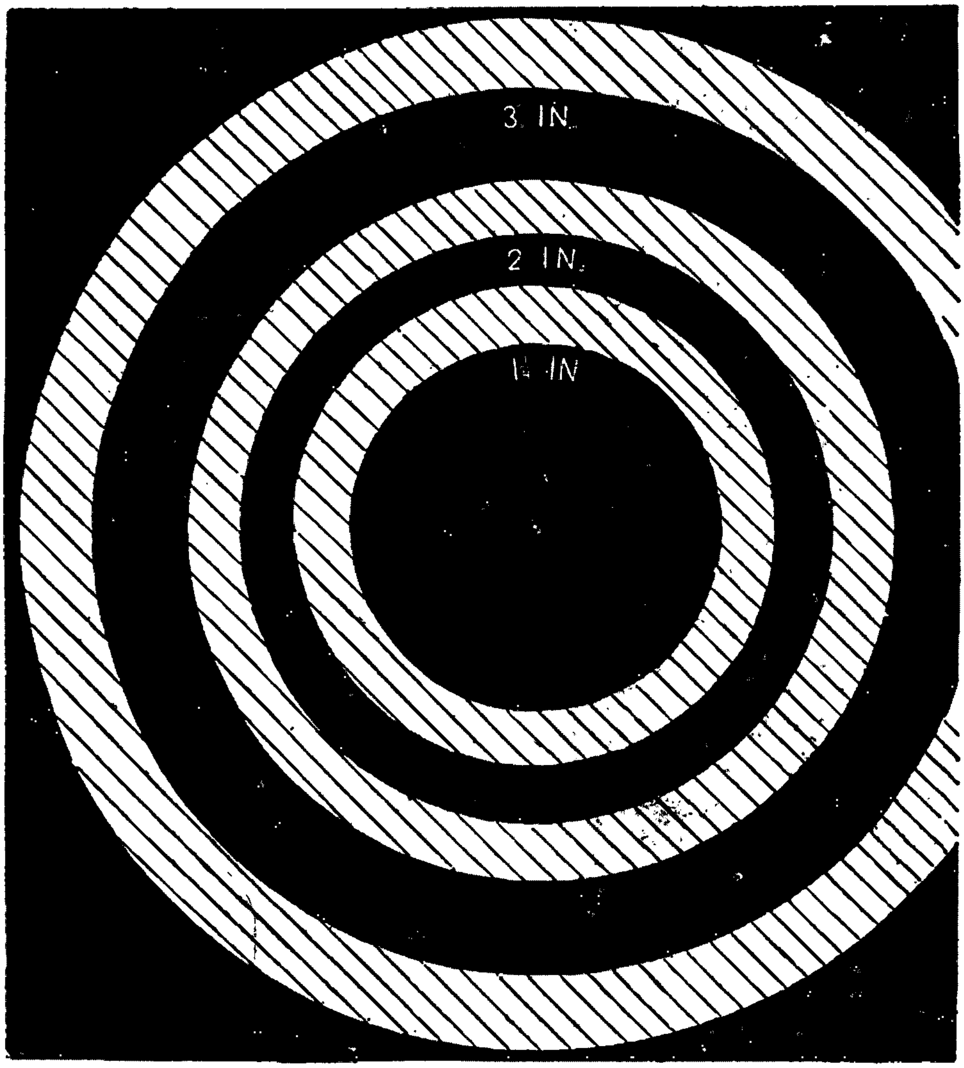
FOR STEAM, GAS AND WATER.

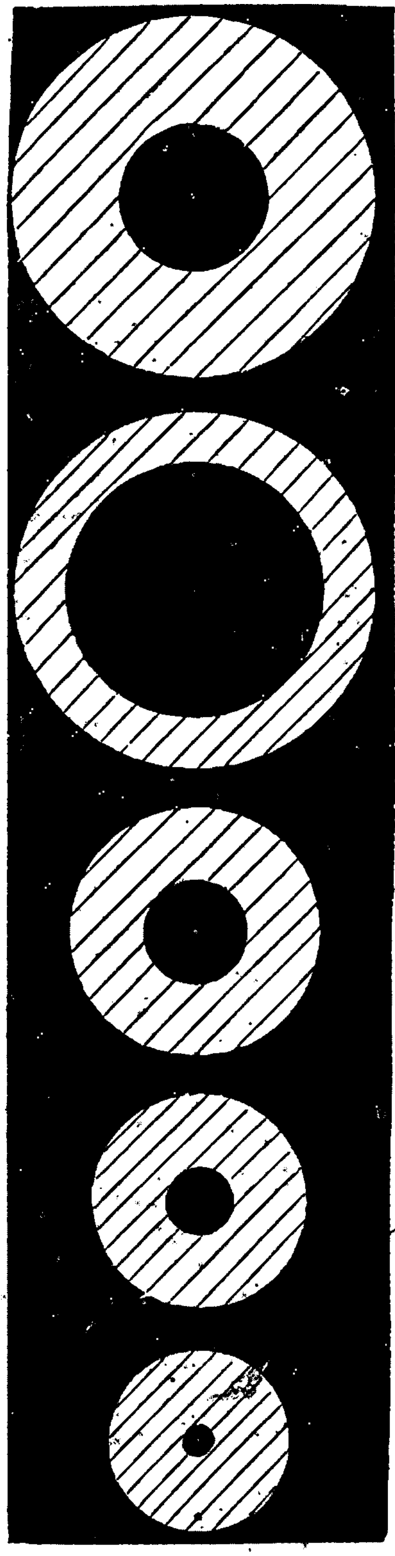


The illustrations shown on page 5, represent the first six sizes of steam and gas pipe, with sectional views showing the thickness of iron, and the diameter, external and internal. Those on pages 6 and 7 represent the larger sizes, which would occupy too much space if shown in a similar manner; it has, therefore, been thought sufficient to show the diameter and thickness. It will be understood, of course, that the larger sizes are screwed in the same manner as those shown on page 5. This pipe is all proved at 300 lbs. to the square inch, and most of it will stand a much greater pressure. The threads are uniform, and great care is taken to preserve the gauge,



which is the same as the English, and all other wrought iron pipe. The 1¼ in., 1½ in., and 2 in. pipe, have eleven threads to the inch. The 2½ in. and 3 in. have eight threads to the inch. The threads on all the other sizes are shown in the cuts. Page 8 shows sections of a few kinds of extra strong and hydraulic pipe. This pipe is capable of sustaining a very great pressure, some of it being often used as high as 20,000 lbs. to the square inch. Steam Guages are also made from this pipe; most of which, for this purpose, is carefully bored out, in order to



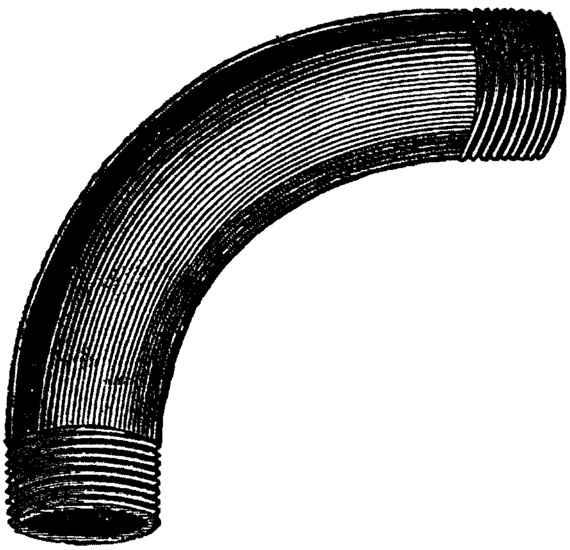


give a perfectly accurate column of mercury, and, consequently, a correct indication of the pressure upon the boiler. The smaller sizes are also used for glass-blowers' tubes, for which purpose they are admirably suited. There are also a great variety of purposes, not enumerated, for which wrought iron pipe can be made available. The kinds shown in these pages are always kept on hand; but if these should not suit the wants of all, W., N. & G. are prepared to make, at short notice, pipe of any desired thickness and diameter.

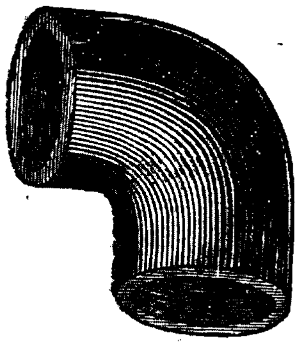
In ordering pipe shown on this page, please state external and internal diameter.

IRON FITTINGS.

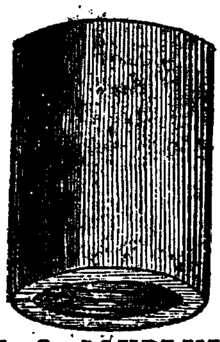
These are mostly made of malleable cast iron, although many are prepared of wrought iron, and some of simple cast iron. It has been found much safer in practice to use the malleable fitting, rather than that of wrought iron, as in the latter, instances will occur of a defective weld, which cannot always be discovered until pressure is applied.



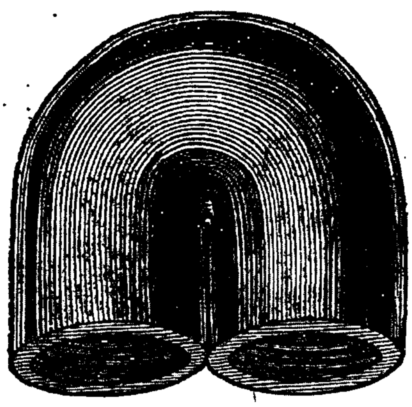
No. 1. BEND—Wrought Iron.



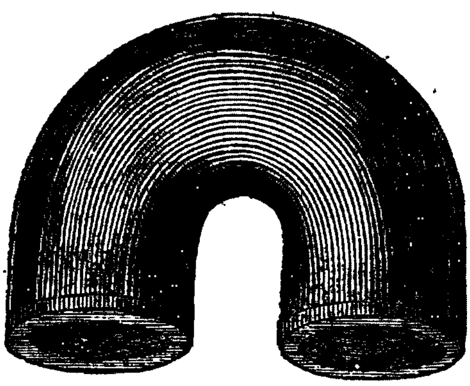
No. 2. ELBOW.



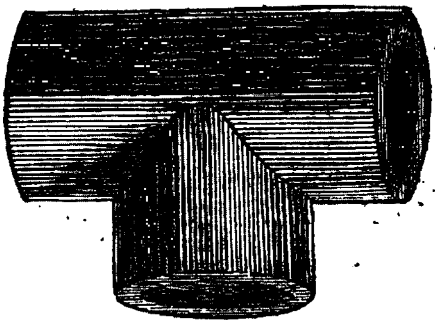
No. 3. COUPLING.



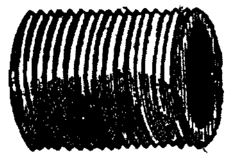
No. 4. RETURN BEND.



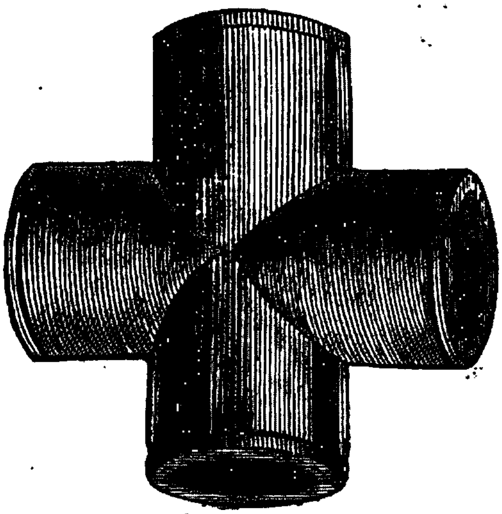
No. 4. RETURN BEND.



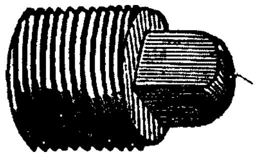
No. 5. EQUAL TEE.



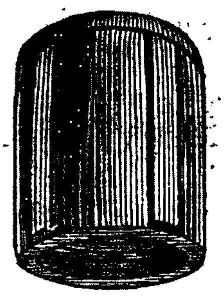
No. 8. NIPPLE.



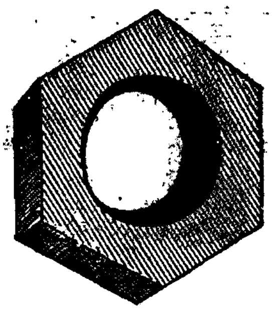
No. 6. EQUAL CROSS.



No. 9. PLUG.

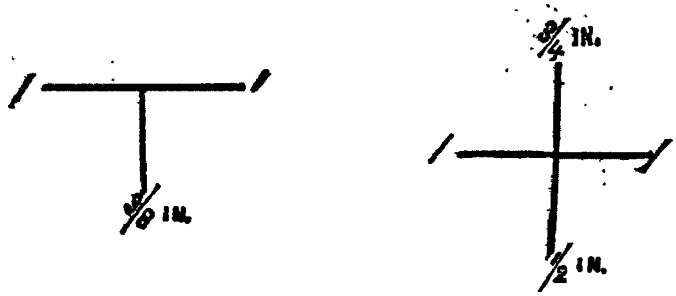


No. 7. CAP.

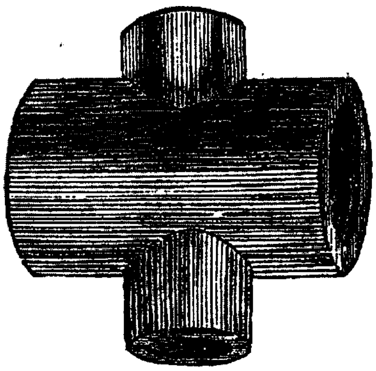


No. 10. LOCK-NUT.

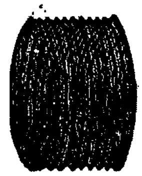
The reducing Tees, Crosses, &c., on this and the following page, are specimens of but a few of the varieties. In ordering this kind of fitting, customers are requested to describe the particular arrangement and sizes desired thus:



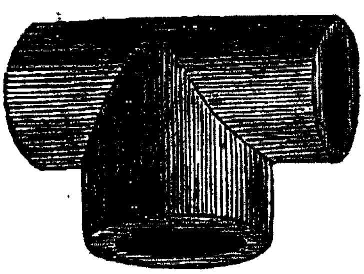
Or any other combination required.



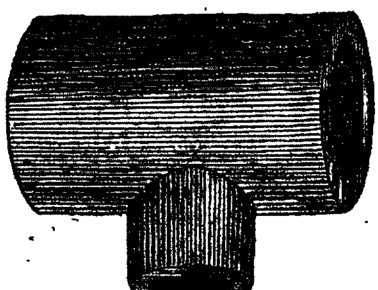
No. 6. CROSS—Equal run reducing outlets.



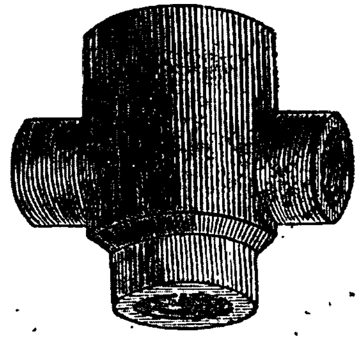
No. 52. BUSHING.



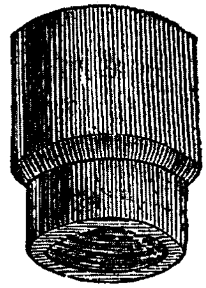
No. 5. TEE—Equal run enlarging outlet.



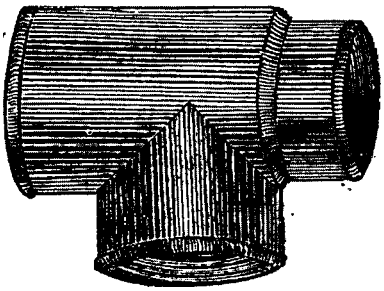
No. 5. TEE—Equal run reducing outlet.



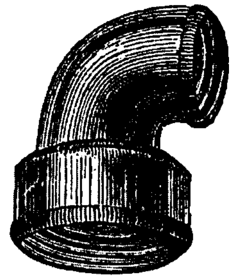
No. 6. CROSS—Reducing.



No. 11. REDUCING COUPLING.



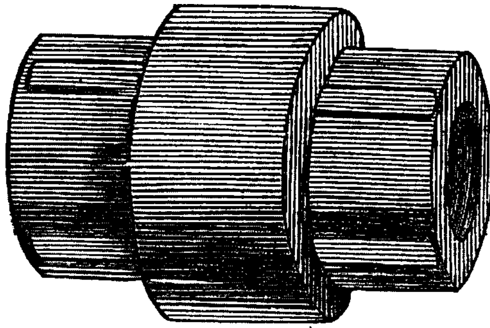
No. 5. TEE—Reducing Run.



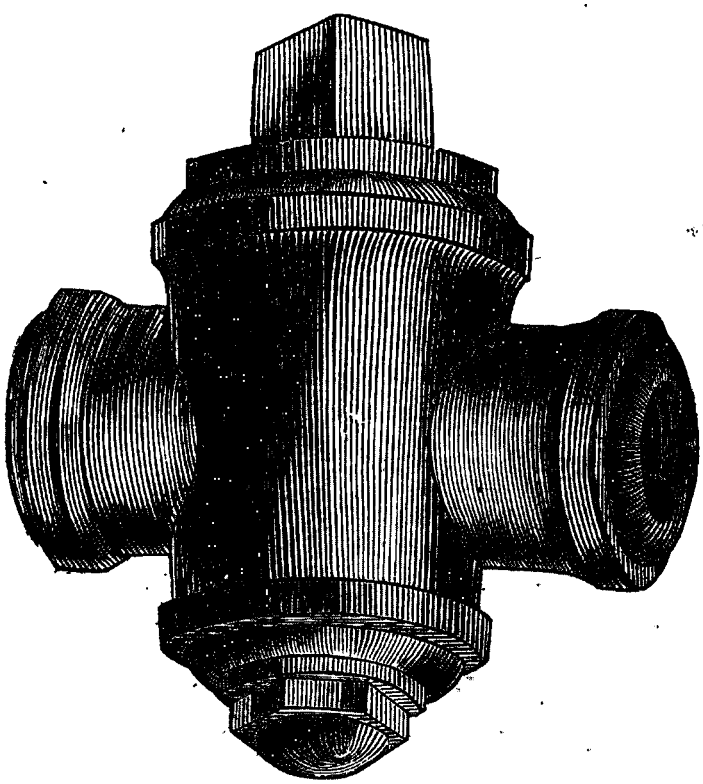
No. 2. REDUCING ELBOW.

No. 12. FLANGE.

Flanges of all diameters, from 4½ to 12 inches.

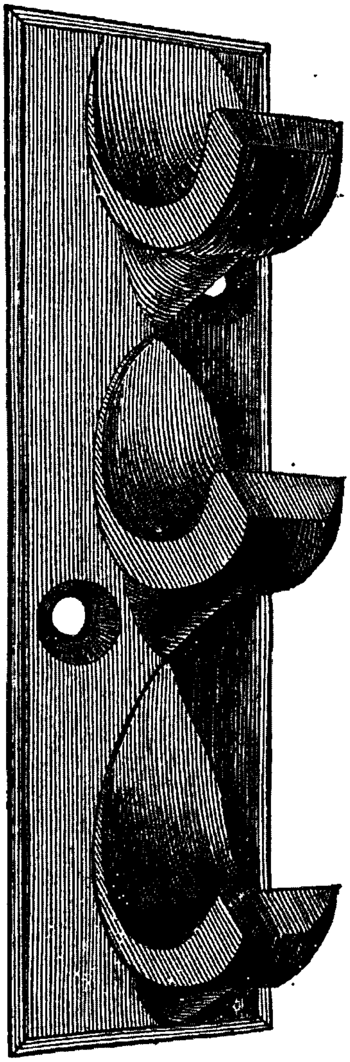


No. 13. IRON UNION.

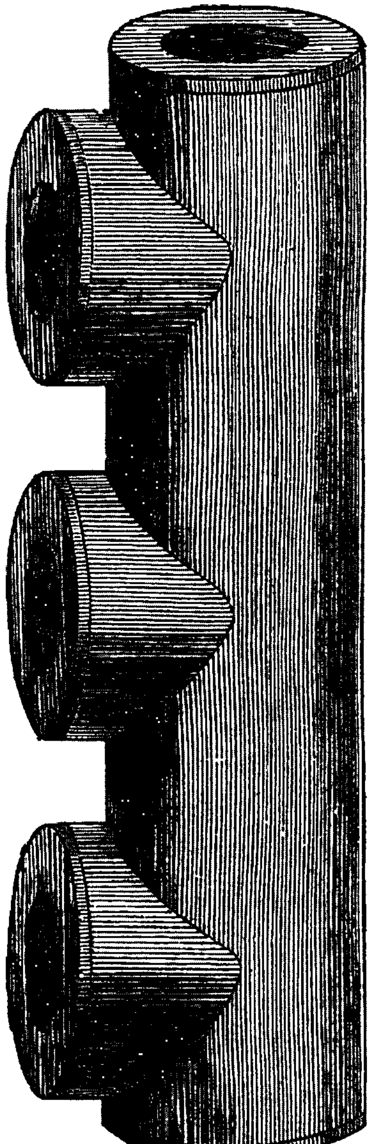


No. 14. IRON COCK.

Better than brass, *when kept in constant use*, for Gas or Steam; also, the only metal admissible where alkali, mercury, and many other liquids are used.

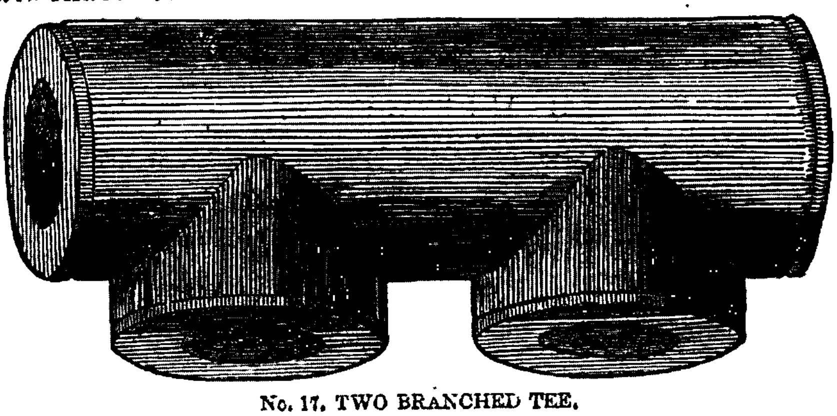


Branch Tees, from two to six opening, with inlets from $\frac{3}{4}$ to $1\frac{1}{2}$ inches in diameter; and outlets of $\frac{3}{4}$ of an inch and 1 inch diameter.

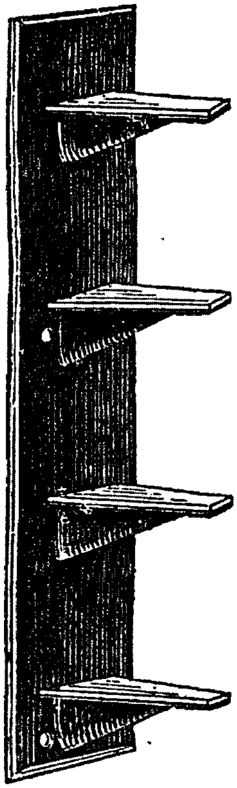


No. 15. THREE HOOKED PLATE.

No. 16. THREE BRANCHED TEE.



No. 17. TWO BRANCHED TEE.

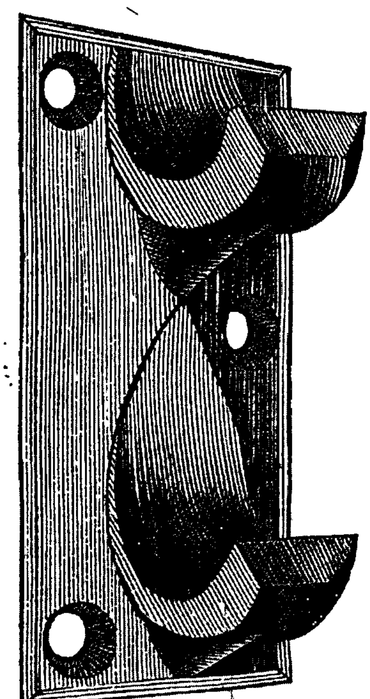


No. 18. "Corner Plate," is intended for the corners of rooms, around which steam pipe is carried, to allow the pipe to slide backward and forward, as it expands and contracts.

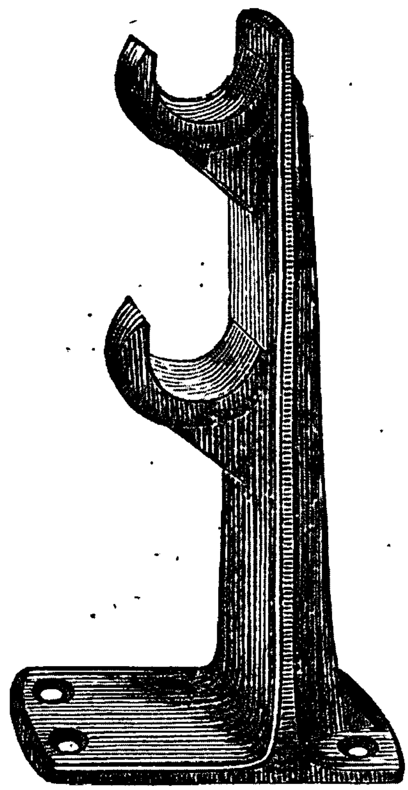
No. 20. Stand Hook, is intended to put between the horses in drying closets, and in other places where the pipe is put away from the wall.

RING PLATE.

No. 18.
CORNER PLATE.



No. 19. TWO HOOKED PLATE

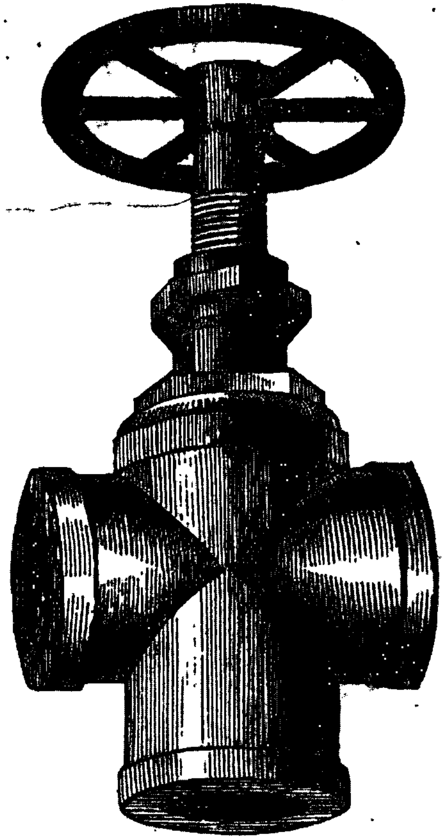


No 20. STAND HOOK.

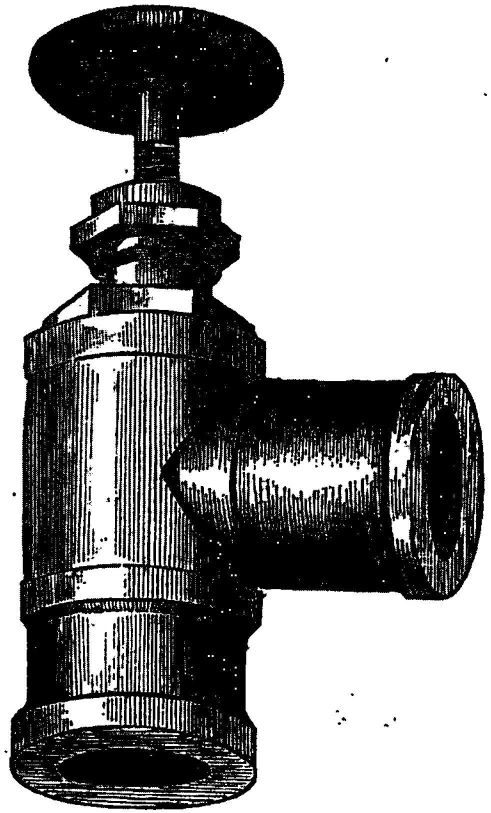
BRASS WORK.

To this branch of their business W., N. & G. have given more than ordinary attention, and the result has been, that all their *Brass Work* is of the highest order of workmanship and materials. The Globe Valve, No. 21, now so generally adopted for steam purposes, was first got up by them, and that they have since been so extensively copied by other makers, is sufficient evidence of their excellence and adaptation to the wants of engineers and machinists. None of the copyists, however, have been able to come up to their standard. Their Gauge Cocks, also, have, in a great measure, superseded all other kinds. They ask particular attention, in this department, to the beauty of the designs, and the skill displayed in adapting the fixtures to the purpose for which they are intended.

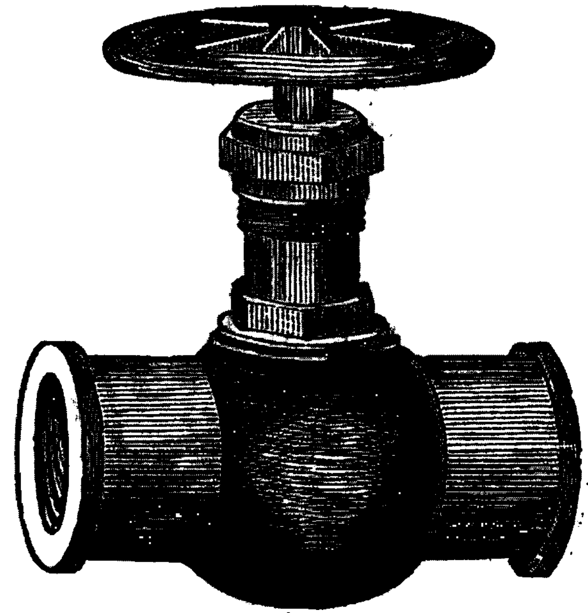
Walworth, Nason & Guild also make patterns, and manufacture to order any description of brass work that may be desired. Their facilities for executing this kind of work are not excelled by any establishment in the country. They can, therefore, furnish promptly orders of any magnitude.



No. 23. THREE WAY VALVE.

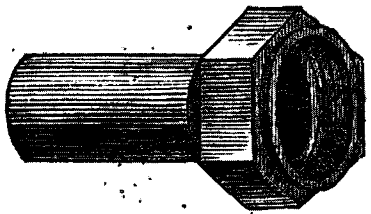


No. 22. ANGLE VALVE.

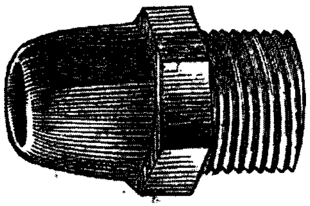


No. 21. GLOBE VALVE.

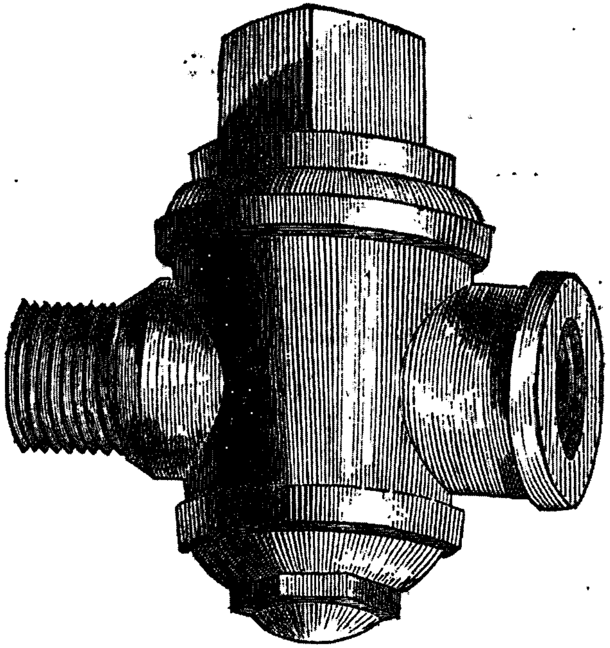
These valves are so admirably adapted to steam purposes, that they are fast superseding all other kinds. The facility with which they are connected, their durability and convenience is universally acknowledged.



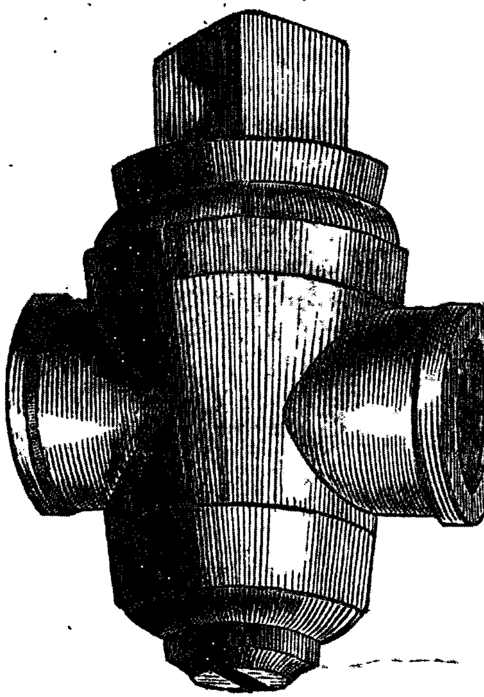
No. 27. SOLDERING UNION



No. 26. SOLDERING NIPPLE.

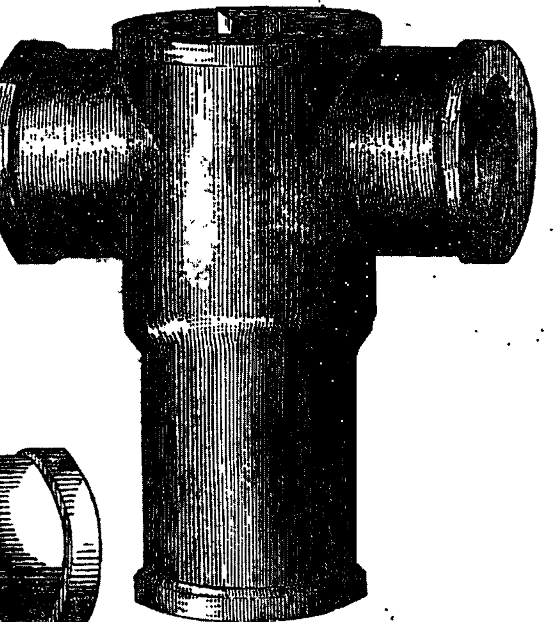


No. 25. GAS-COCK.

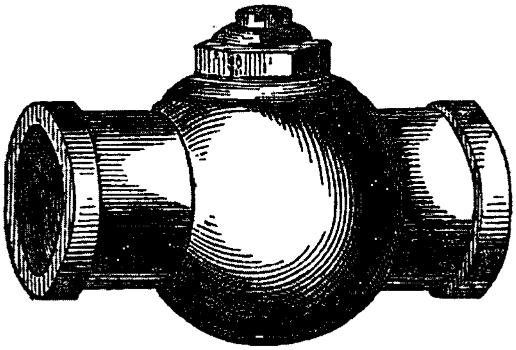


No. 24. STEAM-COCK.

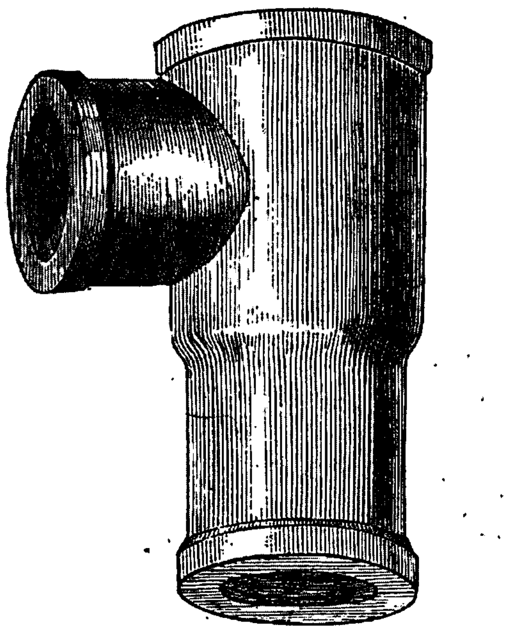
One or the other forms of Check Valve, shown on this page, cannot fail to meet any required circumstance.



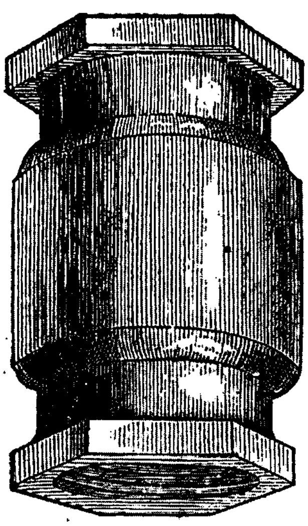
No. 28. TWO WAY CHECK-VALVE.



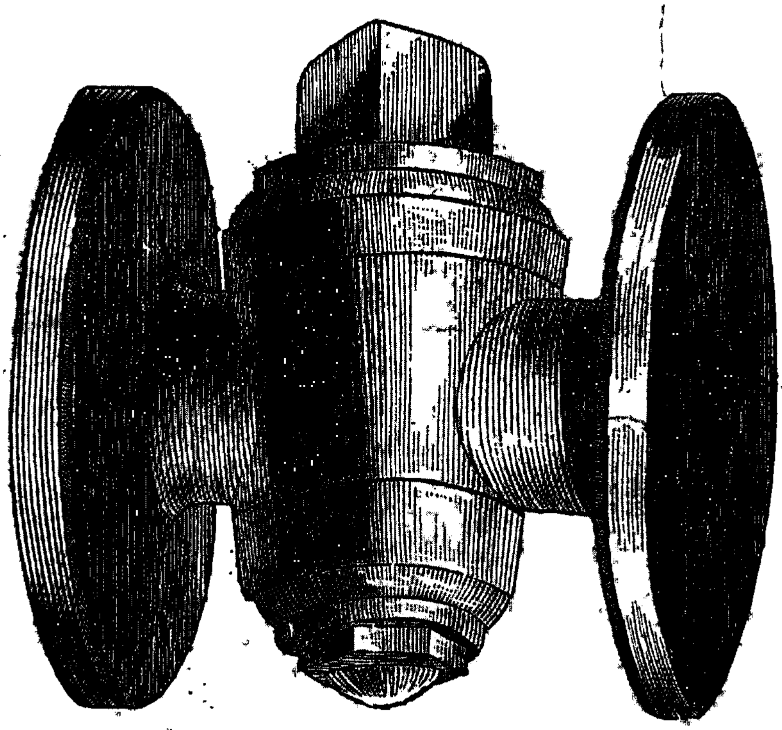
No. 43. GLOBE CHECK-VALVE.



No. 30. ANGLE CHECK-VALVE.

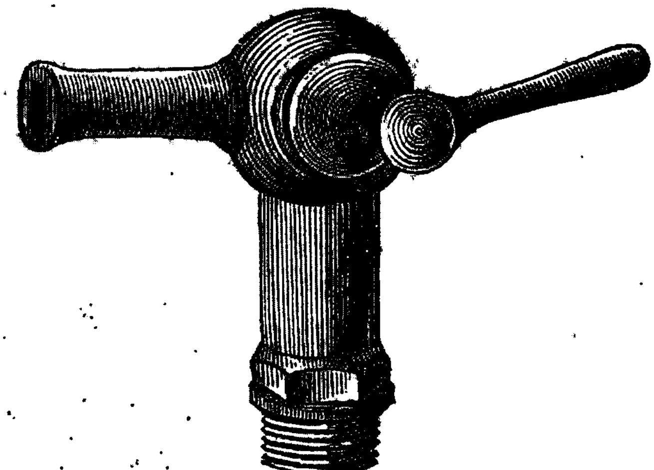


No. 29. CHECK-VALVE. (in line.)

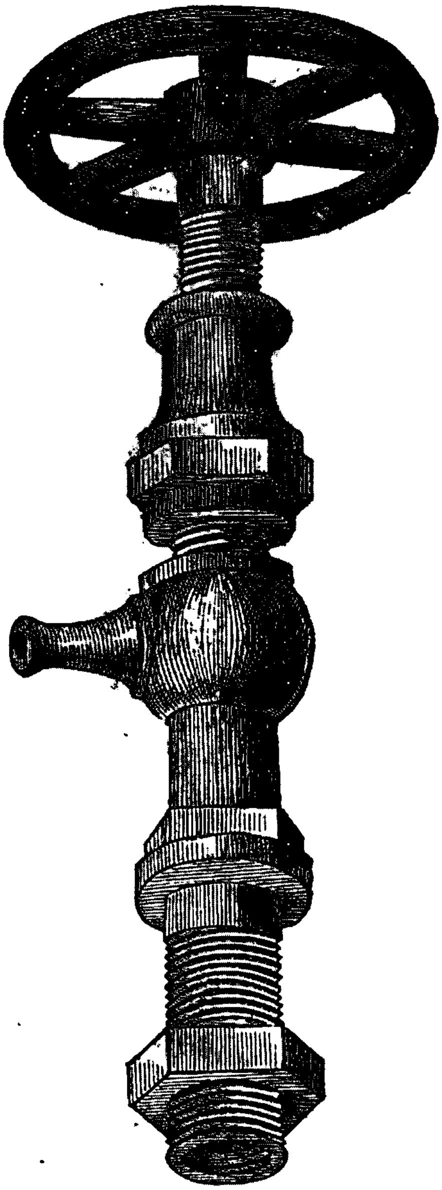


No. 31. FLANGED STEAM-COCK.

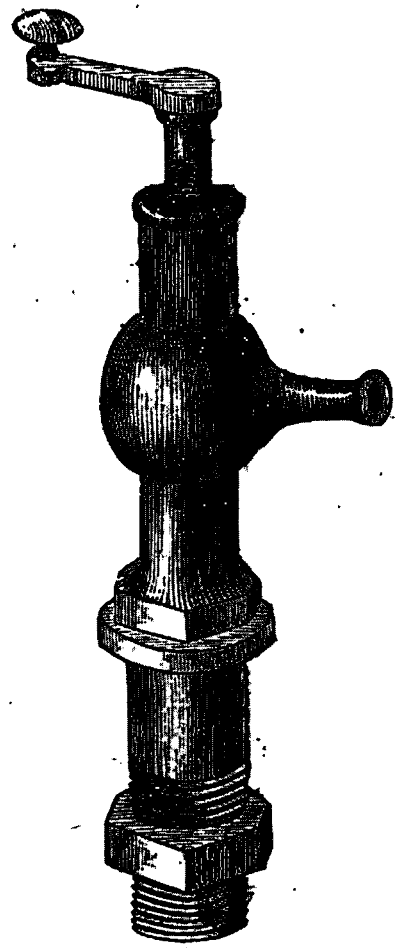
These Cocks are made with flanges of various sizes.



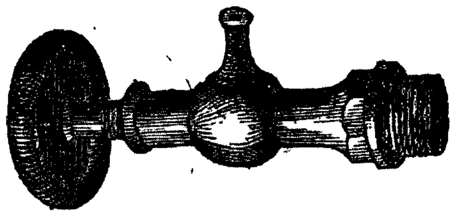
No, 32. GLOBE SERVICE-COCK.



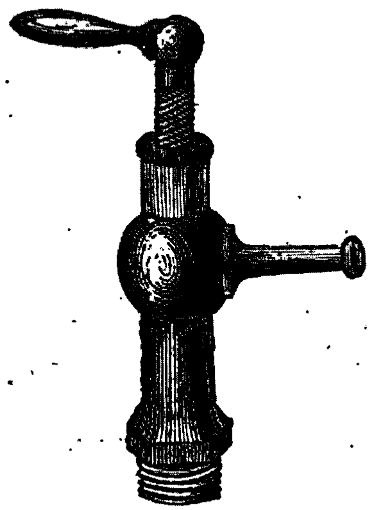
Nc. 33. WHEEL GAUGE-COCK.



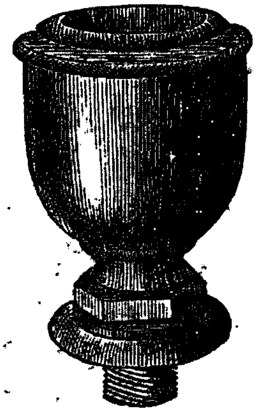
No. 34. GAUGE-COCK.



No. 35. GAUGE-COCK.

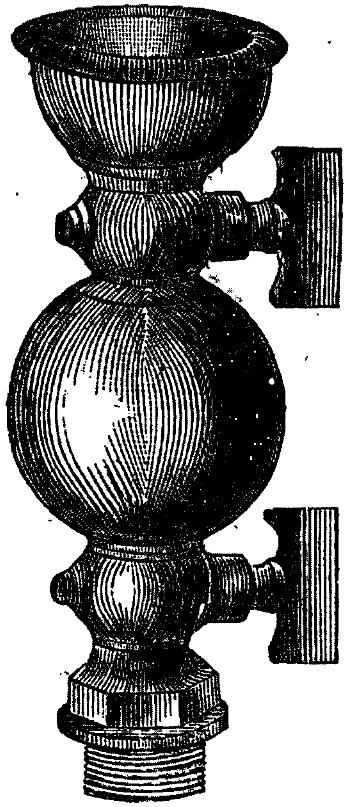


No. 36. GAUGE-COCK.

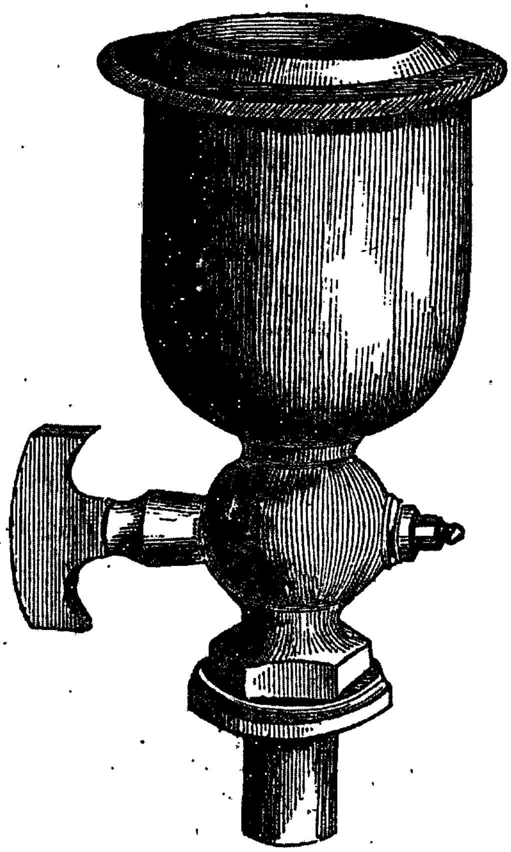


Oil Cups, of all sizes, after these patterns.

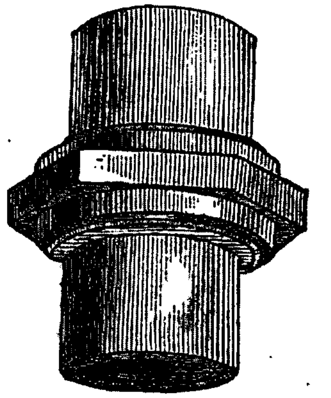
No. 37. OIL CUP.



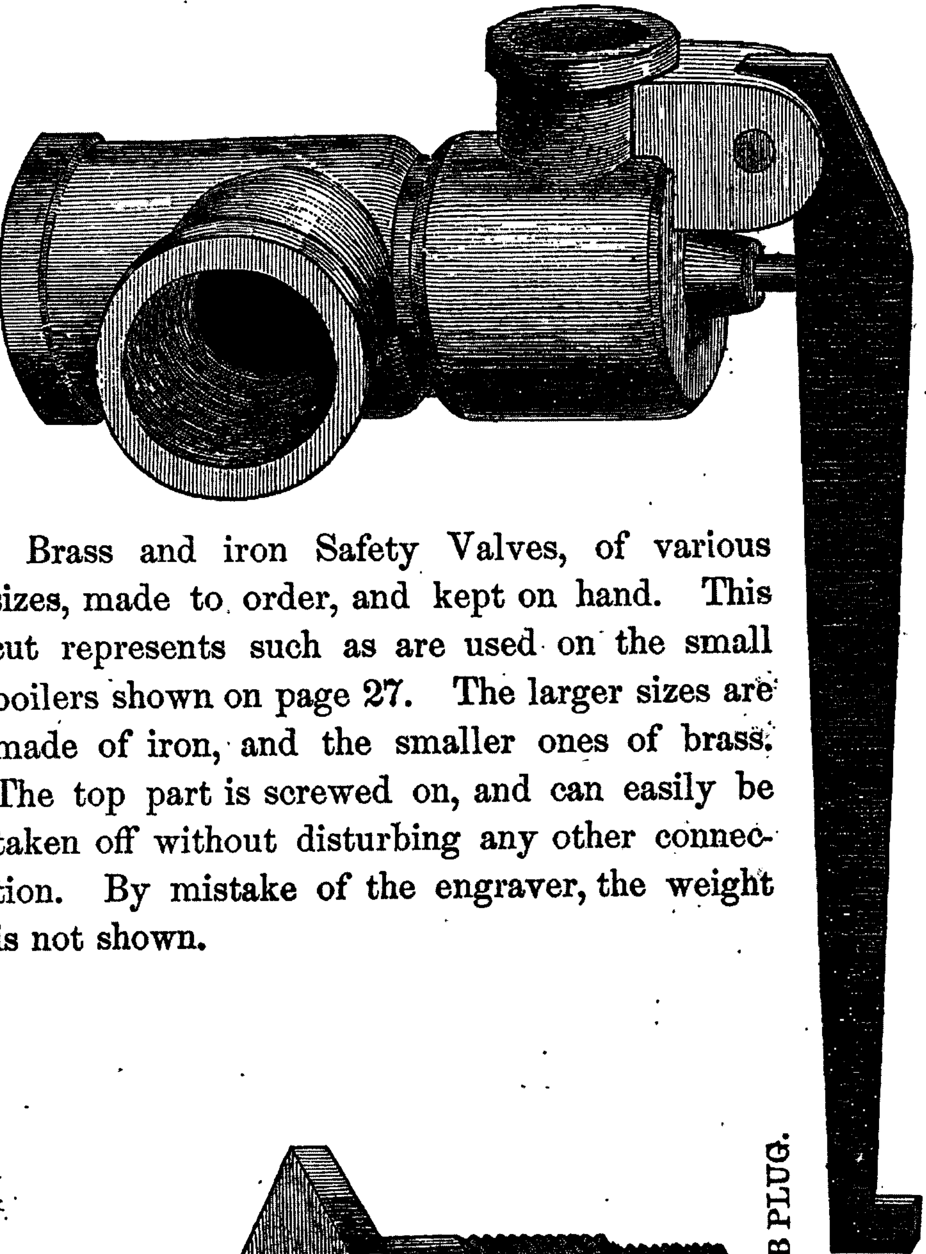
No. 38. OIL CUP.



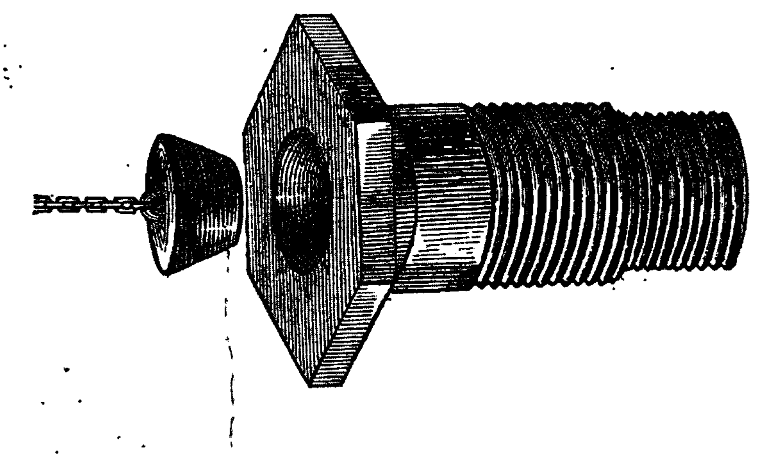
O.L CUP.



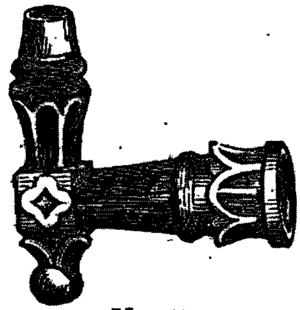
No. 40. BRASS UNION.



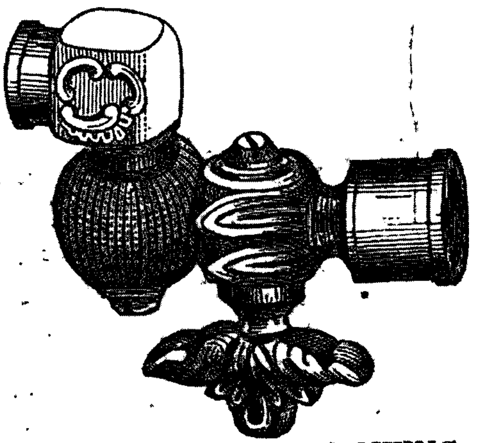
Brass and iron Safety Valves, of various sizes, made to order, and kept on hand. This cut represents such as are used on the small boilers shown on page 27. The larger sizes are made of iron, and the smaller ones of brass. The top part is screwed on, and can easily be taken off without disturbing any other connection. By mistake of the engraver, the weight is not shown.



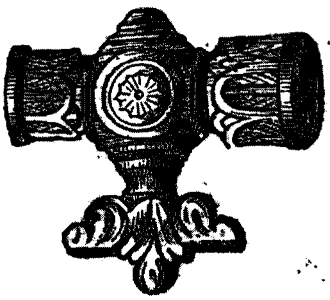
No. 39. WASH-TUB PLUG.



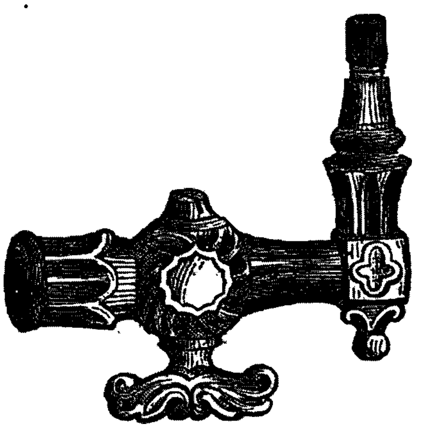
No. 46.
BURNER ELBOW



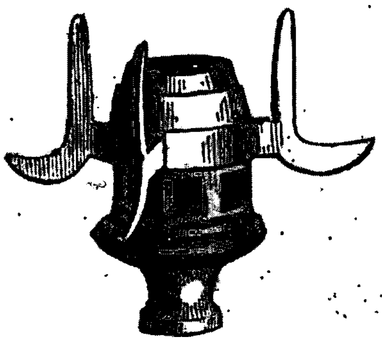
No. 47. GAS COCK AND SWING.



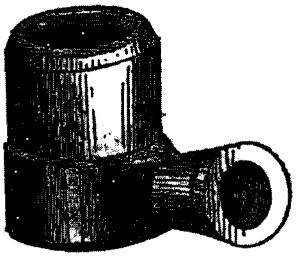
No. 49. GAS COCK.



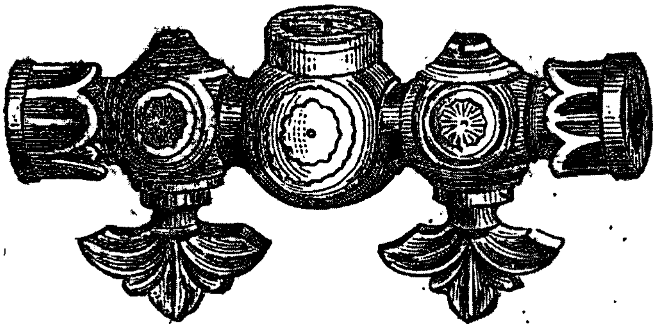
No. 45. BURNER ELBOW COCK.



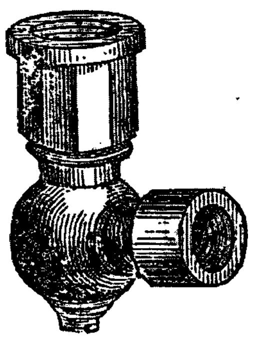
ARGAND BURNER.



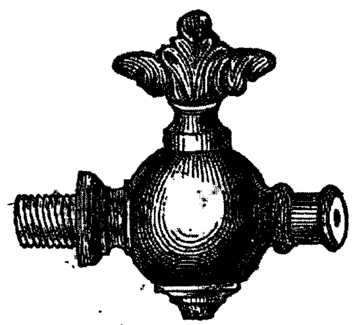
ELBOW ARGAND BURNER.



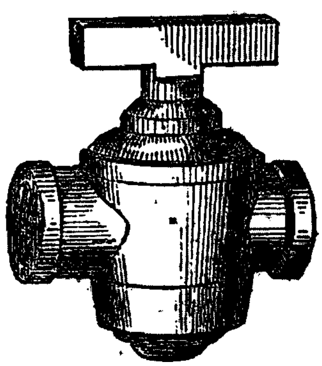
No. 44. DOUBLE PENDENT CENTER.



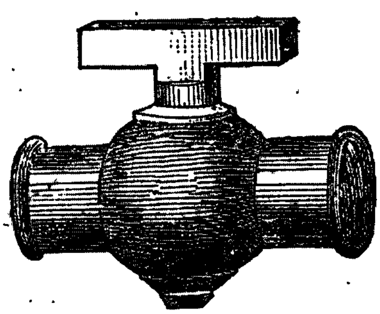
SWING JOINT



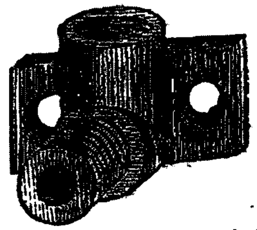
No. 50. AIR COCK.



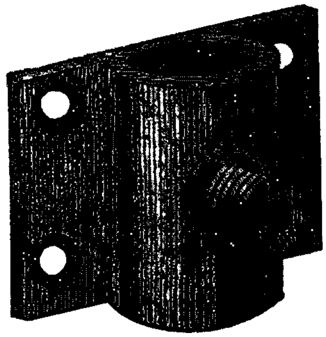
No. 24. STEAM COCK.



No. 51. GAS COCK.

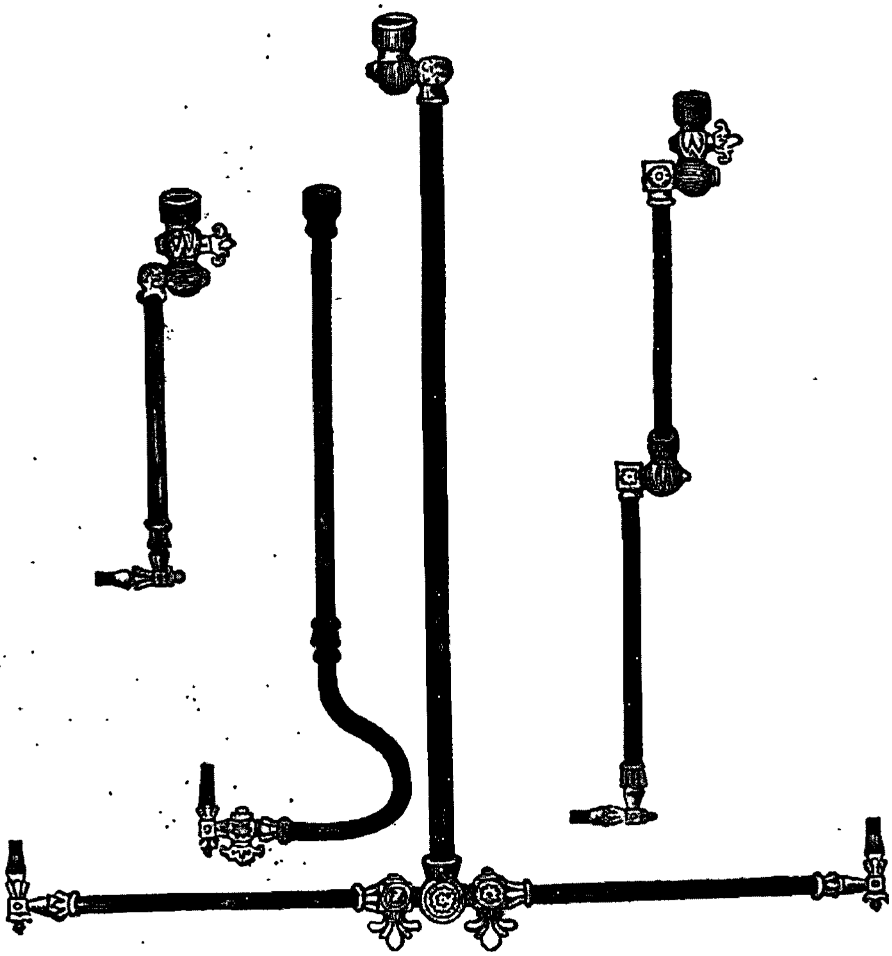


No. 41. FLANGED ELBOW.



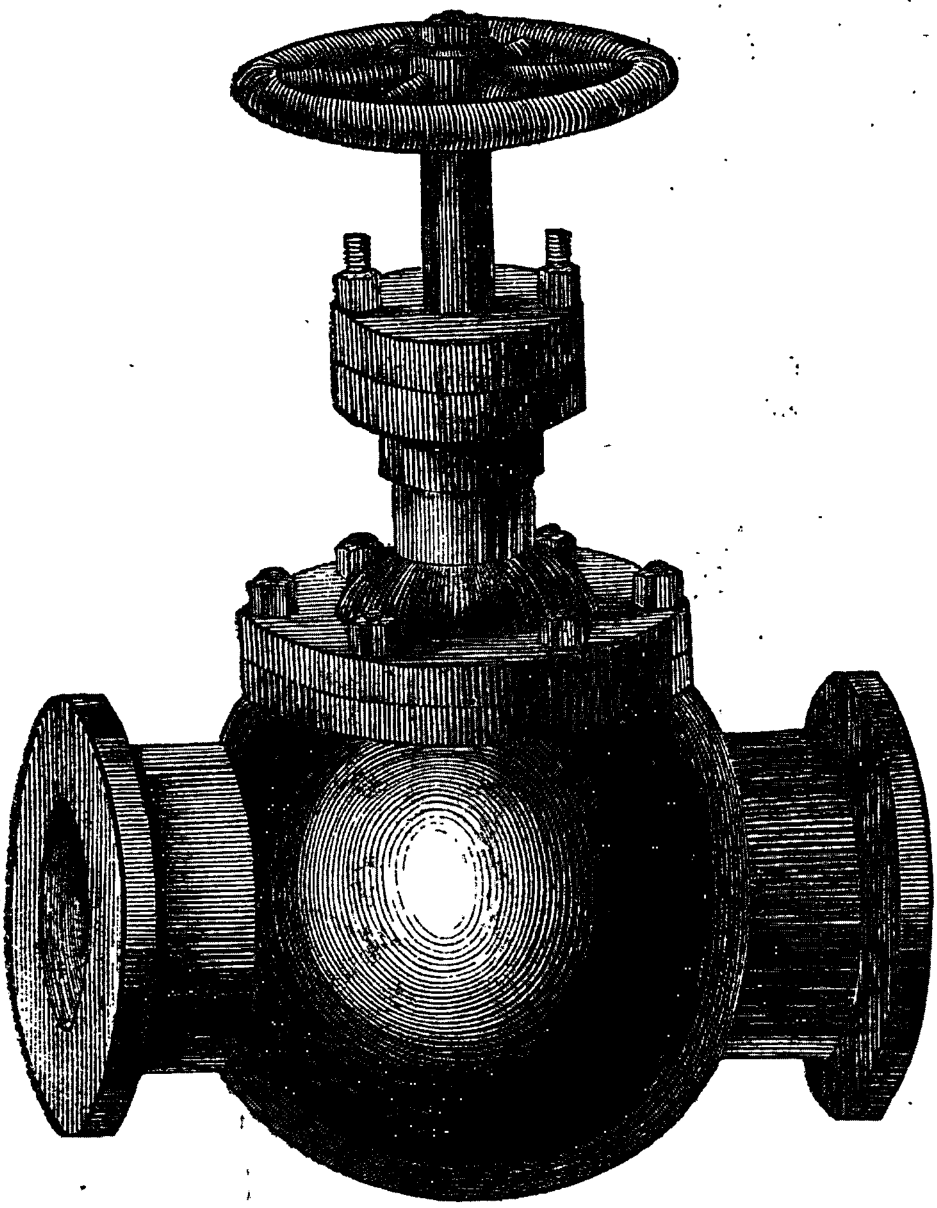
No. 42. FLANGED TEE.

The PENDANTS and BRACKETS shown below are particularly designed for stores and factories. They are made in the very best manner, and much stronger than usual, in order to stand hard usage.



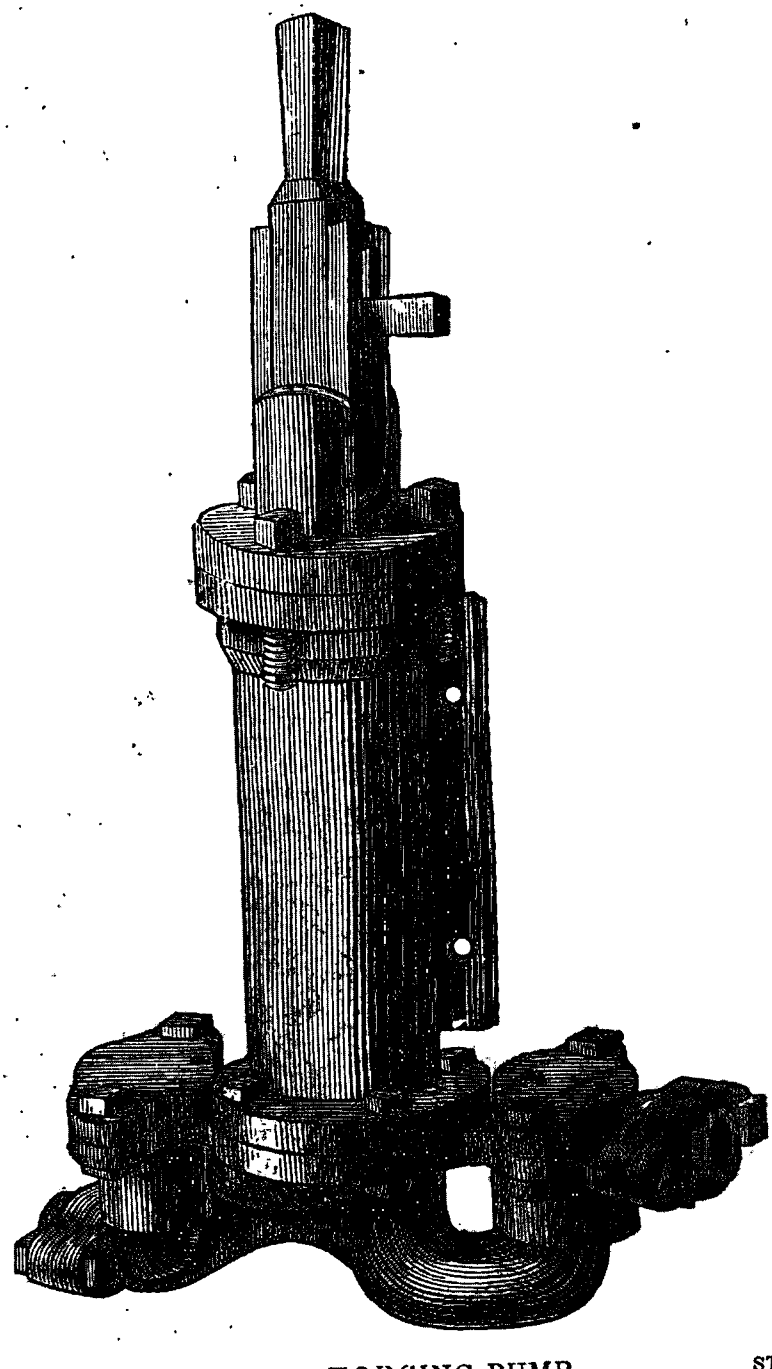
This illustration represents the 4 inch Valve. It is made wholly of iron, excepting the valve and valve-seat, which are of brass, and accurately fitted.

It may be well to mention here, that all valves above 2 inch are made partly of iron. The $2\frac{1}{2}$ and 3 in. have brass valves and seats, brass spindles and stuffing-boxes, and are furnished with or without flanges. All above 3 inch have only the valve and its seat of brass, and are made with flanges only.

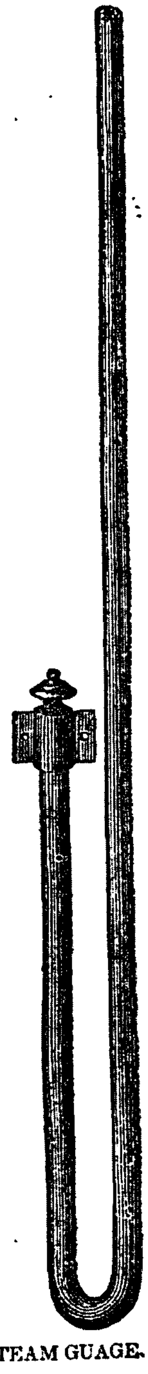


No. 21 IRON GLOBE VALVE.

The FORCING PUMP, shown below, is fitted with ball valves, arranged to be driven either by "power" or by hand. The mercury gauges are made of any sized calibre. They are accurately bored, and finished with brass or iron caps.



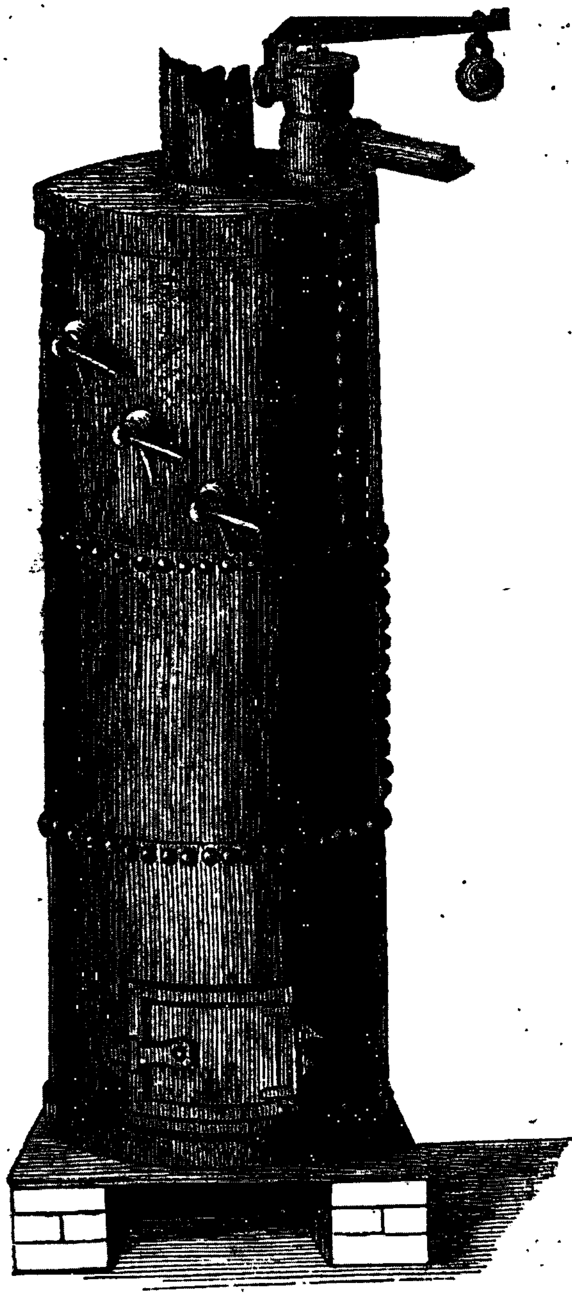
FORCING PUMP.



STEAM GUAGE.

VERTICAL TUBULAR BOILER.

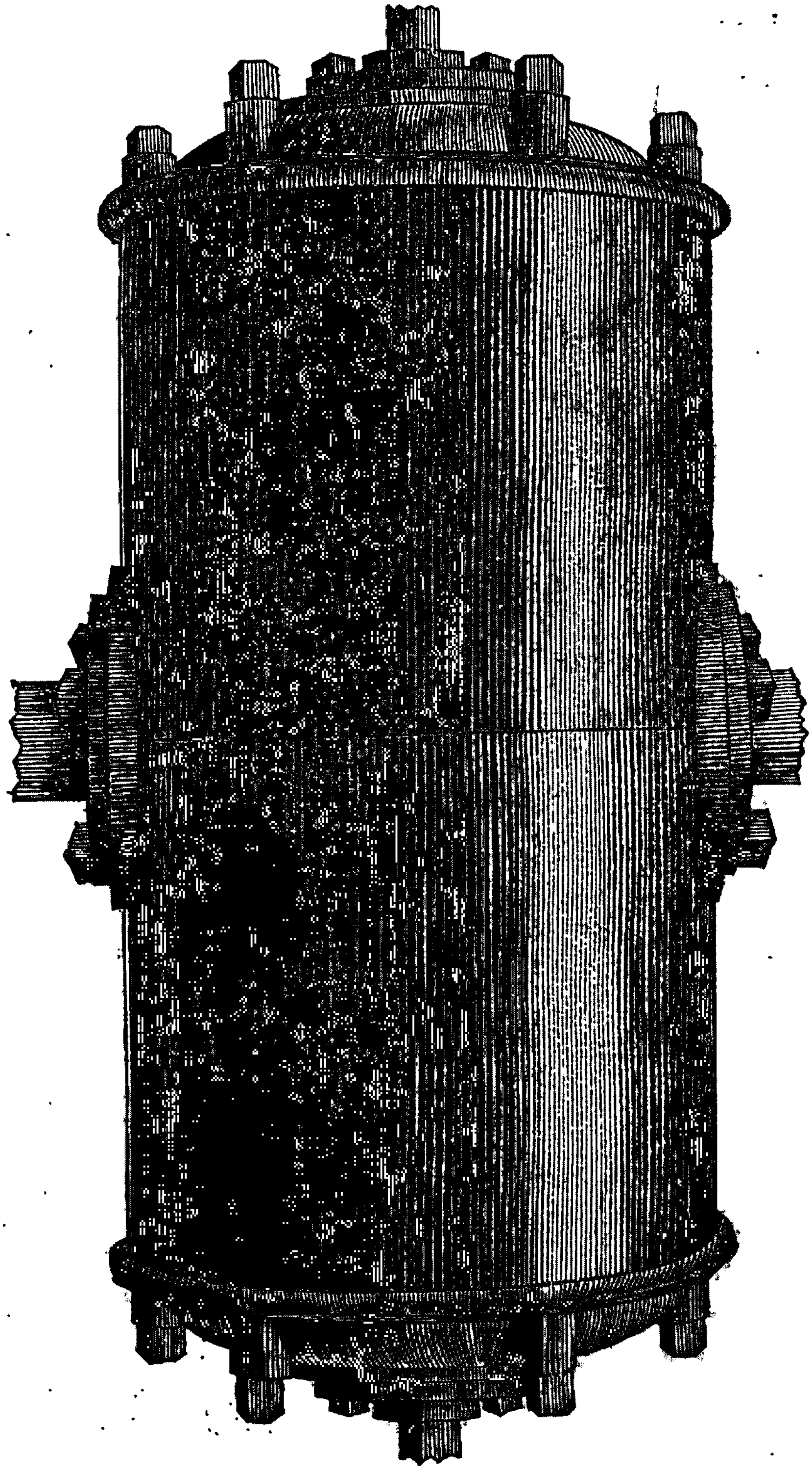
The boiler here shown is one which, for all small pur poses, has become a general favorite. It is, perhaps, the best kind in use for hotels, dyers, soap-makers, laundries, and for warming small factories, and moving small engines. It has a large amount of fire surface in a very small space. For instance, a boiler of this description, 32 inches in diameter and eight feet high, contains 61 one and a half inch flues, and altogether, one hundred and fourteen feet of fire surface, consequently it will make steam economically. There cannot be less than one hundred of these boilers in use in this city alone.



The following are a few of the places where they are in use:

Astor House, Union Place Hotel, Ward's Island, Irving House, N. Y. Hotel, Soria's Dye-house, Smith's Oil Factory, Stone street; Tweedy's Hat Factory, Danbury, Conn.; Steam Ships Atlantic and Pacific; Strong Mills, Cohoes, N. Y.; Worthington & Baker's Machine Shop, &c., &c. They are kept on hand at prices varying from $50 to $600.

All other descriptions of boilers made to order.

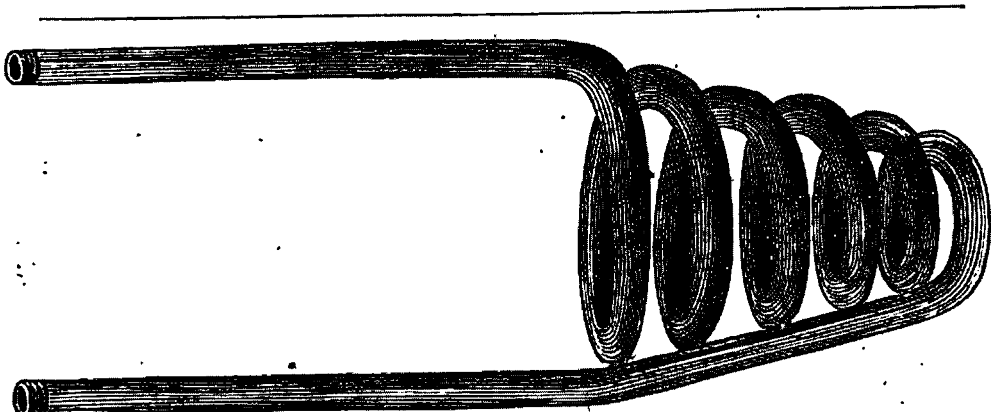


TUBULAR HEATER.

TUBULAR HEATER.

These heaters are made with cast iron cylinders, filled with small tubes. They have moveable heads, in order that they may be readily cleaned, if required. They are made of various sizes, suitable for engines of six to fifty horse power.

As many of our customers have expressed an idea that it is better to exhaust the steam through the tubes, and pump the feed water round them, we deem it advisable to give our reasons for working the other way. First—The heater will heat more water when the outer or larger circumference of the tubes is exposed to the steam, which is a poorer conductor than the water. Second—If the water is bad, the heater is nearly as likely to get coated as the steam boiler, and by removing the heads the tubes can be easily bored out. Third—The pressure is taken off from the outer cylinder. This, of course, is of more consequence in large heaters than small ones. For the above reasons this heater has been constructed to pump the feed water through the tubes, and exhaust the steam around them.

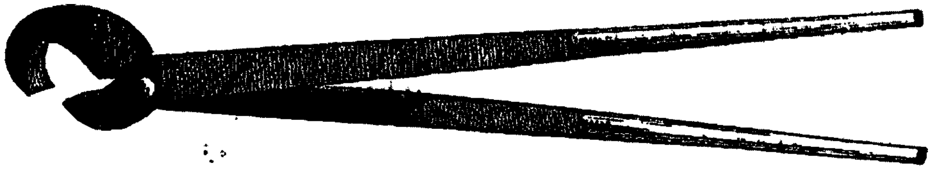


TUYERE COIL.

Coils of every conceivable shape made to order, and warranted sound.

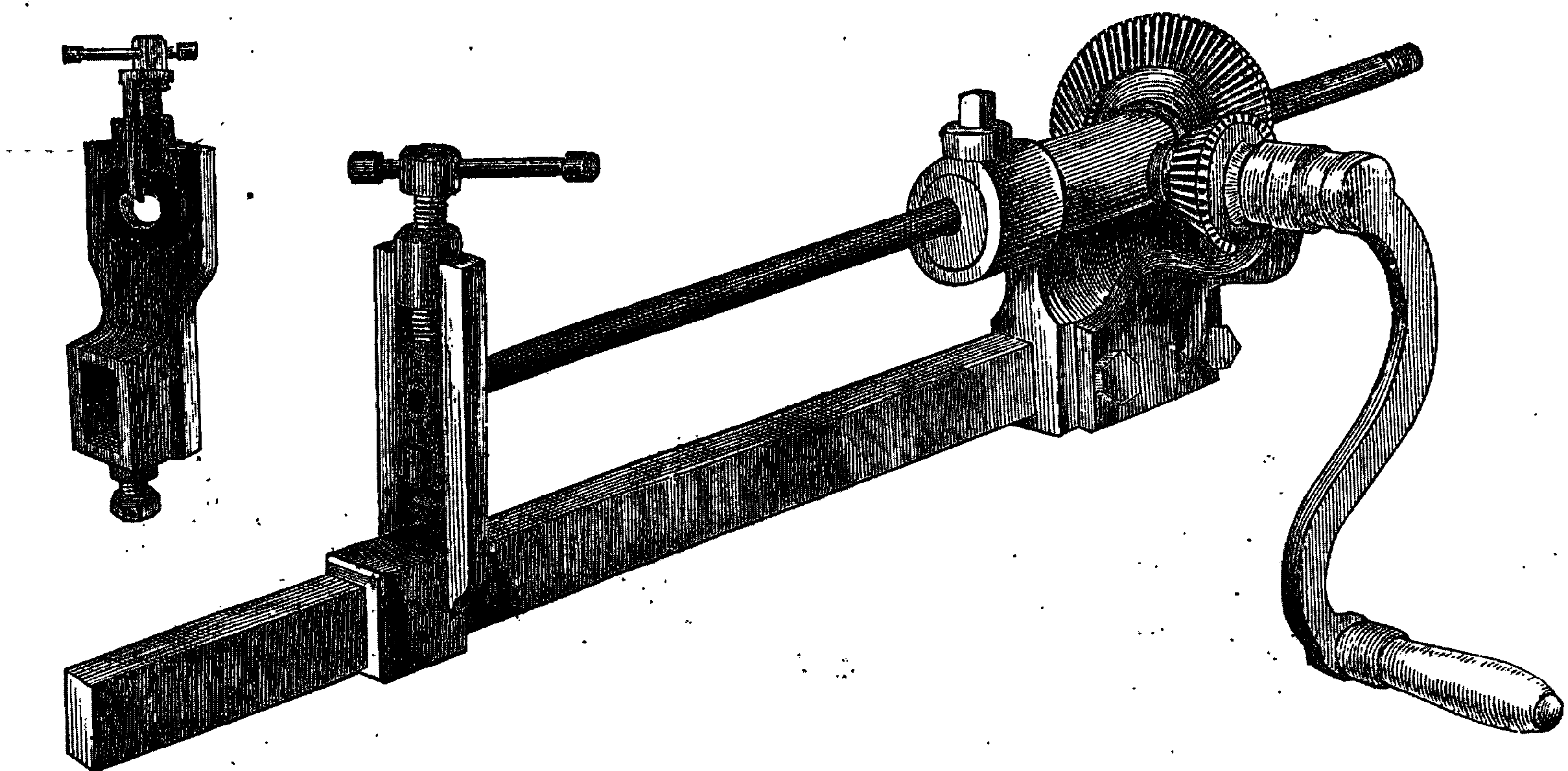
SCREW CUTTING MACHINE.

This Machine is particularly designed for the use of Gas Fitters, and others, engaged in putting up wrought iron pipes. Its convenience cannot be questioned. The cutting off arrangement is simple, and effective; by it, a boy can cut off more pipe in one hour, than a man can file off in three hours. The saving of files in one year will more than pay for the whole machine. Besides, a boy or common laborer can cut perfectly straight threads without any difficulty. Indeed, it is impossible to cut them otherwise. The die, frame, and cut off machine, it will be observed. slip off, and the whole can be put in a tool chest. The machine cuts from 1¼ to ⅛ in. pipe. It is also well adapted to cutting bolts, &c.

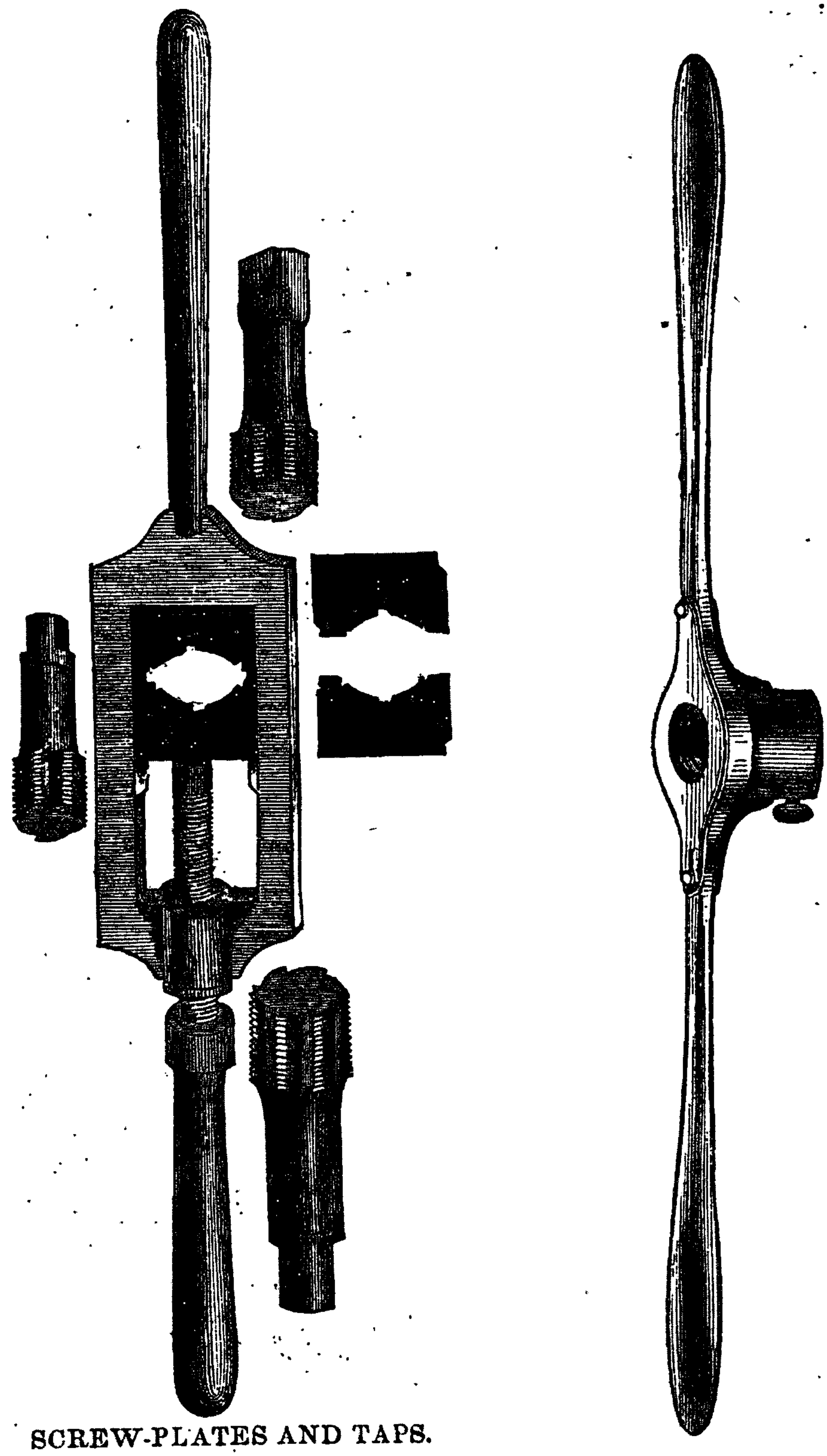


PIPE TONGS.

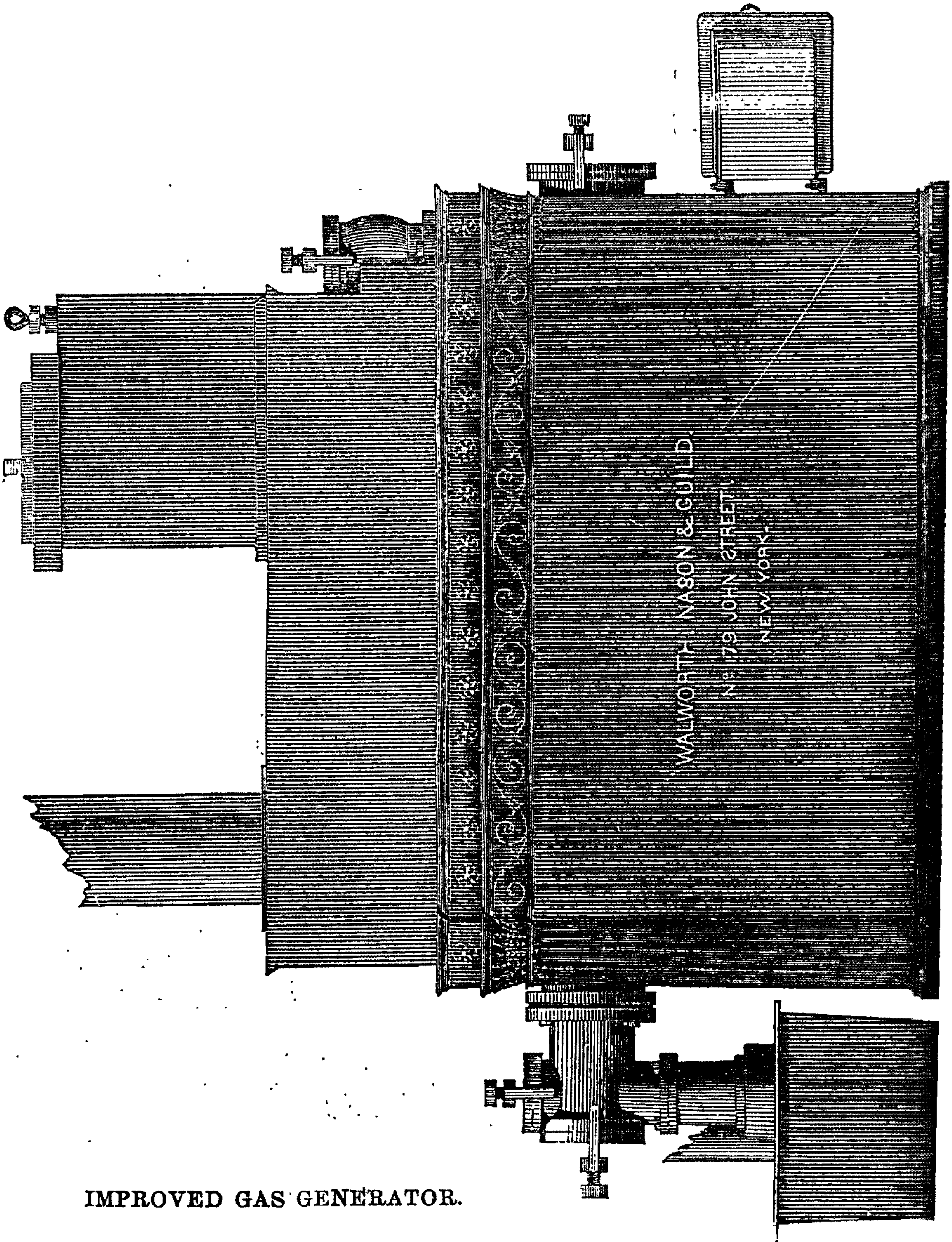
PLYERS.



SCREW-CUTTING MACHINE.



SCREW-PLATES AND TAPS.



IMPROVED GAS GENERATOR.

The Gas Generator, shown on the preceding page, is better arranged, has stood the test of practice better, and been more extensively introduced in factories and public buildings, than any other. It is set in a strong cast iron frame, well-secured against being thrown out of shape by expansion. The plan of letting the melted rosin from the kettle into the retort has been found far superior to the old method. It not only increases the amount of gas obtained from a given quantity of material, but it is also more convenient, and does not expose the melted rosin to the cooling action of the atmosphere, or to the more objectionable contingency of taking fire from the furnace. It also, in a great measure, prevents that pungent and disagreeable smell hitherto so objectionable in all gas apparatus. These, and other advantages not here enumerated, should induce those who contemplate the use of gas to examine this Generator.

Many pages might be filled with extracts of letters from those having Generators in use. The following are selected:

[From Robert Rennie, Esq.]

"*Lodi Print Works.*

"Messrs. Walworth, Nason & Guild:

"Gent'n.—I have now had your Rosin Gas Apparatus in operation in my works for over six months, and I am glad to have it in my power to say that it gives satisfaction.

"For two years previously I used oil with Crutchett's Patent Apparatus, but I have found yours so much cheaper and equally good, that I take great pleasure in recommending it to any parties who may be desirous of lighting with Gas.

"The cost between rosin and oil is as one to five—that is, oil costs five dollars per thousand feet, while rosin does not cost one dollar per thousand feet.

"I have no trouble with it, never having been at any time without light since its erection.

"I am yours, respectfully,

(Signed) "ROBERT RENNIE.

"P. S. Oil can be used in W., N. & G.'s apparatus equally well as in the old original oil Generator. R. R."

[Extract from a letter from DR. BRIGHAM, Superintendent, &c., of the State Lunatic Asylum at Utica.]

* * * "We have just been visited by most of the Medical Superintendents of other Lunatic Asylums, and several resolved, after examining our gas apparatus, to make efforts to have such at their own establishments. Formerly it cost us in winter about four dollars a day for oil. We can now make gas enough to supply us, the same length of time, for one dollar eighty-nine cents—that is, the cost for rosin, coal, labor and board of a man, amounts but to that sum.

"In haste, but truly, gentlemen,

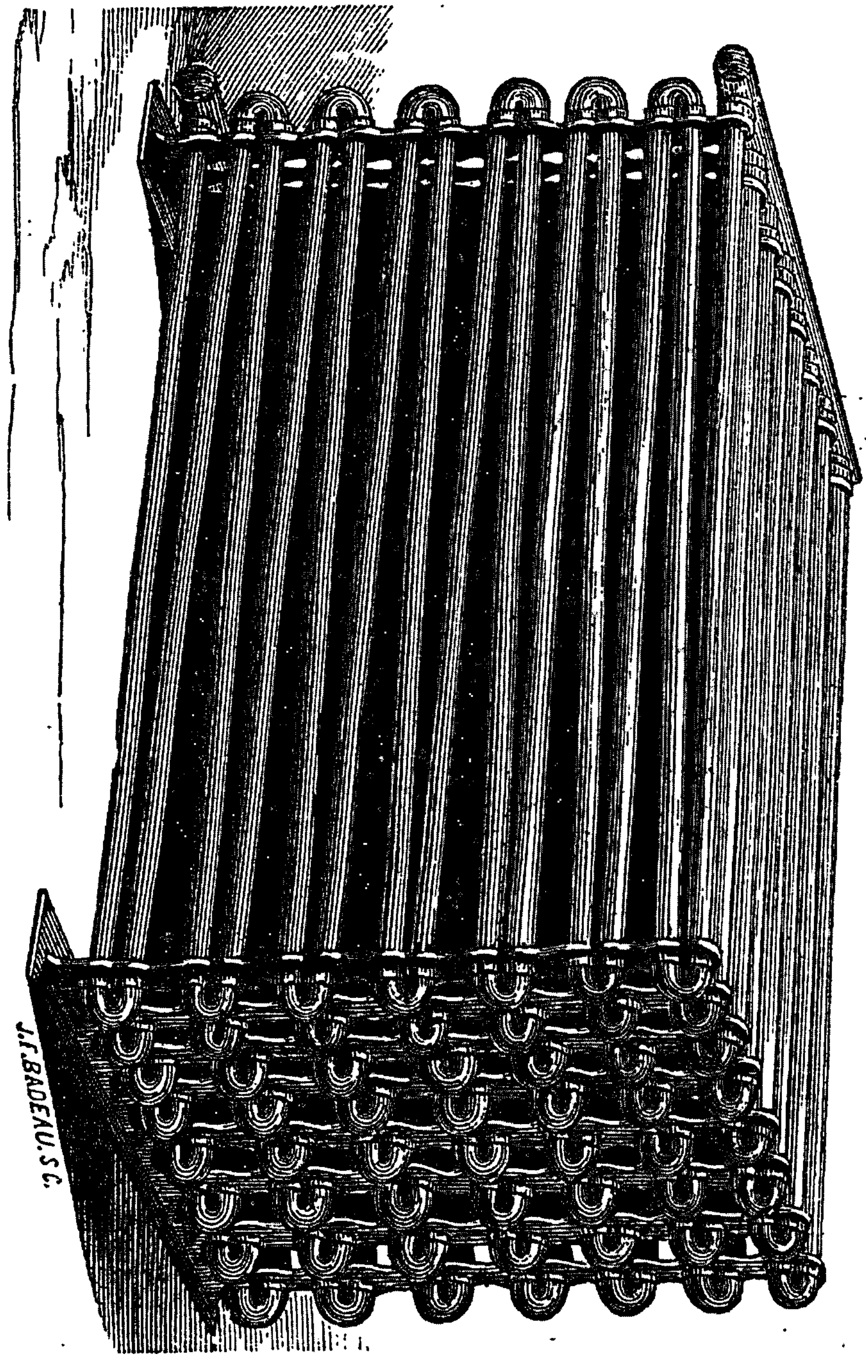
"Your obliged and obed't serv't,

(Signed) "A. BRIGHAM.

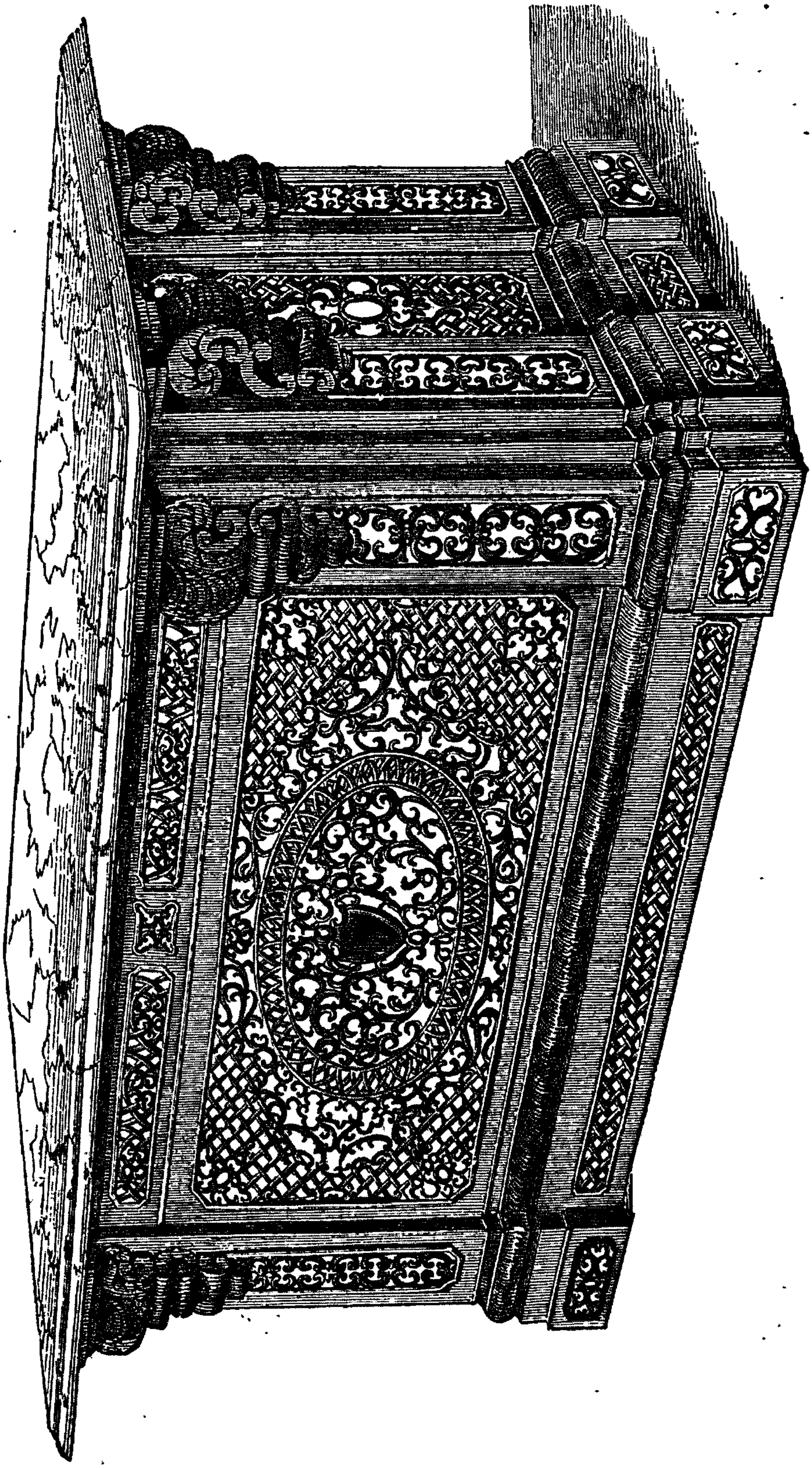
"Messrs. WALWORTH, NASON & GUILD."

The following is a list of some of the most extensive establishments that have been lighted by the apparatus of Walworth, Nason & Guild:

New-York State Lunatic Asylum	*Utica, N. Y.*
Globe Mills, (woolen)	" "
Hollister's Mills, (")	*Checkerville, N. Y.*
" Washington Steam Mill, (woolen)	" "
" Empire Mills, (woolen)	*Clayville, N. Y.*
" Clayville Mills, (woolen)	" "
S. & I. Townsend's Cotton Factory	*Cornwall, Orange Co., N. Y.*
Rankin, Duryee & Co.'s Hat Factory	*Newark, N. J.*
Robert Rennie's Lodi Print Works	*Rennieville, N. J.*
H. V. Butler's Ivanhoe and Passaic Paper Mills	*Patterson, N. J.*
American Mills, (woolen)	*Rockville, Ct.*
Wool Growers' Manufacturing Co.'s Mills, (woolen)	*Rockton, Little [Falls, N. Y.*
Saxony Woolen Mill	" "
Utica Steam Cotton Mills	*Utica, N. Y.*
Glendale Woolen Mill	*Berkshire Co., Mass*



This engraving shows the manner of arranging pipe in coils, by which a large amount of radiating surface is obtained in a small space. Coil to be covered where desirable by the ornamented cases represented on the next page.



WARMING BY STEAM.

The question of what is an economical and efficient substitute for stoves, grates or fire-places, for warming apartments, is one that has engaged the attention of many of the most scientific and ingenious men of the world, for the last half century. The old-fashioned fire-places, with their woful waste of fuel, and the bad draughts that were caused by them, have long since been abandoned, notwithstanding their cheerful appearance, and their moderate aids to ventilation. Stoves, in almost endless varieties, were the first substitutes provided, and the ingenuity of man has been exhausted in giving to them new shapes and modes, to render them economical and healthful. But the arid atmosphere that is engendered by them, causing loss of health to a most alarming extent, as well as their complete lack of any provision for ventilation, (especially the once famous *air-tight* stove,) has thrown them deservedly into disfavor. The hot air-furnace, so common of late in public and private buildings, was the next step towards the solution of this seemingly-difficult question. Still this mode of warming has many objectionable features, and it may be doubted whether, in point of healthfulness, it has any advantages over the ordinary stove.

The fact that air, in contact with iron highly heated, becomes decomposed, is well-known; and the sickly, sulphurous smell that is imparted to it must have been observed by every one. The fire-box of a hot air-furnace, in operation, is almost always heated to redness, and the fires in it are forced much more than in stoves. The air to be warmed, that is introduced into the furnace, impinges directly against the incandescent surface of the iron, and at once becomes decomposed, while all the particles of organic matter contained in it are charred, and give out a fœtid odor. The highly-rarefied column rushes quickly through the tubes, and, desiccated and loaded with the minute particles of burned animal and vegetable matter, is poured into the apartment, generally through one aperture, never through more than two or three. An equable ventilation is impossible under this arrangement; the heated currents fly directly to whatever ventilating passages are provided, while the foul air lingers, undisturbed, in those parts of the room not in the vicinity of the registers and ventilators. The effect upon the furniture, paint and drapery of a room, under this state of things, is very severe; a sooty discoloration takes place in a short time, and on walls painted in fresco, the delicate tints are almost immediately destroyed. The most alarming features, however, are the effects upon the inmates of the apartment; headaches, dizziness, a peculiar chilly feeling, loss of appetite, ending ultimately in absolute sickness, are sure to occur under the influence of an atmosphere heated to excessive dryness, promoting, as it does, a rapid evaporation from the body, on account of the great avidity for moisture which such an air possesses.*

---

* NOTE.—The following extract is given from a paper, read before the Royal Society of London by Dr. Ure, giving his explanation of the cause of the very general state of indisposition and disease prevailing among the officers engaged in the Long-Room of the London Custom-House, this apartment being heated by hot air-furnaces, placed in the cellar below. "The permanent action of an artificial desiccated air on the animal economy may be stated as follows:—When plunged in a very dry air, the insensible perspiration will be increased; and, as it is a true evaporation or gasefaction, it will generate cold proportionably to its amount. Those parts of the body which are most insulated in the air, and fartherest from the heart, such as the extremities, will feel this refrigerating influence most powerfully. Hence the coldness of the hands and feet, so generally felt by the inmates of the apartment, though its temperature be at or above

The plan of Walworth, Nason & Guild, for warming buildings, and which originated with them, is that of warming by radiation, from small pipes filled with steam or hot water, and placed in the apartment to be warmed. These pipes are distributed around the base skirting of the room, concealed, if desirable, by open-worked screening, or they are arranged in coils, covered by ornamental cases, (which serve as pier tables, &c.,) and placed in suitable positions.* The old method of warming by steam, was to hang up, in the room to be warmed, some six or seven feet above the floor, cast iron or copper pipes of a large calibre, which, besides being very unsightly, was found to be objectionable on account of the heat radiating too directly upon the heads of the inmates. To avoid this, and also to provide for a more efficient distribution of the heat, these large pipes were afterwards car-

60°. The brain being screened by the skull from this evaporating influence, will remain relatively hot, and will get surcharged besides, with the fluids which are repelled from the extremities by the condensation or contraction of the blood vessels, caused by cold; hence the affections of the head, such as tension, and its dangerous consequences. If sensible perspiration happen, from debility, to break forth from a system previously relaxed, and plunged into dry air, so attractive of vapor, it will be of the kind called a cold, clammy sweat, on the sides and back, as experienced by many of the inmates of the Long-Room. Such, in my humble apprehension, is a rationale of the phenomena observed at the Custom-House. Similar effects have resulted from hot air in stoves, of a similar kind, in many other situations." * * * "It may be admitted that the comfort of sedentary individuals, occup ng large apartments, cannot be adequately secured by the mere influx of hot air from separate rooms; it requires the genial influence of radiating surfaces in the apartments themselves, such as open fires, or *pipes filled with hot water or steam.*"

* See cut on page 40, which is the reprentation of a table designed for this purpose, and is the same as those on board the steamship Franklin, and all the steamers of Collins's line, as well as those introduced into many public and private houses.

ried around the sides of the apartment near the floor. This arrangement occupies too much space, is almost always leaky, and, in frosty weather, the cast iron pipes are very liable to split, in consequence of the condensed water flowing ahead of the steam, causing unequal expansion. This system of small pipes, placed one directly over the other, (as shown by cuts on pages 14 and 15, which are the fittings designed for these coils,) obviates all the objections found against the old plans of warming by steam, and furnishes, also, it is respectfully urged, an efficient and healthful substitute for the expensive and highly deleterious methods of warming, commented upon in this article.

For factories, public rooms, churches, hotels, steamships and steamboats, theatres, concert-rooms, &c., &c., this plan is most especially designed, and meets with the warm approval of all who have introduced it into their establishments.

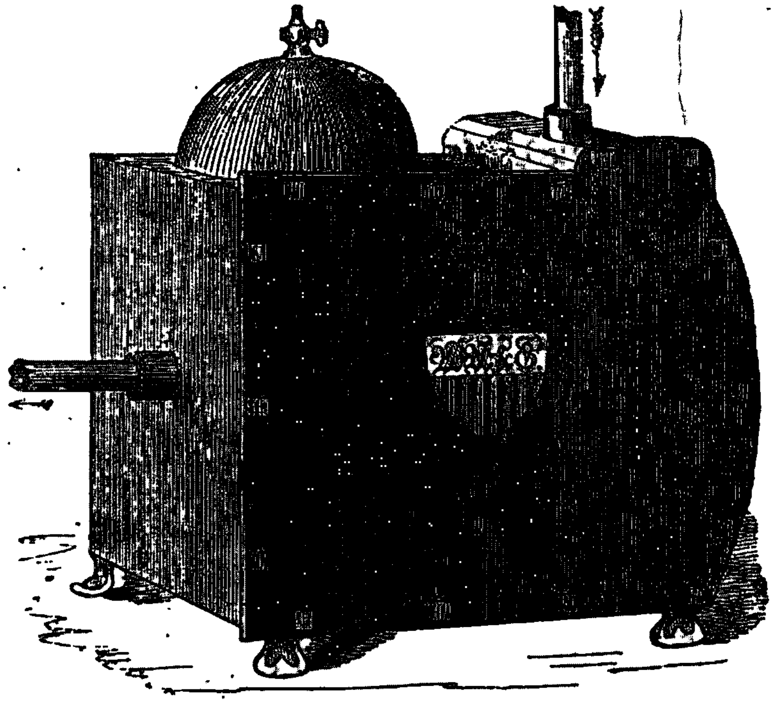
The *exhaust steam* from an engine can be applied efficiently for warming by this method; a simple device having been contrived to prevent the exhaust from backing upon the engine.

The same method has also been eminently successful for Drying Closets in laundries, drying wool and woolen goods; heating all sorts of liquor, seasoning cabinet stuff, heating calls for veneering, curing rubber goods, and, in short, for every purpose requiring a high, safe, and uniform temperature.

The following places, in which this plan of warming, drying, &c., has been introduced by Walworth, Nason & Guild, have been selected from among a large number, now in operation:

American Tract House	*New-York.*
Arcadia Mills	*Milton, Florida.*
Strong Mills, (cotton,)	*Cohoes, N. Y.*
Clark, Work & Co.'s Mill, (cotton,)	*Clinton, N. Y.*
Washington Mill, (woolen,)	*Checkerville, N. Y.*
Do. Steam do. do.	do. do.
James River Manufacturing Co.	*Virginia.*
Laflin & Brother, (Paper Mill,)	*Herkimer, N. Y.*
Nunns & Clark, (Piano Forte Factory,)	*N. Y. City.*
Partridge, Goald & Whiting, (Paper Hangings,)	"
D. Powers & Sons, (Oil Cloth,)	*Lansingburg.*
J. E Whipple, (")	do.
Palmer, Richardson & Co., (Jewellers,)	*Newark, N. J*
Rankin, Duryee & Co., (Hatters,)	do.
Robert Rennie, (Calico Printer,)	*Lodi,* "
Union India Rubber Co.	*N. Y. City.*
O.R. Stillman, (cotton,)	*Westerly, R. I.*
Utica Cotton Manufacturing Co.	*Utica.*
Cornwall Cotton Factory	*Orange Co., N. Y.*
Uncasville Manufacturing Co., (cotton,)	*Uncasville. Ct.*
Mississippi do do. do.	*Mississippi.*
Astor House	*N. Y. City.*
Evening Post, (Printing Office,)	do.
James Goold & Co., (Coach-makers,)	*Albany*
American Pin Co.	*Waterbury, Ct.*
Howe Manufacturing Co.	*Birmingham, Ct.*
Clarendon House,	*Cor. 4th Avenue and 18th-st., N. Y.*
A. E. Tweedy & Co.'s Hat Manufactory	*Danbury, Ct.*
Stoddard's Piano Forte Factory	*32d-street, N. Y.*
J. G. McMurray & Co., Brush Factory	*Lansingburg, N. Y.*
Steam-Ship Atlantic	*Collins's Line.*
" " Pacific	*Collins's Line.*
" " Arctic	*Collins's Line.*
" " Baltic	*Collins's Line.*
" " Franklin	*Havre Line.*
Ferry Boats.—Fulton Ferry	5 *Boats.*
" " Jersey City "	2 "
" " Williamsburg "	7 "
H. L. Sturtevant's Hat Manufactory	*Danbury, Ct.*

And many others, too numerous to mention.



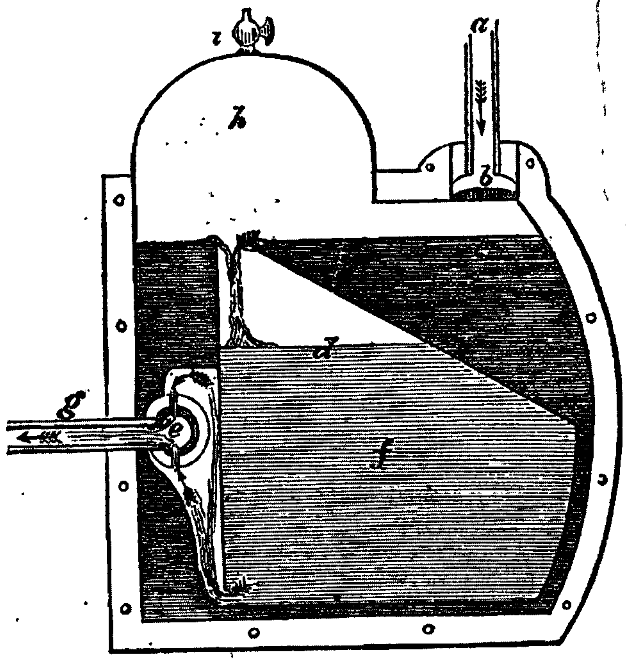
STEAM TRAP.

THIS machine, as its name denotes, is intended to prevent the waste of steam, and to regulate the discharge of condensed steam, from pipes and other fixtures used in warming buildings by steam. The necessity of a perfect apparatus for this purpose, has long been felt, and various attempts have been made to meet it.

Tredgold, and others, used a syphon or bent tube, which answered the purpose for very low pressures, but in the great majority of cases was entirely useless. The "Valve-Box," invented by Professor Mapes, although far superior to the "syphon," has many objections; the chief of which is that it will not operate well at varying pressures. For example, a Valve-Box, which would work well at 50 lbs. pressure to the square inch, would not work well at a much greater or a much less pressure. Another objection is, that any trifling sediment collecting in the pan will prevent the valve from closing tight, and, consequently, allow the steam to blow through when the pan is empty. To obviate these and other difficulties, the *Steam Trap* has been constructed. It has been thoroughly tested, and is believed to be a perfect apparatus for the purpose intended. One of them was connected with 1,200 feet of small wrought iron pipe, and the whole pressure of the boiler, 70 lbs. to the square inch, opened upon it. It was also connected with the exhaust pipe from the engine, and so arranged that either could be opened upon the Steam-Trap at pleasure. The exhaust pipe was about 100 feet in length, and the condensation, of course, trifling; yet, under these adverse circumstances, it kept the pipes free from water in both cases, regularly discharging as often as the float was filled, and shutting off the steam as completely as can be done by a stop-cock.

By examining its construction it will be observed that it should do so under all circumstances. The annexed cut, with the letters of reference, will explain its construction and mode of operation.

(*a*,) is the inlet pipe, through which the steam and water flows into the reservoir (*c*.) The float (*f*,) being empty, rises, turning on the hinge or cock (*e*.) When the water rises high enough to overflow and fill the float, it sinks, and opens the passages through the hinge; the water is then forced by the pressure of the steam through the opening in the bottom of the float (*f*,) and out of the discharge pipe (*g*.) When the float is discharged, it rises again and closes the apertures against the steam. (*b*,) is a small shelf or chamber, open at both ends into the reservoir, to prevent the water or steam from impinging upon the top of the float. (*h*,) is an air-chamber; (*i*,) is an air-cock, which should be opened in starting, and left open until all the air is ejected.



IRON STEAM BOILERS vs. COPPER BOILERS.

It has been for many years, and still is, the practice of scientific men, to recommend copper in preference to wrought iron, for boilers to heat water or other fluids, on the ground of the superior conducting power of the former over the latter metal; and it will doubtless appear strange to many, that a doctrine so well established should now, for the first time, (known to the writer,) meet with the most unqualified dissent. The superior conducting power of copper over iron admits of no doubt; and yet, upon this confessedly correct basis has been raised the most fallacious doctrine the whole range of scientific engineering of the present age can produce. It is scarcely possible to imagine the enormous amount of money wasted, and worse than wasted, in this country alone, by the use of copper instead of iron in the boilers of steamboats, to say nothing of locomotives. Four boilers were recently put into a United States steamer, which cost $120,000, and weighed 140 tons, while iron ones, according to Professor Renwick, would have cost only $34,000, and have weighed only 82 tons; thus, in addition to the $86,000 useless first cost, there is a useless weight of 58 tons also.

That such an enormous outlay should be sanctioned, may well excite surprise, founded, as it is, upon an engineering blunder, did we not remember another which kept its ground for some time in England—the much-valued invention of Blenkinsop, in the early days of railroad engineering.

In the case with these, and many other boilers, (more particularly government ones,) the heaviest, dearest and weakest material is employed, for reasons which, sooner or later, must appear too childish to be entitled to notice.

The experiments which have been made, proving that copper is a better conductor of heat than iron, are principally those of M. Brot and M. Despretz. On a bar of each metal being plunged into a bath of mercury or of molten lead, it was found, that although the temperature of each was, of course, almost, if not absolutely identical, at the smallest appreciable distance from the bath, that the copper, being the best conductor of heat, kept it to itself, or would not readily part with it, while the iron was an inferior one in conducting power, in consequence of parting with it more rapidly. The term "good conductor" has, therefore, been applied erroneously, because it was intended to convey the idea that it would convey or conduct the heat or caloric of the fire through itself, into the water, on the other side; which does not apply to the copper, but to iron; which is confirmed by the facts, which are well known, *that the absorptive and radiative powers are always equal in the same metal*, and are far greater in iron than in copper, while the latter metal is in the same ratio the best reflector; for, *reflection is inversely as radiation*, as proved by Leslie and others. The power of reflection, then, appears to control that of radiation, &c., &c., confine the caloric within the metallic (copper) surfaces, or at least within that depth in which the power of reflection lies.

With these facts before us, together with others, proving, beyond a doubt, that all things being the same, more water is evaporated in the same space of time in iron than in copper boilers, with the same amount of fuel, it is not possible that the present absurd and fallacious arguments can stand another year; and their downfall must be hailed with pleasure by all who love the truth, and progress, and science, and will inevitably lead to the perfecting of boilers, made of that still *most noble* of all the metals—*iron—glorious iron.*

Copper being a better reflector than iron, is then, in consequence, inferior as an absorber of caloric, and for the same reason, also, as a radiator: but superior as a conductor, that is, as a retainer; for it appears that it is difficult for the caloric to get into copper, (as compared with iron,) and equally difficult to get out of it again when it has once got in, and therefore it expands within it; so that in a locomotive boiler, with copper tubes of a moderate length, the end of the tubes next the smoke box, may be conveying away the heat from the end next the furnace—a state of things which it behooves our railway engineers and directors to look after, as one of the elements of extravagance, in that most economical boiler. Iron tubes of half the length would extract more of the caloric from the burning fuel, and it is only because they are of copper, that it is necessary to make them so long.

Iron absorbs heat so much more rapidly than copper, that many explosions have occurred, which would not had copper been used; although this is admitted, it is a little too bad to praise copper for this also, that it will not let a boiler blow up, when, everything considered, it ought to blow up, if a good fire and a good medium through which to convey its caloric into the water, have any virtue in them. Copper cannot be a good medium through which to raise steam, and a bad one to blow up with; that is rather too much, yet the argument means this if anything; nevertheless, it is admitted that this is not the ground on which any dependence can be placed, because, whenever such a catastrophe has happened, it has arisen from a defective arrangement of the boiler—in fact the *greatest defect* that can properly occur in the designing of a boiler—the want of *a complete and thorough circulation of the water within it*, on precisely the same principle as the circulation of hot water in pipes, for the purpose of warming buildings. No boiler of such a construction as here recommended ever blew up from the cause alluded to, as it is well known that water is a far better conductor of caloric than any metal, in the proportion (according to the experiments of Mr. Sparkes, of England) of about 26 to 10.—*Railroad Journal.*

PRICE.	Diameter.	Thickness.	Weight.
Pr. ft.	Outside.	Wire Gauge.	Average.
Cents.	Inches.	No.	lbs. pr. ft.
29	$1\frac{1}{2}$	15	$1\frac{1}{6}$
31	$1\frac{3}{4}$	13	$1\frac{5}{8}$
34	2	"	2
39	$2\frac{1}{4}$	"	$2\frac{1}{6}$
43	$2\frac{1}{2}$	$12\frac{1}{2}$	$2\frac{9}{16}$
48	$2\frac{3}{4}$	"	$2\frac{5}{6}$
51	3	"	$3\frac{1}{10}$
85	$3\frac{1}{2}$	12	4
$1 10	4	11	5
1 50	5	10	$6\frac{1}{2}$

5*

GENERAL RULES.

DISCHARGE BY HORIZONTAL PIPES.

1. The less the diameter of the pipe, the less is the proportional discharge of the fluid.
2. The greater the length of the discharging pipe, the greater the diminution of the discharge.
3. The friction of a fluid is proportionally greater in small than in large pipes.
4. *The velocity of water flowing out of an aperture is as the square root of the height of the head of the water.*

Theoretically the velocity would be $\sqrt{}$ height × 8. In *practice* it is $\sqrt{}$ height × 5.4=velocity in feet per second.

DISCHARGE BY VERTICAL PIPES.

The discharge of fluids by vertical pipes is augmented, on the principle of the gravitation of falling bodies; consequently, the greater the length of the pipe, the greater the discharge of the fluid.

DISCHARGE BY INCLINED PIPES.

A pipe which is inclined will discharge in a given time a greater quantity of water than a horizontal pipe of the same dimensions.

DEDUCTIONS FROM VARIOUS EXPERIMENTS.

1. The areas of orifices being equal, that which has the smallest perimeter, will discharge the most water under equal heads; hence circular apertures are the most advantageous.
2. That in consequence of the additional contraction of the fluid vein, as the head of the fluid increases, the discharge is a little diminished.
3. That the discharge of a fluid through a cylindrical horizontal tube, the diameter and length of which are equal to one another, is the same as through a simple orifice.
4. That the above tube may be increased to four times the diameter of the orifice with advantage.
5. The velocity of motion that would result from the direct, unretarded action of the column of a fluid which produces it, being a constant, or 8.

The velocity through an aperture in a thin plate, with the same pressure, is .... 5.
Through a tube from two to three diameters in length, projecting outward 6.5
Through a tube of the same length, projecting inward 5.45
Through a conical tube of the form of the contracted vein 7.9

Curvilineal and rectangular pipes discharge less of a fluid than rectilineal pipes.

DISCHARGE FROM RESERVOIRS RECEIVING NO SUPPLY OF WATER.

For prismatic vessels the general law applies, that twice as much would be discharged from the same orifice if the vessel were kept full during the time which is required for emptying itself.

DISCHARGES FROM COMPOUND OR DIVIDED RESERVOIRS.

The velocity in each may be considered as generated by the difference of the heights in the two contiguous reservoirs; consequently, the square root of the difference will represent the velocity, which, if there are several orifices, must be inversely as their respective areas.

DISCHARGE BY WEIRS AND RECTANGULAR NOTCHES.

The quantity of water discharged is found by taking $\frac{2}{3}$ of the velocity due to the mean height, using 5.1 for the coefficient of the velocity.

Example.—What quantity of water will flow from a pond, over a weir 102 inches in length by 12 inches deep?

$\frac{2}{3}\sqrt{}$ 1 foot × 5.1 × 8.5 area of weir=28.9 cubic feet in one second.

TABLE—*Showing the Head necessary to overcome the Friction of Water in Horizontal Pipes, by* Mr. Smeaton.

VELOCITY OF WATER IN PIPE PER SECOND.

Feet. 0	Inches. 6	Feet. 1	Inches. 0	Feet. 1	Inches. 6	Feet. 2	Inches. 0	Feet. 2	Inches. 6	Feet. 3	Inches. 0	Feet. 3	Inches. 6	Feet. 4	Inches. 0	Feet. 4	Inches. 6	Feet. 5	Inches. 0	Bore of the Pipes.
	4.5	1	4.7	2	11.10	4	9.7	7	1.7	10	1.0	13	8.0	17	10.	22	6.7	28	0.2	½ inch.
	3.0		11.1	1	11.3	3	2.5	4	9.2	6	8.6	9	1.3	11	10.6	15	0.5	18	8.1	¾ "
	2.2		8.4	1	5.5	2	4.9	3	6.9	5	0.5	6	10.	8	11.	11	3.4	14		1 "
	1.8		6.7	1	2.	1	11.1	2	10.3	4	0.4	5	5.6	7	1.6	9	0.3	11	2.5	1¼ "
	1.5		5.6		11.7	1	7.2	2	4.6	3	4.3	4	6.7	5	11.3	7	6.2	9	4.1	1½ "
	1.3		4.8		10.	1	4.5	2	0.5	2	10.6	3	10.9	5	1.1	6	5.4	8	0.1	1¾ "
	1.1		4.2		8.7	1	2.4	1	9.4	2	6.2	3	5.	4	5.5	5	7.7	7		2 "
	1.0		3.7		7.8	1	0.8	1	7.	2	9.9	3	0.4	3	11.6	5	0.1	6	2.7	2¼ "
	.9		3.3		7.0		11.5	1	5.1	2	0.2	2	8.8	3	6.8	4	6.1	5	7.2	2½ "
	.7		2.8		5.0		9.6	1	2.3	1	8.2	2	3.3	2	11.7	3	9.1	4	8.	3 "
	.6		2.4		5.0		8.2	1	0.2	1	5.3	1	11.4	2	6.6	3	2.7	4		3½ "
	.6		2.1		4.4		7.2		10.7	1	3.1	1	8.5	2	2.7	2	9.8	3	6.	4 "
	.5		1.9		3.9		6.4		9.5	1	1.4	1	6.2	1	11.8	2	6.1	3	1.4	4½ "
	.4		1.7		3.5		5.8		8.6	1	0.1	1	4.4	1	9.4	2	3.1	2	9.6	5 "
	.4		1.4		2.9		4.8		7.1		10.1	1	1.7	1	5.8	1	10.6	2	4.	6 "
	.3		1.2		2.5		4.1		6.1		8.6		11.7	1	3.3	1	7.3	2		7 "
	.3		1.0		2.2		3.6		5.4		7.6		10.2	1	1.4	1	4.9	1	9.	8 "
	.25		.9		1.9		3.2		4.8		6.7		9.1		11.9	1	3.	1	6.7	9 "
	.2		.8		1.7		2.9		4.3		6.0		8.2		10.7	1	1.5	1	4.8	10 "
	.2		.8		1.6		2.6		3.9		5.5		7.5		9.7	1	0.3	1	3.3	11 "
	.19		.7		1.5		2.4		3.6		5.0		6.8		8.9		11.3	1	2.0	12 "

Look for the velocity of water in the pipe in the upper line, and in the column beneath it, and opposite to the given diameter, is the height of the column or head requisite to overcome the friction of such pipe for 100 feet in length, and obtain the required velocity.

TABLE *of the Weight of a Lineal Foot of Cast Iron Pipes, in lbs.*

Diameter of bore in Inches.	Thickness of the Metal, in inches.							
	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1	$1\frac{1}{8}$	$1\frac{1}{4}$
2	8.8	12.3	16.1	20.3				
2½	10.6	14.7	19.2	23.9				
3	12.4	17.2	22.2	27.6	33.3	39.3	45.6	
3½	14.2	19.6	25.3	31.3	37.6	44.2	51.1	
4	16.1	22.1	28.4	35.0	41.9	49.1	56.6	64.4
4½	18.0	24.5	31.4	38.7	46.2	54.0	62.1	70.6
5	19.8	27.0	34.5	42.3	50.5	58.9	67.6	76.7
5½	21.6	29.5	37.6	46.0	54.8	63.8	73.2	82.8
6	23.5	31.9	40.7	49.7	59.1	68.7	78.7	88.8
6½	25.3	34.4	43.7	53.4	63.4	73.4	84.2	95.1
7	27.2	36.8	46.8	56.8	67.7	78.5	89.7	101.2
7½	29.0	39.1	49.9	60.7	72.0	83.5	95.3	107.4
8	30.8	41.7	52.9	64.4	76.2	88.4	100.8	113.5
8½	32.9	44.4	56.2	68.3	80.8	93.5	106.5	119.0
9	34.5	46.6	59.1	71.8	84.8	98.2	111.8	125.8
9½	36.3	49.1	62.1	75.5	89.1	103.1	117.4	131.9
10	38.2	51.5	65.2	79.2	93.4	108.0	122.8	138.1
10½	..	54.0	68.2	82.8	97.7	112.9	128.4	144.2
11	..	56.4	71.3	86.5	102.0	117.8	133.9	150.3
11½	..	58.9	74.3	90.1	106.3	122.7	139.4	156.4
12	..	61.3	77.4	93.6	110.6	127.6	145.0	162.6
13	..	..	82.7	101.2	118.2	137.4	154.1	173.5
14	..	..	89.3	108.2	126.5	146.2	165.3	185.2
15	..	..	95.2	115.7	135.3	156.2	176.2	198.1
16	..	..	..	123.3	143.1	166.1	187.5	211.3
17	..	..	..	130.2	152.5	178.5	198.2	223.4
18	..	..	..	137.0	161.2	185.3	209.1	235.6
19	..	..	..	..	169.2	195.7	223.3	247.1
20	..	..	..	..	178.1	205.2	233.2	259.0
21	..	..	..	..	..	214.1	243.5	273.2
22	..	..	..	..	..	223.0	254.8	285.4
23	..	..	..	..	..	233.4	265.5	298.3
24	..	..	..	..	..	245.2	267.5	310.6

Iron Cement for joining the Flanches of Iron Pipes, &c.—Take of Sal Ammoniac, 2 ounces; Flowers of Sulphur, 1 ounce; clean cast-iron Borings or Filings, 16 ounces: mix them well in a mortar, and keep them dry. When required for use, take one part of this powder, and twenty parts of clean iron borings or filings, mix thoroughly in a mortar, make the mixture into a stiff paste with a little water, and apply it between the joints, and screw them together. A little fine grindstone sand added, improves the cement.

A mixture of white paint with red lead, spread on canvas or woollen, and placed between the joints, is best adapted for joints that require to be often separated.

NOTE—These weights do not include any allowance for flanches, or for spigot or faucet ends. The weight of the two flanches of a pipe are generally reckoned equal to the weight of one foot in length. The weight of a spigot and faucet ends is reckoned equal to the weight of half a foot in length.

WEIGHT OF COPPER PIPES TWELVE INCHES LONG.

From ½ to 3 inch bore, ⅛ inch thick.

Size of Bore.	½ in.	⅝	¾	⅞	1	1⅛	1¼
Weight.	lbs. .94	lbs. 1.14	lbs. 1.33	lbs. 1.51	lbs. 1.69	lbs. 1.89	lbs. 2.08
Size of Bore.	1⅜	1½	1⅝	1¾	1⅞	2	2⅛
Weight.	lbs. 2.23	lbs. 2.42	lbs. 2.67	lbs. 2.87	lbs. 3.03	lbs. 3.21	lbs. 3.39
Size of Bore.	2¼	2⅜	2½	2⅝	2¾	2⅞	3
Weight.	lbs. 3.58	lbs. 3.78	lbs. 3.97	lbs. 4.12	lbs. 4.34	lbs. 4.56	lbs. 4.78
Size of Bore.	½	⅝	¾	⅞	1	1⅛	1¼
Weight.	lbs. 2.27	lbs. 2.65	lbs. 3.02	lbs. 3.4	lbs. 3.77	lbs. 4.12	lbs. 4.5
Size of Bore.	1⅜	1½	1⅝	1¾	1⅞	2	2⅛
Weight.	lbs. 4.9	lbs. 5.29	lbs. 5.7	lbs. 6.08	lbs. 6.42	lbs. 6.79	lbs. 7.17
Size of Bore.	2¼	2⅜	2½	2⅝	2¾	2⅞	3
Weight.	lbs. 7.55	lbs. 7.9	lbs. 8.31	lbs. 8.68	lbs. 9.12	lbs. 9.47	lbs. 9.82

TABLE—Of the Calibre and weight of Lead-Pipe made in New-York.

Calibre.	Weight pr. ft.		Calibre.	Weight pr. ft.		Calibre.	Weight pr. ft.	
In.	lbs	oz	In.	lbs	oz	In.	lbs	oz
⅜ No. 1	0	8	light	2	12	medium	6	7
light	0	11	medium	3	6	strong	7	7
medium	1	1	strong	3	15	ex. strong	9	0
strong	1	9	ex. strong	5	0	2½in. 3-16 thick	7	13
ex. strong	1	14	1¼in. No. 2	1	14	¼ thick	11	0
½ No. 1	0	9½	No. 1	2	4	5-16 thick	13	8
light	0	15	ex. light	2	12	⅜ thick	16	12
medium	1	4	light	3	2	3in. waste	5	0
strong	1	8	medium	3	10	3-16 thick	9	5
ex. strong	2	1	strong	3	14	¼ "	12	8
⅝ No. 1	0	12	ex strong	5	2	5-16 "	16	0
light	1	11	1½ ex. light	3	6	⅜ "	19	12
medium	2	2	light	4	4	3½in. ¼ thick	15	10
strong	2	7	medium	5	3	5-16 thick	18	4
ex. strong	2	11	strong	6	8	⅜ thick	21	12
¾ No. 1	1	3	ex. strong	8	0	4in. waste	5	2
ex. light	1	8	1¾in. No. 1	3	6	" "	5	14
light	2	0	ex. light	3	10½	¼ thick	16	12
medium	2	9	light	4	7	5-16 thick	21	0
strong	3	2	medium	5	2	⅜ "	25	4
ex. strong	3	6	strong	6	10½	4½in. waste	5	12
1in. No. 2	1	7	2in. No. 1	2	14½	5in "	6	8
No. 1	1	14	ex. light	4	5	5in "	9	4
ex. light	2	3	light	5	7	5in "	11	4

The following regulation in regard to the size and other proportions of tubing, allowed to be used in fitting up dwelling-houses and other buildings, with fixtures for the introduction of gas, has been adopted by the Manhattan Gas Light Company, and many others in the United States:

Size of Tubing.	Greatest Length Allowed.	Greatest Number of Burners.
1/4 inch,	6 feet,	1 burner,
3/8 "	20 "	3 "
1/2 "	30 "	6 "
5/8 "	40 "	12 "
3/4 "	50 "	20 "
1 "	70 "	35 "
1 1/4 "	100 "	60 "
1 1/2 "	150 "	100 "
2 "	200 "	200 "

TABLES

Of the different quantities of Coal-Gas of the Specific Gravity ·420, delivered in one hour, from horizontal pipes of different diameters and lengths, and under different pressures.

Quantities delivered by a two-inch Main in cubic feet.

Length of pipe in yards.	Pressure in inches and parts, of a perpendicular head of water.					
	0·50	0·75	1·00	1·50	2·00	3·00
10	2896	3558	4135	4923	5792	6950
15	2364	2904	3331	4089	4728	5768
20	2047	2507	2886	3541	4094	4994
25	1830	2241	2580	3165	3660	4465
30	1673	2049	2368	2894	3346	4082
40	1445	1770	2037	2490	2890	3525
50	1294	1585	1824	2238	2588	3157
100	915	1121	1290	1582	1830	2232
150	748	916	1054	1304	1496	1825
200	647	792	912	1119	1294	1578
250	579	709	816	1010	1158	1412
300	522	639	736	903	1044	1273
400	457	559	644	790	914	1115
500	409	500	576	707	818	997

Quantities delivered by a three-inch Main in cubic feet.

Length of pipe in yards.	Pressure in inches and parts, of a perpendicular head of water.					
	0·50	0·75	1·00	1·50	2·00	3·00
10	6516	7981	9187	11272	13032	15899
20	4606	5642	6494	7964	9212	11238
30	3764	4610	5307	6511	7528	9184
40	3258	3990	4593	5635	6516	7949
50	2911	3565	4104	5036	5822	7102
100	2059	2522	3303	3562	4118	5023
150	1682	2060	2371	2909	3364	4004
200	1456	1783	2052	2518	2912	3552
250	1302	1594	1835	2252	2604	3176
300	1188	1455	1675	2055	2376	2898
400	1029	1260	1450	1780	2058	2510
500	920	1126	1297	1591	1840	2244
600	840	1027	1184	1453	1680	2049
700	778	953	1096	1345	1556	1898
800	728	892	1026	1259	1456	1776
900	686	840	967	1186	1372	1673
1000	651	797	917	1126	1302	1588
1760	490	600	690	847	980	1195

Carburetted hydrogen gas of the specific gravity ·420 will flow through a circular orifice one-fourth of an inch diameter, with a pressure equal to five-tenths of an inch head of water at the rate of eighty cubic feet per hour, and under different pressures, as follows:

Pressure.	Quantity of Gas in cubic feet by experiment.	Quantity of Gas in cubic feet by calculation.
1 inch.	113·0	111·7
2 "	160·5	160·0
3 "	195·0	193·1
4 "	226·0	226·2
5 "	253·0	253·0

TABLE *of the Expansive force of Steam from* 212° *to* 352½°.

(From experiments of Committee of Franklin Institute.)

The unit is the atmospheric pressure, 30 inches of mercury.

Degrees of heat.	Pressure.	Degrees of heat.	Pressure.	Degrees of heat.	Pressure.
212°.	1.	298.5°	4.5	331.°	7.5
235°.	1.5	304.5°	5.	336.°	8.
250°.	2.	510.°	5.5	340.5°	8.5
264°.	2.5	315.5°	6.	345.°	9.
275°.	3.	321.°	6.5	349.°	9.5
284°.	3.5	326.°	7.	352.°	10.
291.5°	4.				

Under the pressure of the atmosphere alone, water cannot be heated above the boiling point.

27,104 cubic feet of steam, at the pressure of the atmosphere, equal 1 lb. avoirdupois.

A column of mercury 2 inches in height will counterbalance a pressure of 0.98 lbs. on a square inch.

Form and direction of Steam-pipes.—Enlargements in steam-pipes succeeded by contractions, always retard the velocity of the steam—more or less according to the nature of the contraction—and the like effect is produced by bends aud angles in the pipes. These should therefore be made as straight, and their internal surface as uniform and free from inequalities, as may be practicable. The following proportions of velocity, from Mr Tredgold, will exemplify this:—

The velocity of motion that would result from the direct unretarded action of the column of fluid which produces it, being unity	1000 or 8
The velocity through an aperture in a thin plate by the same pressure is	·625 or 5
Through a tube from two to three diameters in length, projecting outwards	·813 or 6·5
Through a tube of the same length, projecting inwards	·681 or 5·45
Through a conical tube, or mouth-piece, of the form of the contracted vein	·983 or 7·9

TABLE showing the Horses' Power of High-pressure Steam Engines, as rated by the principal makers of this city and vicinity.

Horses' power.	Diameter of cylinder in inches.	Length of stroke in feet.
4	7	1
5	6	1½
6	6½	2
8	7	2
10	7½	3
12	8½	3
15	9	3½
20	10	4
25	11	4
30	12	4
45	14	4
50	13	5
75	18	5
100	20	5

TABLE—Showing the weights, evaporative powers per weight, and bulk and character of fuels, from report of Profess. Walter R. Johnson, 1844

Designation of Fuel.	Specific gravity.	Weight per cubic foot.	Lbs. of steam from water at 212° by 1 *lb.* of fuel.	Lbs. of steam from water at 212° by 1 *cub. foot* of fuel.	Weight of Clinkers from 100 lbs. of coal,
BITUMINOUS.					
Cumberland, *maximum*	1.313	52.92	10.7	573.3	2.13
" *minimum*	1.337	54.29	9.44	532.3	4.53
Blossburgh	1.324	53.05	9.72	522.6	3.40
Midlothian, *screened*	1.283	45 72	8.94	438.4	3.33
" *average*	1.293	54.04	8.29	461.6	8.82
Newcastle	1.257	50.82	8.66	453.9	3.14
Pictou	1.318	49.25	8.41	478.7	6.13
Pittsburgh	1.252	46.81	8.20	384.1	.94
Sydney	1.338	47.44	7.99	386.1	2.25
Liverpool	1.262	47.88	7.84	411.2	1.86
Clover Hill	1.285	45.59	7.67	359.3	3.86
Cannelton, Ia.	1.273	47.65	7.34	360.	1.64
Scotch	1.519	51.09	6.95	369.1	5.63
ANTHRACITE.					
Peach Mountain	1.464	53.79	10.11	581.3	3.03
Forest Improvement	1.477	53.66	10.06	577.3	.81
Beaver Meadow, No. 5	1.554	56.19	9.88	572.9	.60
Lackawanna	1.421	48.89	9.79	393.	1.24
Beaver Meadow, No. 3	1.610	54.93	9.21	526.5	1.01
Lehigh	1.500	55.32	8.93	415.4	1.02
COKE.					
Natural Virginia	1.323	46.64	8.47	407.9	5.31
Midlothian	....	32.70	8.63	282.5	10.51
Cumberland	....	31.57	8.99	284.	3.55
WOOD.					
Dry Pine Wood	....	21.01	4.69	98.6	....

The above table exhibits the ultimate effects. As a safe estimate for practical values, a deduction (for the coals) of 14-100 should be made.

WEIGHT OF SUNDRY FUELS TO FORM A CUBIC FOOT OF WATER AT 52° INTO STEAM AT 220°.

	lbs.		lbs.
Newcastle coal	8.	Peat	30.5
Pine wood (dry)	20.2	Olive oil	5.9
Oak wood (dry)	12.	Coke	9.

TABLE—Showing the heating power of different substances.

Name.	Weight of water in lbs. heated 1° by 1 lb. of the combustible.	Lbs. of steam by 1 lb. of combustible, from 52° to 200°.	Name.	Weight of water in lbs. heated 1° by 1 lb. of the combustible.	Lbs. of steam by 1 lb. of combustible, from 52° to 220°.
Alcohol	11000		Pine, (seasoned).	5466	4.66
Olive oil	14500	12.	Coal, Newcastle	9230	7.90
Beeswax (yellow)	14000	11.	" Welsh	11840	10.1
Tallow	15000	12.	" Anthracite	9560	8.
Oak wood, (seasoned)	4600	3.90	" Cannel	9000	7.7
" (dried on a stove)	5000	5.12	Coke	9110	7.7
			Peat	3250	2.8

WATER.

A cubic foot weighs 1.000 ounces, or 62½ lbs. avoirdupois; a column 1 inch square and 1 foot high weighs 434028 lbs., or, in round numbers, ½ lb.

A cubic inch weighs .0361 of a lb., and at 212° has a force of 29.56 inches mercury.

The height of a column of water at 60°, equivalent to the pressure of......	1 lb. per square inch, is	2.30 feet,
	1 " " circular "	" 2.93 "
	1 inch of mercury,	" 1.129 "
	the atmosphere....	" 33.86 "

Salt Water.—A cubic foot of it weighs 64.3 lbs.; a cubic inch, .03721 lbs.

CAPACITY OF CISTERNS IN U. S. GALLONS.

For each 10 inches in Depth.

2	feet diameter	19.5	8 feet diameter	313.33
2½	"	30.6	8½ "	353.72
3	"	44.06	9 "	396 56
3½	"	59.97	9½ "	461.40
4	"	78.33	10 "	489.20
4½	"	99.14	11 "	592.40
5	"	122 40	12 "	705.
5½	"	148.10	13 "	827.4
6	"	176.25	14 "	959.6
6½	"	206.85	15 "	1101.6
7	"	239 88	20 "	1958.4
7½	"	275.40	25 "	3059.9

MISCELLANEOUS.

1 chaldron=36 bushels, or	57.25 cubic feet.
Dry gallon of New-York	276.48 cubic inches.
1 perch of stone	24.75 cubic feet.

DRAWING PAPER.

Cap	13 × 16 inches.	Columbier	33¾ × 23 inches.
Demy	19½ × 15½ "	Atlas	33 × 26 "
Medium	22 × 18 "	Theorem	34 × 28 "
Royal	24 × 19 "	Doub. Elephant	40 × 26 "
Super-Royal	27 × 19 "	Antiquarian	52 × 31 "
Imperial	29 × 21¼ "	Emperor	40 × 60 "
Elephant	27¾ × 22¼ "	Uncle Sam	48 × 120 "

DIGGING.

24 cubic feet of sand, or 18 cubic feet of earth, or 17 cubic feet of clay, make a ton.

HYDRAULIC CEMENT.

A barrel contains 300 lbs., equal to 4 struck bushels.

WEIGHT OF VARIOUS SUBSTANCES IN POUNDS AND DECIMALS.

ARTICLES.	Cubic foot in pounds.	Cubic inches in pounds.
Cast Iron	450.55	0.2607
Wrought Iron	486.65	0.2816
Steel	489.8	0.2834
Copper	555.	0.3212
Lead	708.75	0.4101
Brass	537.75	0.3112
Tin	456.	0.263
Gold, (22 carats fine)	1093.	0.633
Silver, pure, cast	654.6	0.379
Platina	1218.8	0.706
Zinc	429.	0.248
Mercury at 32° of heat	851.2	0.493
" at 212°	836.8	0.484
Sulphur	124.5	0.071
White Pine	29.56	0.0171
" Oak	58.2	0.033
Maple	47.	......
Elm	42.	......
Cedar	35.1	......
Ash	52.9	......
Beech	53.2	......
Lignumvitæ	83.4	......
Mahogany	66.5	......
Hickory	42.	......
Cork	15.	......
Ebony	83.2	......
American Granite—(mean of 9 varieties,)	167.66	......
" Sienite—(mean of 2 varieties,)	178.	......
Scotch Granite	164.1	......
Welsh "	166.4	......
Lime Stone, compact	175.	......
Slate	167.	......
Clay	135.	......
Brick	125.	......
Salt	133.1	......
Coal, Anthracite	50 to 55	......
" Bituminous	42 to 55	......
" Cumberland	53.	......
" Charcoal	18.5	......
Coke, (1 bushel=32 lbs.)	20.13	......
Hydraulic Cement, (Rosendale)	60.25	......
Staten Island Building Sand	78.50	......
Beach Gravel	99.25	......
Broken Stone, for Concrete	86.	......
Dock Mud, New-York Harbor	94.	......
Concrete	145.	......
Fresh Water	62.5	......
Salt Water, (Sea,)	64.3	......
Air	0.07529	......
Steam	0.03689	......

AREAS OF CIRCLES, from 1 to 50.

Diameter.	Area.	Diameter.	Area.	Diameter.	Area.	Diameter.	Area.
$\frac{1}{64}$	.00019	5.	19.635	12.	113.09	19.	283.59
$\frac{1}{32}$	.00076	$\frac{1}{8}$	20.629	$\frac{1}{8}$	115.46	$\frac{1}{8}$	287.27
$\frac{1}{16}$	.00306	$\frac{1}{4}$	21.647	$\frac{1}{4}$	117.85	$\frac{1}{4}$	291.03
$\frac{1}{8}$	.01227	$\frac{3}{8}$	22.690	$\frac{3}{8}$	120.27	$\frac{3}{8}$	294.83
$\frac{3}{16}$	.02761	$\frac{1}{2}$	23.758	$\frac{1}{2}$	122.71	$\frac{1}{2}$	298.64
$\frac{1}{4}$	.04908	$\frac{5}{8}$	24.850	$\frac{5}{8}$	125.18	$\frac{5}{8}$	302.48
$\frac{5}{16}$	.07669	$\frac{3}{4}$	25.967	$\frac{3}{4}$	127.67	$\frac{3}{4}$	306.35
$\frac{3}{8}$	.1104	$\frac{7}{8}$	27.108	$\frac{7}{8}$	130.19	$\frac{7}{8}$	310.24
$\frac{7}{16}$	.1503	6.	28.274	13.	132.73	20.	314.16
$\frac{1}{2}$	.1963	$\frac{1}{8}$	29.464	$\frac{1}{8}$	135.29	$\frac{1}{8}$	318.09
$\frac{9}{16}$	.2485	$\frac{1}{4}$	30.679	$\frac{1}{4}$	137.88	$\frac{1}{4}$	322.06
$\frac{5}{8}$	.3067	$\frac{3}{8}$	31.919	$\frac{3}{8}$	140.50	$\frac{3}{8}$	326.05
$\frac{11}{16}$	.3712	$\frac{1}{2}$	33.183	$\frac{1}{2}$	143.13	$\frac{1}{2}$	330.06
$\frac{3}{4}$	.4417	$\frac{5}{8}$	34.471	$\frac{5}{8}$	145.80	$\frac{5}{8}$	334.10
$\frac{13}{16}$	.5184	$\frac{3}{4}$	35.784	$\frac{3}{4}$	148.48	$\frac{3}{4}$	338.16
$\frac{7}{8}$	.6013	$\frac{7}{8}$	37.122	$\frac{7}{8}$	151.20	$\frac{7}{8}$	342.25
$\frac{15}{16}$	.6902	7.	38.484	14.	153.93	21.	346.36
1.	.7854	$\frac{1}{8}$	39.871	$\frac{1}{8}$	156.69	$\frac{1}{8}$	350.49
$\frac{1}{8}$	.9940	$\frac{1}{4}$	41.282	$\frac{1}{4}$	159.48	$\frac{1}{4}$	354.65
$\frac{1}{4}$	1.227	$\frac{3}{8}$	42.718	$\frac{3}{8}$	162.29	$\frac{3}{8}$	358.84
$\frac{3}{8}$	1.484	$\frac{1}{2}$	44.178	$\frac{1}{2}$	165.13	$\frac{1}{2}$	363.05
$\frac{1}{2}$	1.767	$\frac{5}{8}$	45.663	$\frac{5}{8}$	167.98	$\frac{5}{8}$	367.28
$\frac{5}{8}$	2.073	$\frac{3}{4}$	47.173	$\frac{3}{4}$	170.87	$\frac{3}{4}$	371.54
$\frac{3}{4}$	2.405	$\frac{7}{8}$	48.707	$\frac{7}{8}$	173.78	$\frac{7}{8}$	375.82
$\frac{7}{8}$	2.761	8.	50.265	15.	176.71	22.	380.13
2.	3.141	$\frac{1}{8}$	51.848	$\frac{1}{8}$	179.67	$\frac{1}{8}$	384.46
$\frac{1}{8}$	3.546	$\frac{1}{4}$	53.456	$\frac{1}{4}$	182.65	$\frac{1}{4}$	388.82
$\frac{1}{4}$	3.976	$\frac{3}{8}$	55.088	$\frac{3}{8}$	185.66	$\frac{3}{8}$	393.20
$\frac{3}{8}$	4.430	$\frac{1}{2}$	56.745	$\frac{1}{2}$	188.69	$\frac{1}{2}$	397.60
$\frac{1}{2}$	4.908	$\frac{5}{8}$	58.426	$\frac{5}{8}$	191.74	$\frac{5}{8}$	402.03
$\frac{5}{8}$	5.411	$\frac{3}{4}$	60.132	$\frac{3}{4}$	194.82	$\frac{3}{4}$	406.49
$\frac{3}{4}$	5.939	$\frac{7}{8}$	61.862	$\frac{7}{8}$	197.93	$\frac{7}{8}$	410.97
$\frac{7}{8}$	6.491	9.	63.617	16.	201.06	23.	415.47
3.	7.068	$\frac{1}{8}$	65.396	$\frac{1}{8}$	204.21	$\frac{1}{8}$	420.00
$\frac{1}{8}$	7.669	$\frac{1}{4}$	67.200	$\frac{1}{4}$	207.39	$\frac{1}{4}$	424.55
$\frac{1}{4}$	8.295	$\frac{3}{8}$	69.029	$\frac{3}{8}$	210.59	$\frac{3}{8}$	429.13
$\frac{3}{8}$	8.946	$\frac{1}{2}$	70.882	$\frac{1}{2}$	213.82	$\frac{1}{2}$	433.73
$\frac{1}{2}$	9.621	$\frac{5}{8}$	72.759	$\frac{5}{8}$	217.07	$\frac{5}{8}$	438.30
$\frac{5}{8}$	10.320	$\frac{3}{4}$	74.662	$\frac{3}{4}$	220.35	$\frac{3}{4}$	443.01
$\frac{3}{4}$	11.044	$\frac{7}{8}$	76.588	$\frac{7}{8}$	223.65	$\frac{7}{8}$	447.69
$\frac{7}{8}$	11.793	10.	78.539	17.	226.98	24.	452.39
4.	12.566	$\frac{1}{8}$	80.515	$\frac{1}{8}$	230.33	$\frac{1}{8}$	457.11
$\frac{1}{8}$	13.364	$\frac{1}{4}$	82.516	$\frac{1}{4}$	233.70	$\frac{1}{4}$	461.86
$\frac{1}{4}$	14.186	$\frac{3}{8}$	84.540	$\frac{3}{8}$	237.10	$\frac{3}{8}$	466.63
$\frac{3}{8}$	15.033	$\frac{1}{2}$	86.590	$\frac{1}{2}$	240.52	$\frac{1}{2}$	471.43
$\frac{1}{2}$	15.904	$\frac{5}{8}$	88.664	$\frac{5}{8}$	243.97	$\frac{5}{8}$	476.25
$\frac{5}{8}$	16.800	$\frac{3}{4}$	90.762	$\frac{3}{4}$	247.45	$\frac{3}{4}$	481.10
$\frac{3}{4}$	17.720	$\frac{7}{8}$	92.885	$\frac{7}{8}$	250.94	$\frac{7}{8}$	485.97
$\frac{7}{8}$	18.665	11.	95.033	18.	254.46	25.	490.87
		$\frac{1}{8}$	97.205	$\frac{1}{8}$	258.01	$\frac{1}{8}$	495.79
		$\frac{1}{4}$	99.402	$\frac{1}{4}$	261.58	$\frac{1}{4}$	500.74
		$\frac{3}{8}$	101.62	$\frac{3}{8}$	265.18	$\frac{3}{8}$	505.71
		$\frac{1}{2}$	103.86	$\frac{1}{2}$	268.80	$\frac{1}{2}$	510.70
		$\frac{5}{8}$	106.13	$\frac{5}{8}$	272.44	$\frac{5}{8}$	515.72
		$\frac{3}{4}$	108.43	$\frac{3}{4}$	276.11	$\frac{3}{4}$	520.70
		$\frac{7}{8}$	110.75	$\frac{7}{8}$	279.81	$\frac{7}{8}$	525.83

TABLE—(Continued.)

Diameter.	Area.	Diameter.	Area.	Diameter.	Area.	Diameter.	Area.
26.	530.93	33.	855.30	40.	1256.6	47.	1734.9
.⅛	536.04	.⅛	861.79	.⅛	1264.5	.⅛	1744.1
.¼	541.18	.¼	868.30	.¼	1272.3	.¼	1753.4
.⅜	546.35	.⅜	874.84	.⅜	1280.3	.⅜	1762.7
.½	551.54	.½	881.41	.½	1288.2	.½	1772.0
.⅝	556.76	.⅝	888.00	.⅝	1296.2	.⅝	1781.3
.¾	562.00	.¾	894.61	.¾	1304.2	.¾	1790.7
.⅞	567.26	.⅞	901.25	.⅞	1312.2	.⅞	1800.1
27.	572.55	34.	907.92	41.	1320.2	48.	1809.5
.⅛	577.87	.⅛	914.61	.⅛	1328.3	.⅛	1818.9
.¼	583.20	.¼	921.32	.¼	1336.4	.¼	1828.4
.⅜	588.57	.⅜	928.06	.⅜	1344.5	.⅜	1837.9
.½	593.95	.½	934.82	.½	1352.6	.½	1847.4
.⅝	599.37	.⅝	941.60	.⅝	1360.8	.⅝	1856.9
.¾	604.80	.¾	948.41	.¾	1369.0	.¾	1866.5
.⅞	610.26	.⅞	955.25	.⅞	1377.2	.⅞	1876.1
28.	615.75	35.	962.11	42.	1385.4	49.	1885.7
.⅛	621.26	.⅛	968.99	.⅛	1393.7	.⅛	1895.3
.¼	626.79	.¼	975.90	.¼	1401.9	.¼	1905.0
.⅜	632.35	.⅜	982.84	.⅜	1410.2	.⅜	1914.7
.½	637.94	.½	989.80	.½	1418.6	.½	1924.4
.⅝	643.54	.⅝	996.78	.⅝	1426.9	.⅝	1934.1
.¾	649.18	.¾	1003.7	.¾	1435.3	.¾	1943.9
.⅞	654.83	.⅞	1010.8	.⅞	1443.7	.⅞	1953.6
29.	660.52	36.	1017.8	43.	1452.2	50.	1963.5
.⅛	666.22	.⅛	1024.9	.⅛	1460.6	.⅛	1973.8
.¼	671.95	.¼	1032.0	.¼	1469.1	.¼	1983.1
.⅜	677.71	.⅜	1039.1	.⅜	1477.6	.⅜	1993.0
.½	683.49	.½	1046.3	.½	1486.1	.½	2002.9
.⅝	689.29	.⅝	1053.5	.⅝	1494.7	.⅝	2012.8
.¾	695.12	.¾	1060.7	.¾	1503.3	.¾	2022.8
.⅞	700.98	.⅞	1067.9	.⅞	1511.9	.⅞	2032.8
30.	706.86	37.	1075.2	44.	1520.5	51.	2042.8
.⅛	712.76	.⅛	1082.4	.⅛	1529.1	.⅛	2052.8
.¼	718.69	.¼	1089.7	.¼	1537.8	.¼	2062.9
.⅜	724.64	.⅜	1097.1	.⅜	1546.5	.⅜	2072.9
.½	730.61	.½	1104.4	.½	1555.2	.½	2083.0
.⅝	736.61	.⅝	1111.8	.⅝	1564.0	.⅝	2093.2
.¾	742.64	.¾	1119.2	.¾	1572.8	.¾	2103.3
.⅞	748.69	.⅞	1126.6	.⅞	1581.6	.⅞	2113.5
31.	754.76	38.	1134.1	45.	1590.4	52.	2123.7
.⅛	760.86	.⅛	1141.5	.⅛	1599.2	.⅛	2133.9
.¼	766.99	.¼	1149.0	.¼	1608.1	.¼	2144.1
.⅜	773.14	.⅜	1156.6	.⅜	1617.0	.⅜	2154.4
.½	779.31	.½	1164.1	.½	1625.9	.½	2164.7
.⅝	785.51	.⅝	1171.7	.⅝	1634.9	.⅝	2175.0
.¾	791.73	.¾	1179.3	.¾	1643.8	.¾	2185.4
.⅞	797.97	.⅞	1186.9	.⅞	1652.8	.⅞	2195.7
32.	804.24	39.	1194.5	46.	1661.9	53.	2206.1
.⅛	810.54	.⅛	1202.2	.⅛	1670.9	.⅛	2216.6
.¼	816.86	.¼	1209.9	.¼	1680.0	.¼	2227.0
.⅜	823.21	.⅜	1217.6	.⅜	1689.1	.⅜	2237.5
.½	829.57	.½	1225.4	.½	1698.2	.½	2248.0
.⅝	835.97	.⅝	1233.1	.⅝	1707.3	.⅝	2258.5
.¾	842.39	.¾	1240.9	.¾	1716.5	.¾	2269.0
.⅞	748.83	.⅞	1248.7	.⅞	1725.7	.⅞	2279.6

PRICE LIST.

WALWORTH, NASON & GUILD,

WELDED WROUGHT IRON PIPE,

AND FIXTURES FOR STEAM, GAS, WATER, &c.,

No. 79 John-Street, New-York.

GAS APPARATUS erected, for lighting Mills, Churches, Hotels, and other Public Buildings, on an Improved Plan.

STEAM AND HOT-WATER APPARATUS constructed, for Warming and Ventilating Buildings.

STEAM BOILERS, BOILER FLUES, &c., ALWAYS ON HAND.

INTERNAL DIAMETER OF PIPE AND FITTINGS.	In. 3½	In. 3	In. 2½	In. 2	In. 1½	In. 1¼	In. 1	In. ¾	In. ½	In. ⅜	In. ¼	In. ⅛
Wrought Iron Pipe,	145	123	84	44	25	20	13	10	9	8	7	6
No. 1. Wrought Iron Bends,				100	70	45	30	24	15	12	10	
2. Elbow,	175	150	110	75	55	40	28	18	15	12	10	
3. Coupling,	100	88	63	40	25	20	13	10	9	8	7	
4. Return Bend,					60	45	35	25	20	20	20	
5. Tee,	225	180	150	85	65	50	35	25	20	18	15	
6. Cross,	250	225	190	110	80	60	45	33	28	23	20	
7. Cap,	100	88	63	40	25	20	13	10	9	8	7	7
8. Nipple,	100	88	63	40	25	20	13	10	9	8	7	
Bushing,	100	88	63	40	25	20	13	10	9	8	7	7
9. Plug,	100	88	63	40	25	20	13	10	9	8	7	7
10. Locknut,	100	88	63	40	25	20	13	10	9	8	7	7
11. Reducing Coupling,	100	88	63	40	25	20	13	10	9	8	7	7
12. Flange,	100	90	75	40	30	25	20	15	13	12	10	10
13. Iron Union,	450	350	250	150	125	90	70	50	37	33	25	25
14. Iron Cock,				500	300	225	150	100	80	65	55	
15. 6 Branch Tee,							140	125				
5 "							125	100				
4 "							110	90				
3 "							85	75				
2 "							80	60				
16. 6 Hook Plates,							30	20				
5 "							25	17				
4 "							20	14				
3 "							15	10				
2 "							10	7				
18. Corner Plate, (same as Hook Plates.)												
20. Stand Hook, do. do.												
21. Globe Valve, 6 in. $40 00, 5 in. $33 00, 4 in. $30 00	2500	1600	1200	800	500	400	300	200	150	125	100	40
22. Angle Valve,				800	500	400	300	200	150	125	100	40
23. Three-way Valve,				850	550	425	300	200	150	125	100	40

INTERNAL DIAMETER OF PIPE AND FITTINGS.	*In.* 3	*In.* $2\frac{1}{2}$	*In.* 2	*In.* $1\frac{1}{2}$	*In.* $1\frac{1}{4}$	*In.* 1	*In* $\frac{3}{4}$	*In.* $\frac{1}{2}$	*In.* $\frac{3}{8}$	*In.* $\frac{1}{4}$
No. 24. Steam Cock, ...			700	450	350	275	175	125	100	75
25. Gas "			600	375	300	225	150	100		
26. Soldering Nipple, ...	200	150	75	50	40	30	25	20	17	16
27. Soldering Union, ...			150	125	100	62	50	38	31	
28. Two-way Check Valve, ..			650	500	450	375	200	150	125	
29. Check Valve, in line, ...			400	300	200	150	125	100	75	
30. Angle Check Valve, ...			600	450	350	275	175	125	100	
31. Flanged Steam Cock, (add weight of Flanges, 35 cts. per lb.)										
32. Globe Service Cock, ...							175	125		
33. Wheel Gauge Cock, ...							250			
34. Gauge Cock, ...							200			
35. Gauge Cock, ...						300	200	100	75	
36. Gauge Cock, ...								115		
37. Oil Cup, } Great variety of										
38. Oil Cup, } sizes and prices,										38
39. Wash-tub Plug, ...										
40. Brass Union, ...						88	63	50	50	18
Safety Valve, ...		1200	900	550	425	325	300			25
41. Flanged Elbow, ...							40	35	35	
42. Flanged Tee, ...						45	40	35	35	
43. Globe Check Valve, ...			500	400	300	225	175	125		
44. Pendant Centre, ...75 cts.										
45. Burner Elbow Cock, 50 "										
46. Burner Elbow, ... 12½ "										90
47. Swing Cock, ... 75 "										75
48. Air Cock, ⅛ in. 40 cts.										
Taps, ...each			300	250	200	175	150	125	100	60
Dies, ... per pair,			175	160	150	130	120	110	85	
Screw Plates, ... $23; $15; $12										
Pipe Tongs, ...	350	275	225	175	130	110	90	75	60	
Plyers, ...										
Force Pump, ...	3500	2500	1500							
Double Pendant, ...$2 50										
Single " $1 50										
Two-fold Bracket, ...$1 50										
Single " $1 00										
Swing Joint, ...								63	63	50
Argand Burner, ...$1 00										
Bat-wing and Fish-tail Burners, 12½ cts.; $10 00 per gross.										
Steam Whistle, ...										
Cast Iron Pipe (Socket,)										
" " (Flange,)										
Leather Belting, ...										
Rubber "										