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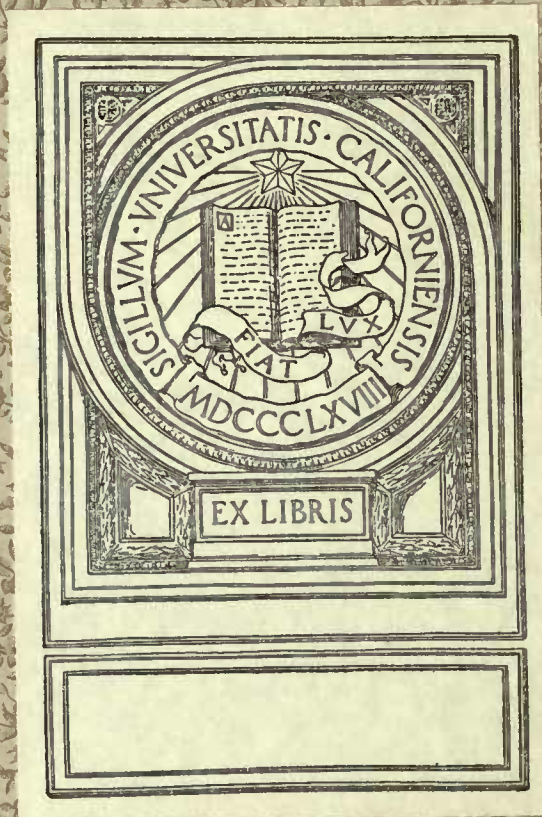
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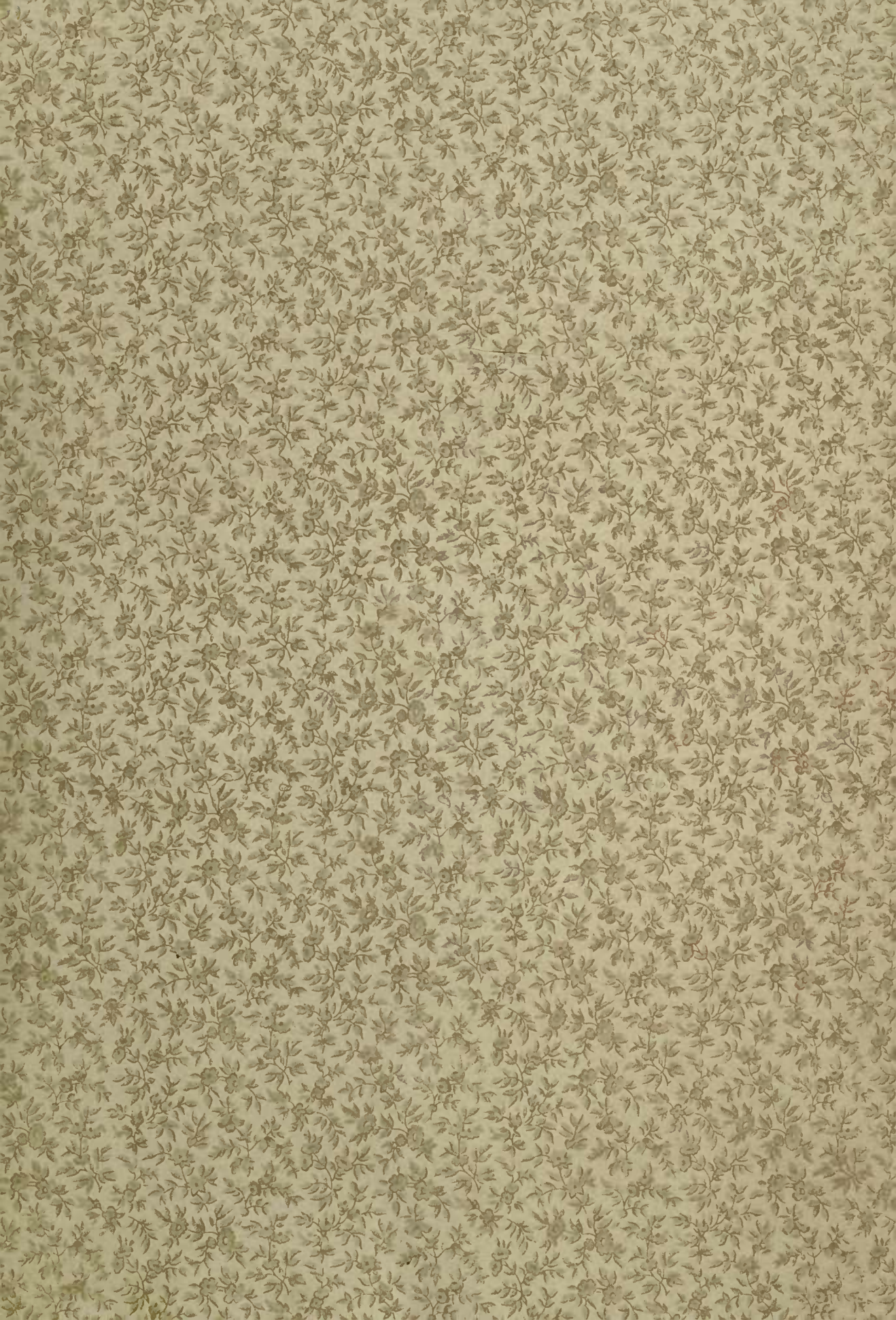


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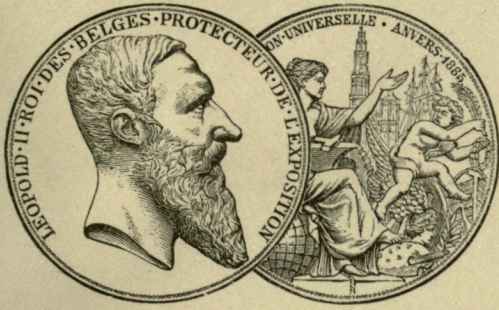
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FRED. BRENNEL, C. E.,
MILWAUKEE AND NEW YORK.

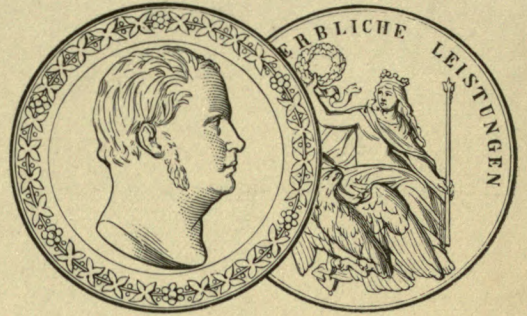




ANTWERP, 1885.
GOLD AND SILVER MEDALS.



DUESSELDORF, 1880.
GOVERNMENT MEDAL.



FRED. BREDEL, C. E.,
GAS ENGINEER AND CONTRACTOR.

MAIN OFFICE—

MILWAUKEE, WIS.,
118 Farwell Ave. P. O. Box 235. Tel. 1506.

BRANCH OFFICE—

NEW YORK, N. Y.,
JULIUS BUSS, Manager, 22 Beaver Street.

DURING my thirteen years' experience in the manufacture of coal and water gas, and heating furnaces for metallurgical processes, I have become acquainted with almost all systems, which enables me to select the best and most suitable apparatus and fireclay material for the purpose and conditions.

The success of Mr. Kloenne's and my apparatus is due to the most careful adherence to theoretical calculations as well as to long practical experience.

Having in my employ a large staff of engineers and firemen, I am enabled to furnish competent men to superintend the erection and starting of any work done by me.

I herewith present this catalogue to the gas fraternity.

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RETORT HOUSES

..... AND

RETORT BENCHES.

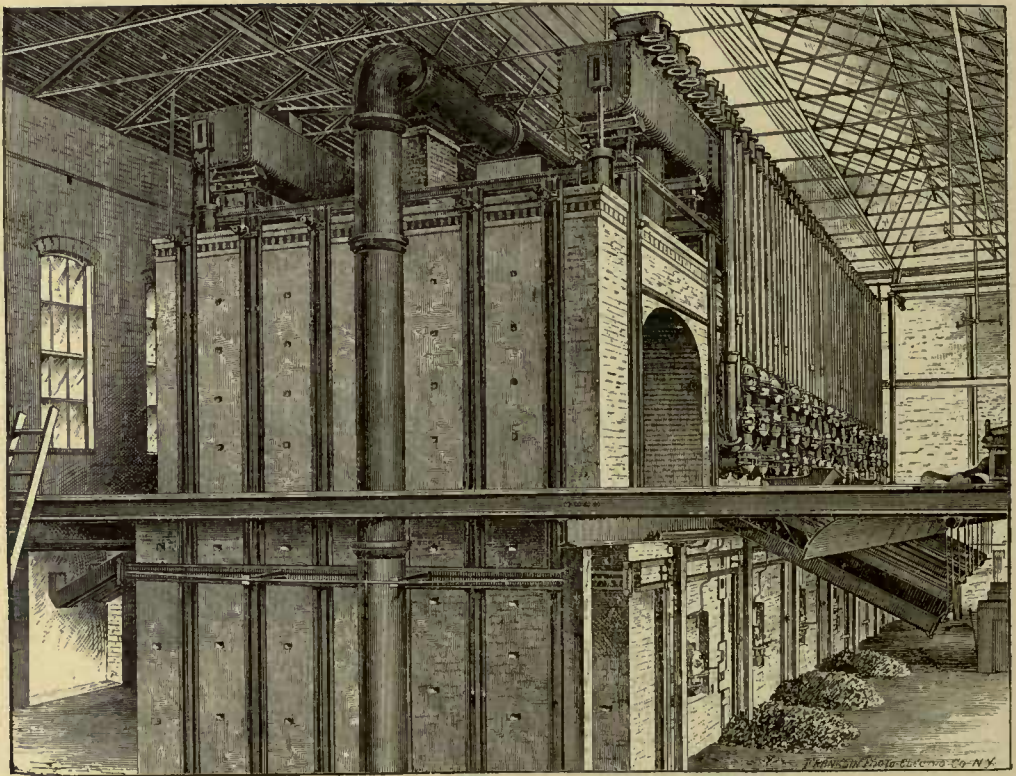
RECUPERATIVE FURNACES, - "KLOENNE-BREDEL SYSTEM."

Patented February 21, 1888.

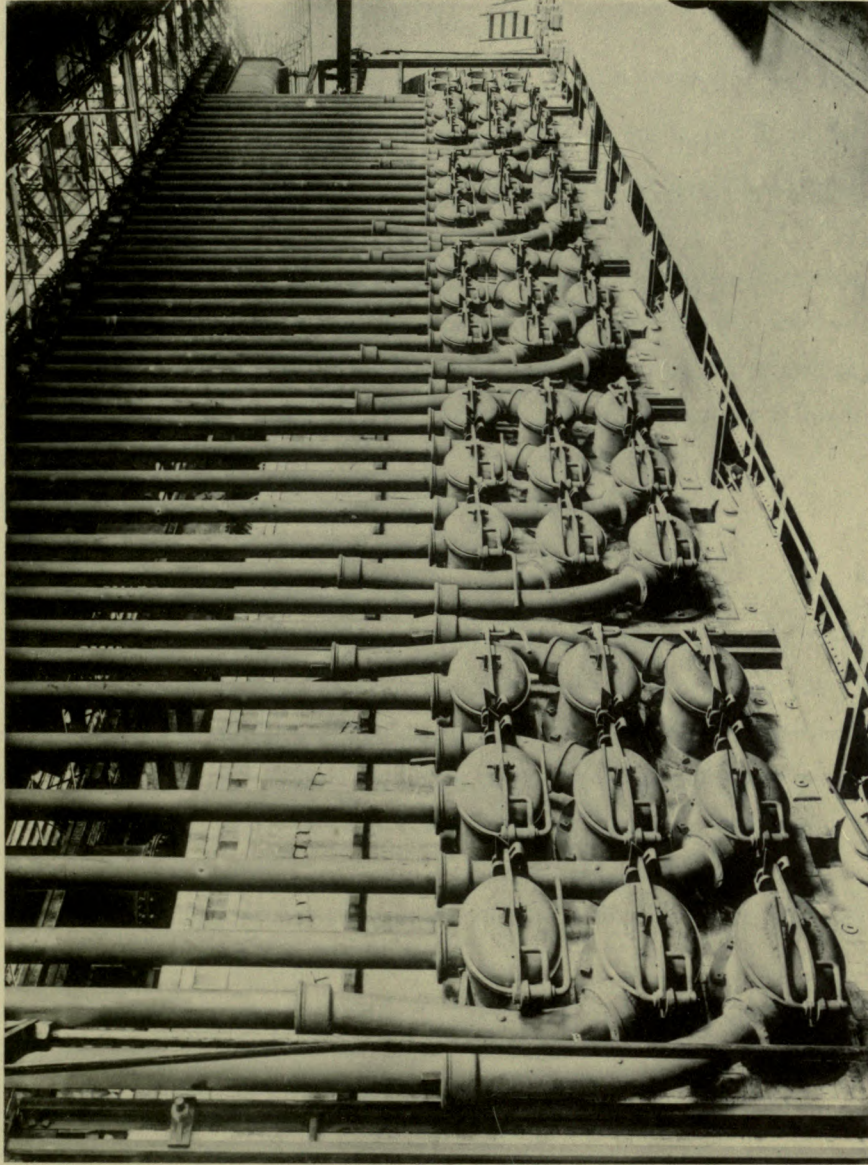
INCLINED RETORT BENCHES, - - "BREDEL SYSTEM."

Patented November 18, 1890, June 23, 1891.

M322879



12 Benches of 9 Retorts each, "Kloenne-Bredel" System.



ERECTED FOR THE MILWAUKEE GAS LIGHT CO.

1886.

Of all recuperative furnaces for heating retorts there is at the present time no other recuperative furnace constructed that will equal the Kloenne-Bredel furnace.

First, in the small amount of coke consumed for fuel, which varies from 15 to 18 per cent. of coke made, or from 10 to 12 lbs. coke per 100 lbs. coal for benches of 9's; and 18 to 22 per cent. of coke made, or from 12 to 14 lbs. coke per 100 lbs. coal carbonized for benches of 6's.

Second, in the yield of gas per mouthpiece, which is from 9,500 to 12,000 ft. per retort of 9 ft. clear.

Third, in the yield per pound of coal, which is from 5.00 to 5.20 cu. ft. per lb. of best gas coal.

Fourth, in the life of retorts, which produce from 7,000,000 to 10,000,000 ft. before replacing becomes necessary.

A construction which has lately become very popular, is my recuperative furnace with *clinkering doors* in the rear and filling doors in front, whereby the *expensive stage floor is done away with*, at the same time facilitating the clinkering and filling of the furnaces and the regulation of the primary and secondary air supply. Such benches have been executed with four, six and eight retorts at the following gas works, which are given as references:

Fort Worth Light & Power Co., Fort Worth, Texas.

San Jose Light & Power Co., San Jose, Cal.

Morristown Gas Light Co., Morristown, N. J.

When using *slack coal* for fuel the consumption for benches of 9's is 14 lbs. per 100 lbs. coal carbonized. Such benches were erected by me as early as 1883 for the Railroad Gas Works, Lyons, France.

Another great advantage is the stability of the construction of the generator and recuperator, which will last *ten years and more without any repair whatever*, except a relining of the generator, which becomes necessary about every two or three years, and requires only a few hundred fire brick, which can be done at an outlay of from \$20.00 to \$30.00.

The numerous *second orders* obtained in this country, of which the following is a partial list, will prove the *superiority of my benches*:

Milwaukee Gas Light Co.	- - - - -	1st order	108 retorts.
Milwaukee Gas Light Co.	- - - - -	2d order	90 retorts.
Milwaukee Gas Light Co.	- - - - -	3d order	36 retorts.*
Newark Gas Light Co.	- - - - -	1st order	54 retorts.
Newark Gas Light Co.	- - - - -	2d, 3d and 4th order	60 retorts.
Newark Gas Light Co.	- - - - -	5th order	32 retorts.*
Cleveland Gas Light & Coke Co.	- - - - -	1st order	72 retorts.
Cleveland Gas Light & Coke Co.	- - - - -	2d order	72 retorts.
Galveston Gas Co.	- - - - -	1st order	6 retorts.
Galveston Gas Co.	- - - - -	2d order	18 retorts.

The by-following is a partial list of the benches constructed since 1885 by me of the Kloenne-Bredel system in the United States and Canada :

		BENCHES OF 9's.			
Newark Gas Light Co.	- - - - -	6 benches	=	54	retorts.
Chicago Gas Light & Coke Co.	- - - - -	8 "	=	72	"
Minneapolis Gas Light Co.	- - - - -	8 "	=	72	"
Milwaukee Gas Light Co., 1886	- - - - -	12 "	=	108	"
Milwaukee Gas Light Co., 1888	- - - - -	10 "	=	90	"
Philadelphiia Gas Works	- - - - -	22 "	=	198	"
Consumers' Gas Co., Toronto	- - - - -	12 "	=	108	"
Nassau Gas Co., Brooklyn E. D.	- - - - -	14 "	=	126	"
Brooklyn Gas Light Co.	- - - - -	10 "	=	90	"
Cleveland Gas Light & Coke Co., 1889	- - - - -	8 "	=	72	"
Cleveland Gas Light & Coke Co., 1891	- - - - -	8 "	=	72	"
Dayton Gas Light & Coke Co.	- - - - -	6 "	=	54	"
Los Angeles Lighting Co.	- - - - -	4 "	=	36	"
St. Paul Gas Light Co.	- - - - -	10 "	=	90	"
People's Gas Light Co., Cleveland	- - - - -	10 "	=	90	"
Total				<hr/> 1332 retorts.	

		BENCHES OF 8's.			
Fort Worth Light & Power Co.	- - - - -	2 benches	=	16	retorts.
		DOUBLE BENCHES OF 6's.			
Newark Gas Light Co.	- - - - -	1 bench	=	12	retorts.
Newark Gas Light Co.	- - - - -	2 "	=	24	" *
Milwaukee Gas Light Co.	- - - - -	3 "	=	36	" *
New Orleans Gas Light Co.	- - - - -	1 "	=	12	" *
Total				<hr/> 84 retorts.	

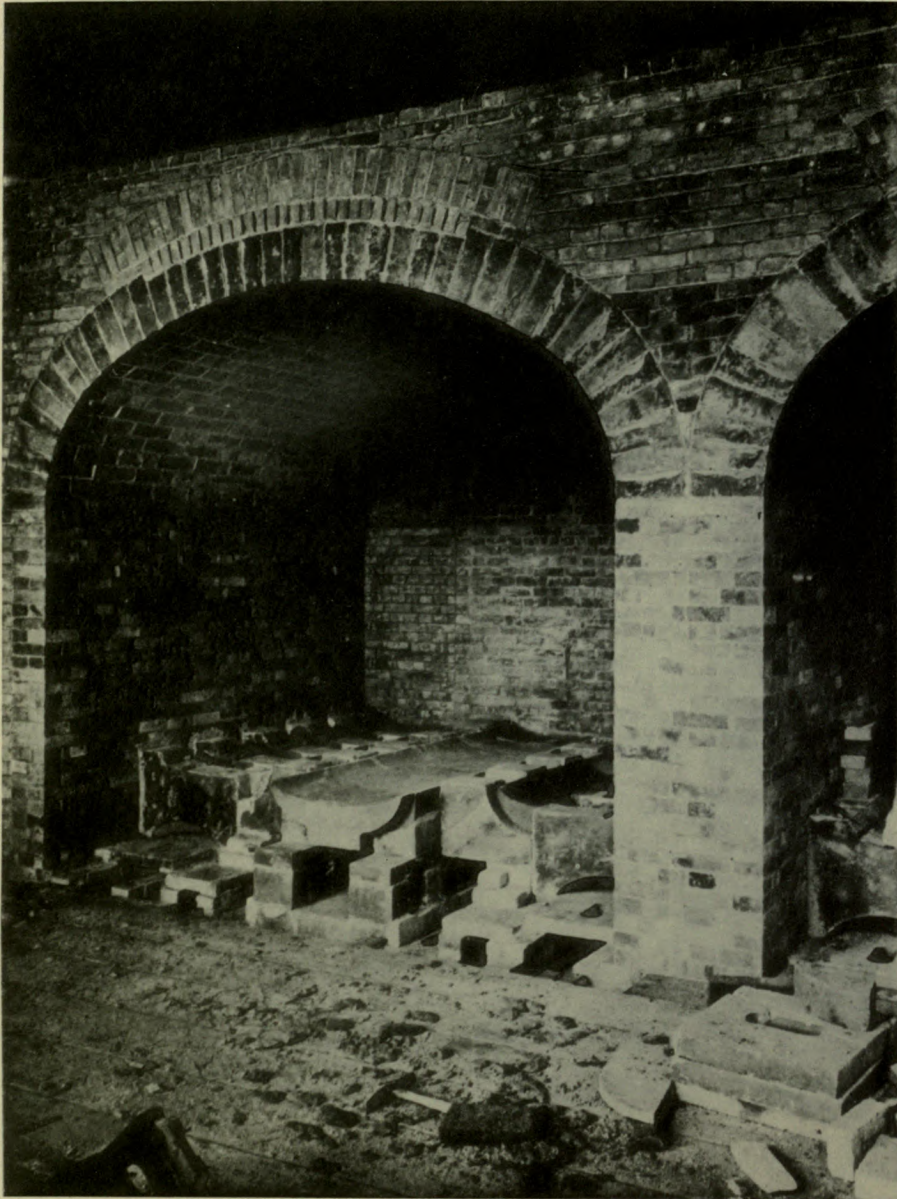
		BENCHES OF 6's.			
Newark Gas Light Co.	- - - - -	8 benches	=	48	retorts.
San Jose Light & Power Co.	- - - - -	4 "	=	24	"
San Francisco Gas Light Co.	- - - - -	2 "	=	12	"
Galveston Gas and Power Co.	- - - - -	4 "	=	24	"
Fort Worth Light Co.	- - - - -	2 "	=	12	"
Central Gas Light Co., New York.	- - - - -	1 "	=	6	"
Morristown Gas Light Co.	- - - - -	2 "	=	12	"
Total				<hr/> 138 retorts.	

		BENCHES OF 4's.			
Newark Gas Light Co.	- - - - -	1 double bench	=	8	retorts. *
Morristown Gas Light Co.	- - - - -	1 bench	=	4	"
Total				<hr/> 12 retorts.	

Grand total, 1582 retorts, having a capacity of over 20,000,000 cu. ft. of gas per 24 hours, including water gas benches.

N. B. The benches marked * are for Water Gas Plants.

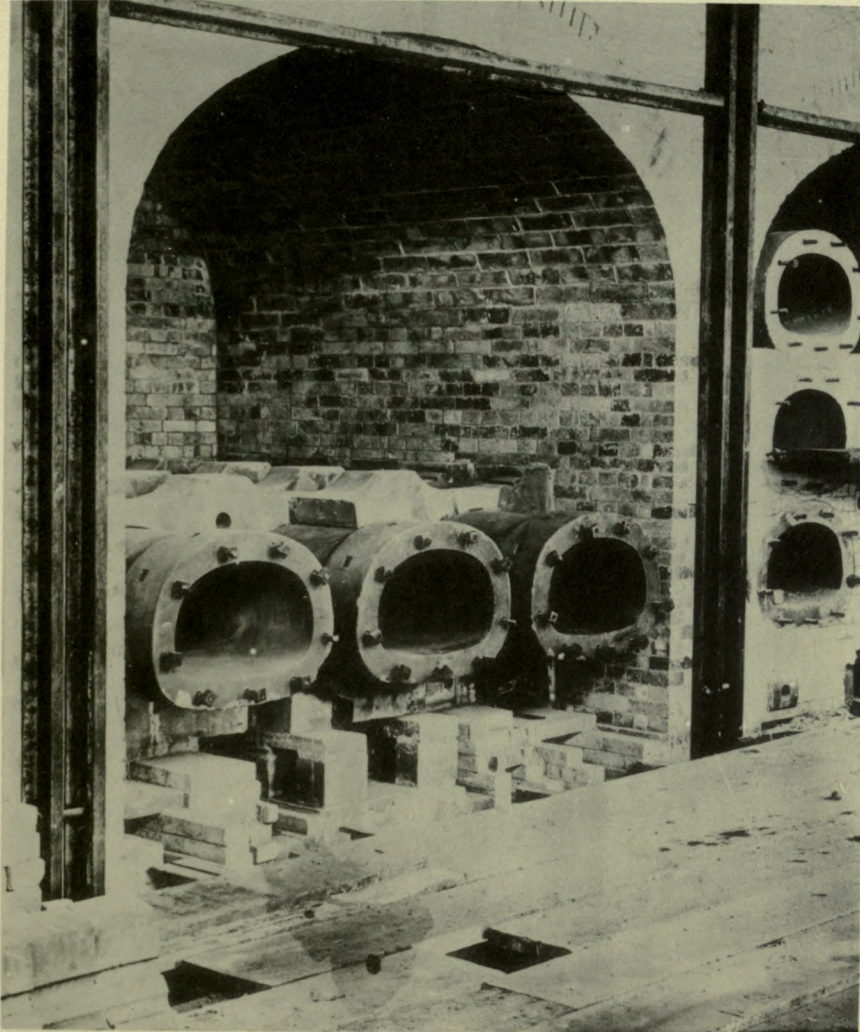
4 Benches of 9 Retorts each, "Kloenne-Bredel" System.



IN COURSE OF ERECTION FOR LOS ANGELES LIGHTING CO.

1890.

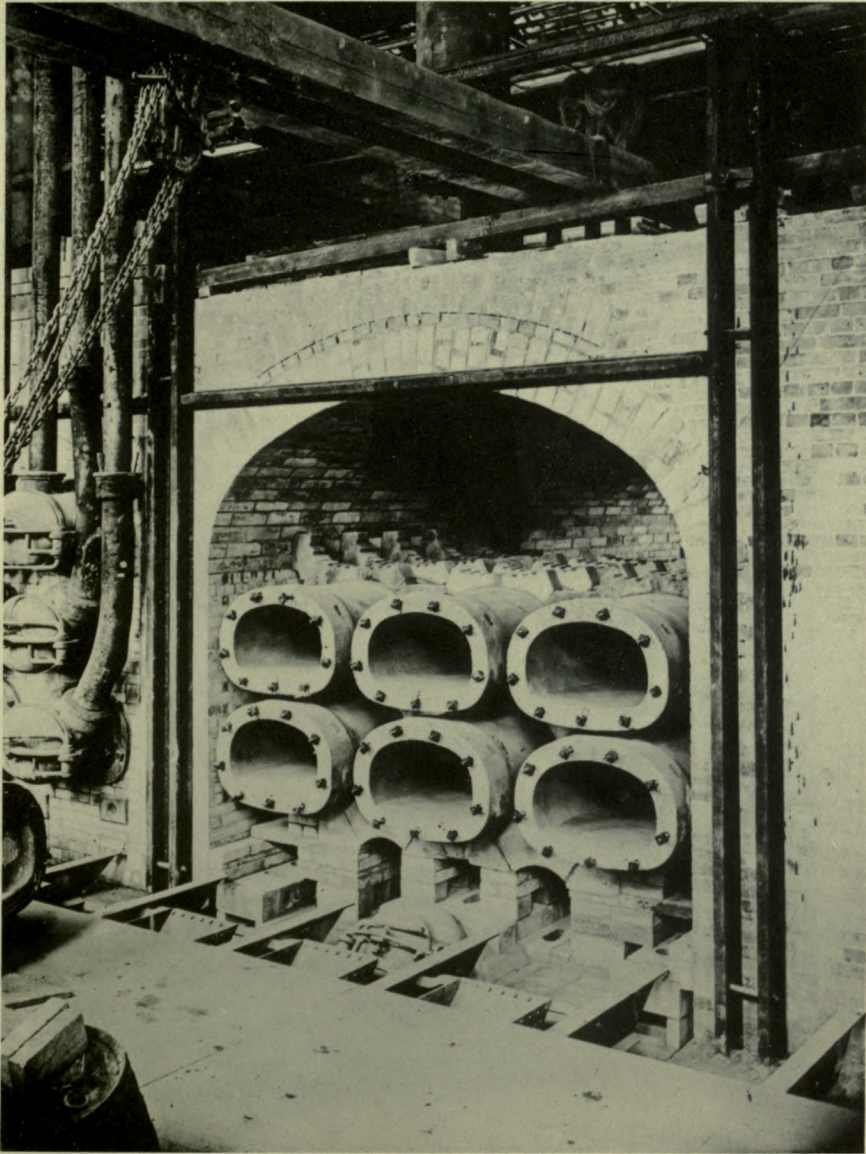
10 Benches of 9 Retorts each, "Kloenne-Bredel" System.



IN COURSE OF ERECTION FOR DAYTON GAS LIGHT AND COKE CO.

1890.

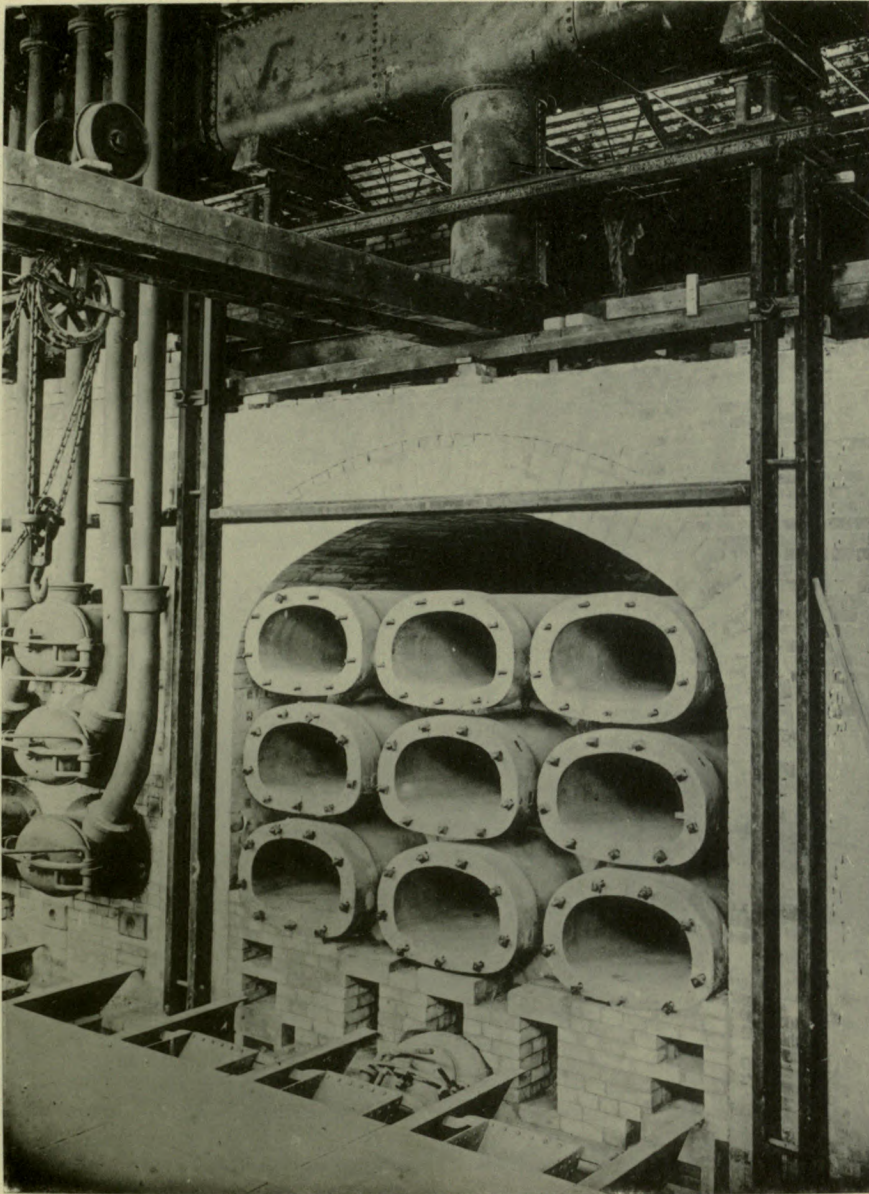
12 Benches of 9 Retorts each, "Kloenne-Bredel" System.



IN COURSE OF ERECTION FOR MILWAUKEE GAS LIGHT CO.

1886.

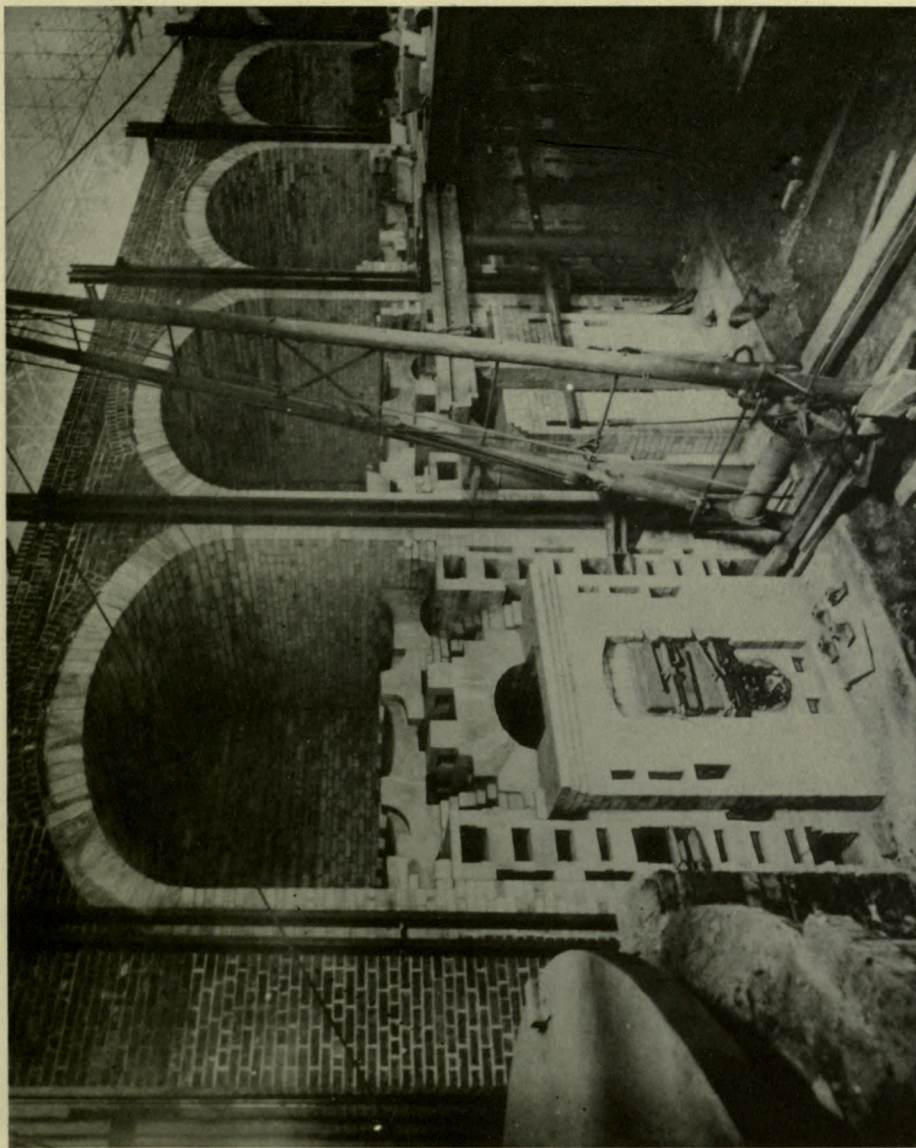
12 Benches of 9 Retorts each, "Kloenne-Bredel" System.



IN COURSE OF ERECTION FOR MILWAUKEE GAS LIGHT CO.

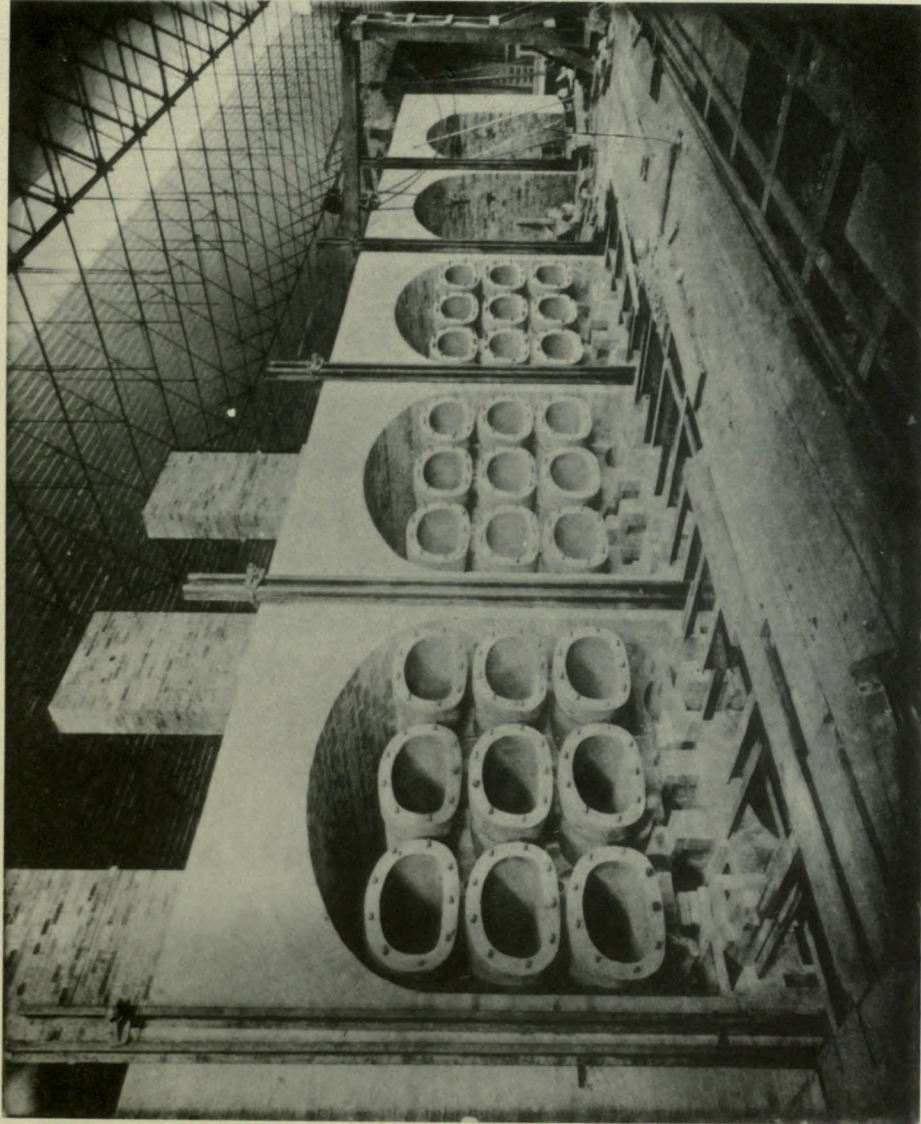
1886.

10 Benches of 9 Retorts each, "Kloenne-Bredel" System.



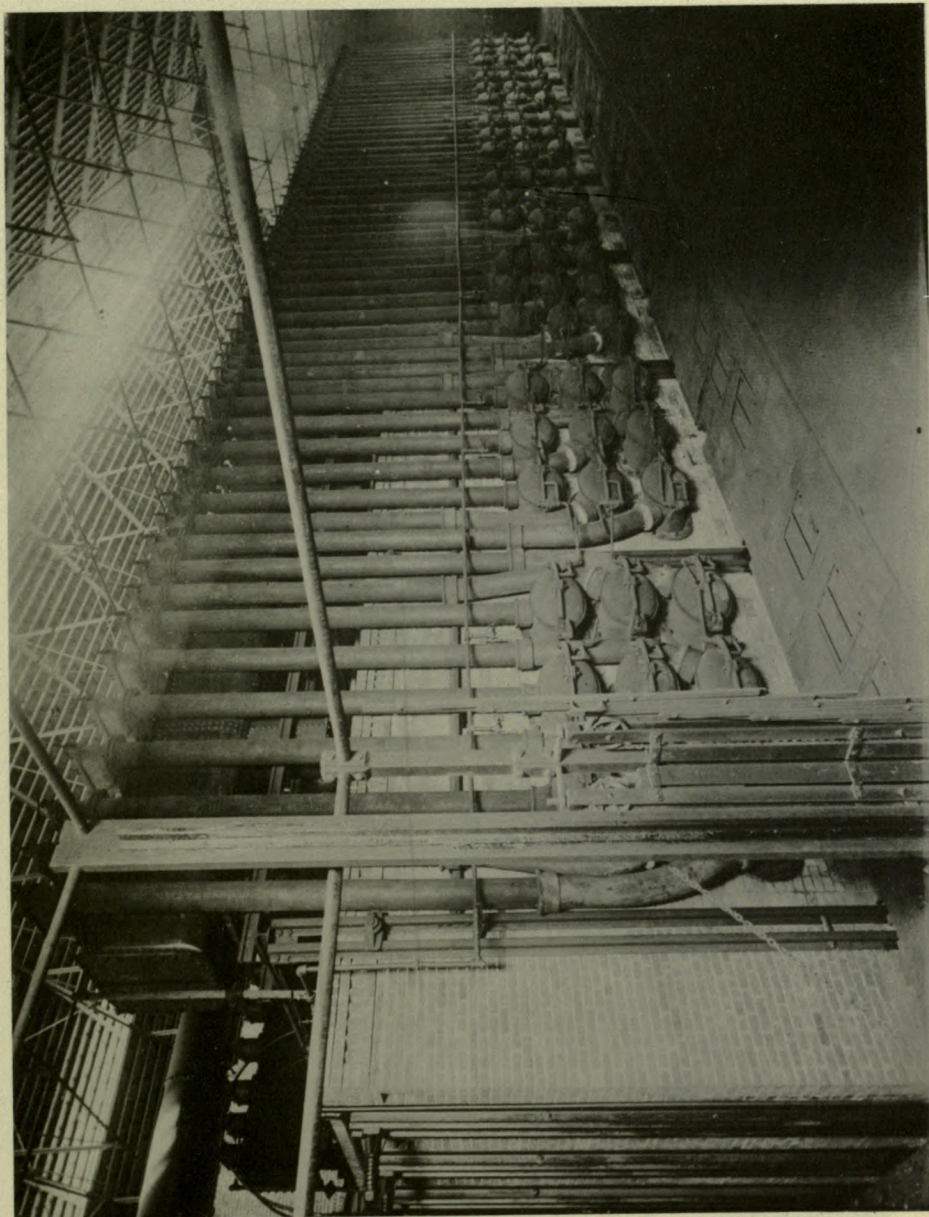
In Course of Erection.
SHOWING GENERATOR AND RECUPERATOR CONSTRUCTION.

10 Benches of 9 Retorts each, "Kloenne-Bredel" System.



IN COURSE OF ERECTION FOR MILWAUKEE GAS LIGHT CO.
1888.

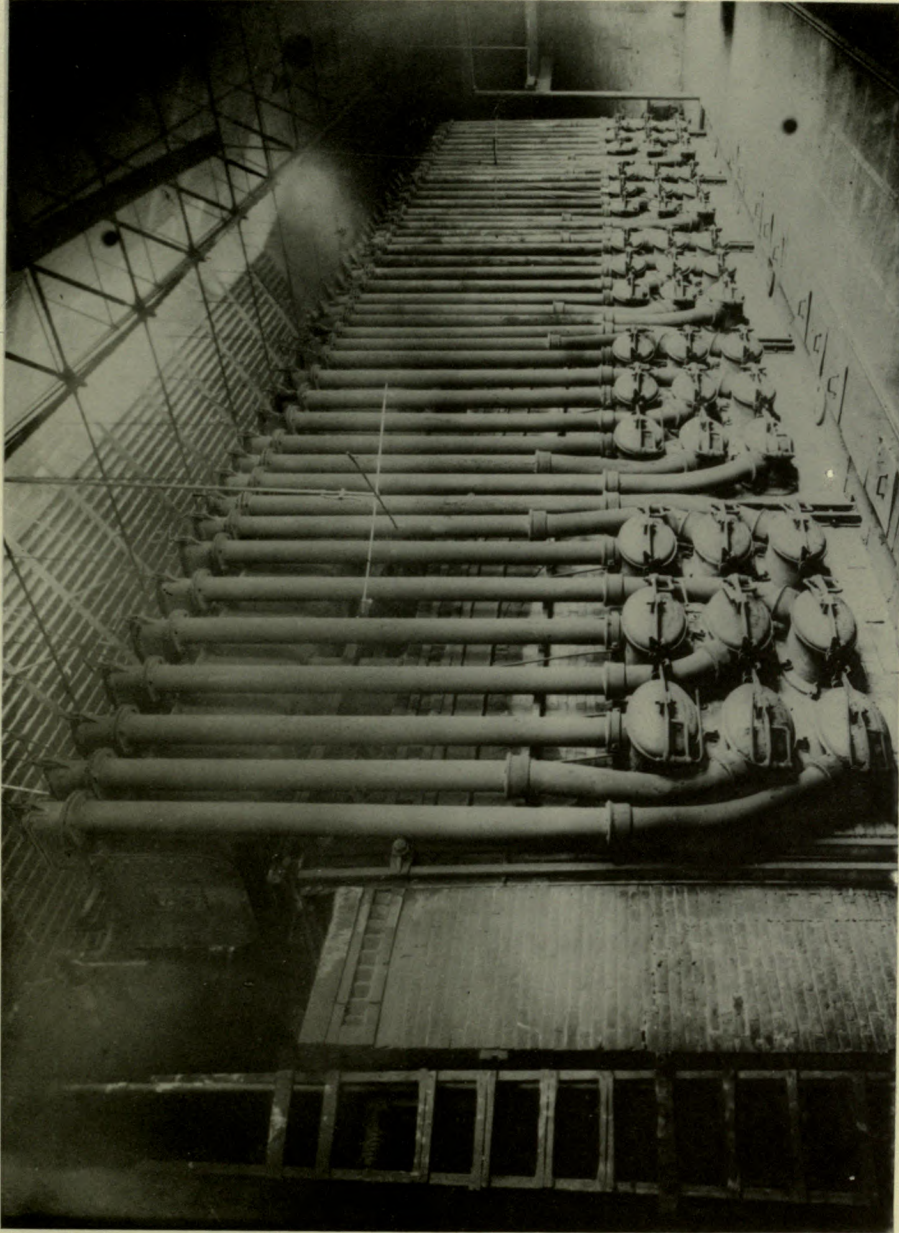
14 Benches of 9 Retorts each, "Kloenne-Bredel" System.



ERECTED FOR THE NASSAU GAS LIGHT CO., BROOKLYN, E. D.

1888.

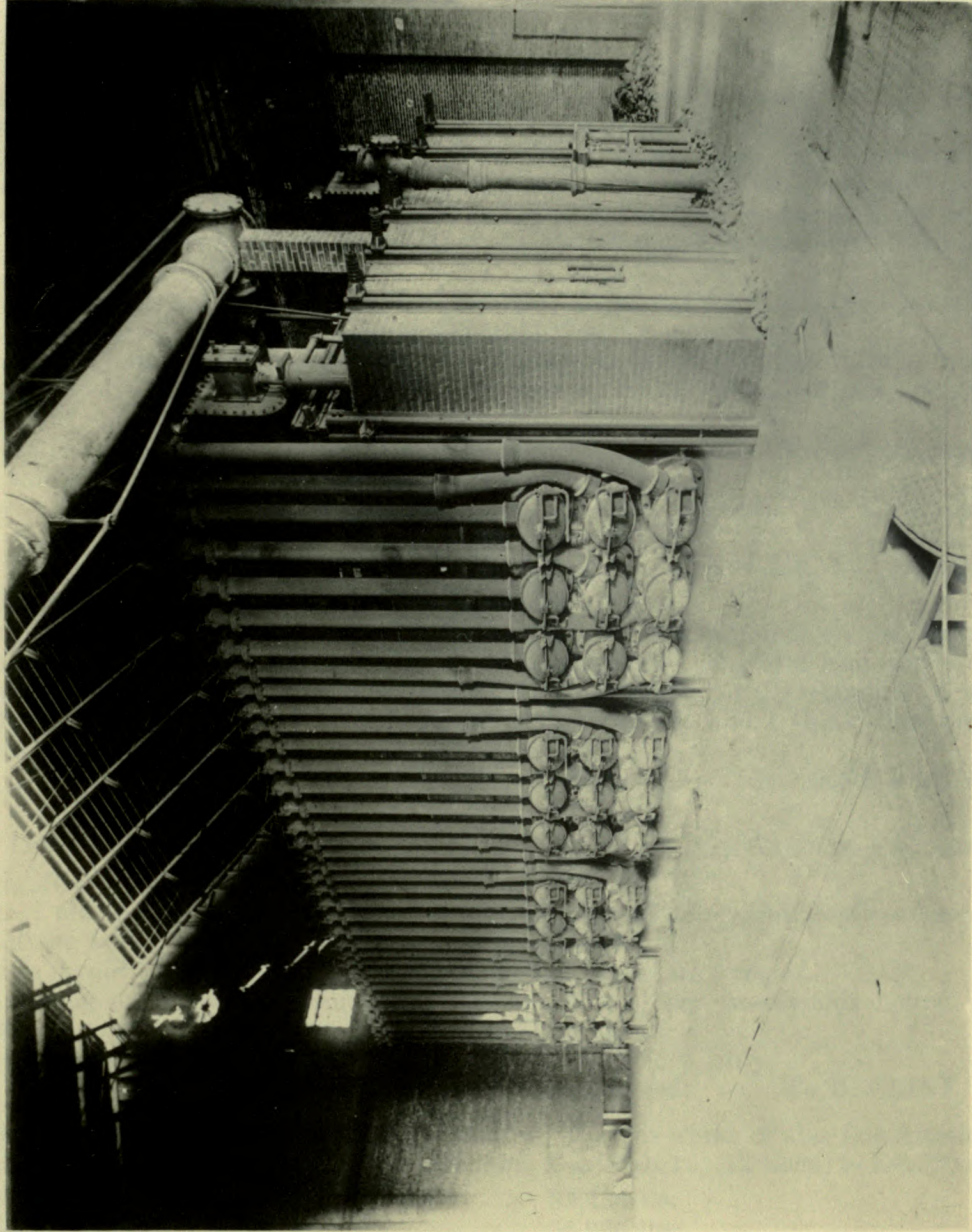
10 Benches of 9 Retorts each, "Kloenne-Bredel" System.



ERECTED FOR THE MILWAUKEE GAS LIGHT CO.

1888.

8 Benches of 9 Retorts each, "Kloenne-Bredel" System.



ERECTED FOR THE CLEVELAND GAS LIGHT CO.

1889.

RESULTS AND TESTIMONIALS OF BENCHES OF 9 RETORTS.

ENGINEER'S OFFICE, MILWAUKEE GAS LIGHT CO.

MILWAUKEE, Wis., Jan. 26th, 1887.

Fred. Bredel, C. E.

DEAR SIR: Upon your request for a testimonial for publication, I am pleased to send you the following, as I consider it deserved, for the way in which your contract was carried out with us.

I would say to any in the profession that among all the plans of benches presented to me from which to select, I chose the "Kloenne" for several reasons. I consider it *perfect in principle*, that at all times it would be under *absolute control*, and also that *each block in the recuperation could be easily seen and repaired if necessary*.

Your work upon our benches was done as good as it possibly could have been by any one, and such has been the opinion of the several visitors during the progress of the work and since its completion, without exception.

We have been running the furnaces since October 6th, and as yet have observed no cracked or sagged retorts. Every part of the work appears as perfect as when set.

Although the first month was used up in experimenting and learning how to run the furnaces, and since that time we have experienced very cold weather, yet we are *selling 26 bushels* of coke per net ton of coal used (40 lbs. per bushel.)

The consumption of coke in the furnaces does not exceed 20 per cent. at the present season, and for the year I am sure will be materially less.

Yours truly,

(Signed)

E. G. COWDERY.

OFFICE OF NEWARK GAS LIGHT CO.

NEWARK, N. J., Jan. 28th, 1887.

Mr. Frederick Bredel, Gen. Agt. Kloenne Regenerating Furnaces.

DEAR SIR: The Kloenne furnaces erected by you have been in continuous use for more than a year, and continue to give us satisfactory results. We are carbonizing 1800 pounds of coal per retort in 24 hours, and the average fuel consumption for this much has been *16.8 per cent.*, or 100 pounds of coal have been carbonized by *11.25 pounds* of hot coke. We have not lost a retort yet, and I think that those in use will give us six months more service.

Very truly,

(Signed)

EUGENE VANDERPOOL.

OFFICE OF LOS ANGELES LIGHTING CO.

LOS ANGELES, CAL., May 5th, 1891.

Mr. Fred. Bredel, Milwaukee, Wis.

DEAR SIR: I take pleasure in stating that the four benches of nine's, full depth recuperation furnaces, erected by you at our works, were completed to *our entire satisfaction*.

The materials furnished and the workmanship were *first class in every respect*.

We are now using one bench, carbonizing *18,000 lbs.* of coal per twenty-four hours. Our heats are excellent, and we use as fuel about *eighteen per cent.* of the coke made.

Wishing you the success that you deserve, I remain,

Very truly,

(Signed)

W. B. CLINE, President.

Test of KLOENNE-BREDEL No. 1, nine retorts, made at the gas works of the Los Angeles Lighting Co. Erected by Fred. Bredel, C. E. Five days' continuous test. Date Feb. 15, (12 noon) to Feb. 20 (12 noon) 1891.

Total coal charged,	- - - - -	89,463 lbs.
Total coke made,	- - - - -	58,956 lbs.
Total coke left for sale,	- - - - -	48,619 lbs.
Total coke used for fuel,	- - - - -	10,337 lbs.
Coke used for fuel per	- - - - -	100 lbs. coal carbonized
Percentage of coke used for fuel,	- - - - -	11.56 lbs.
		18.87 per cent. of total coke made.

Charges per retort per 24 hours, *1,988 lbs.* Wallsend (Austr.) coal. One hundred lbs. coal made *65.9 lbs.* coke and left for sale *54.34 lbs.* coke weighed hot.

The above is a correct statement of the results obtained during a five days' test of Bench No. 1.

Los Angeles, Cal., Feb. 24, 1891.

W. B. CLINE, President.

OFFICE OF CHICAGO GAS LIGHT & COKE Co.

CHICAGO, Jan. 27th, 1887.

Fred. Bredel, Esq.

DEAR SIR: We have had eight benches of nine's, with Kloenne furnaces, running continuously for thirteen months. The results have averaged 9,000 cu. ft. per mouthpiece in twenty-four hours, with a fuel consumption of 13 pounds coke per 100 pounds coal carbonized.

Yours truly,

(Signed)

THEOBALD FORSTALL, v. p.

OFFICE OF ST. PAUL GAS LIGHT Co.

ST. PAUL, MINN., Jan. 25, 1892.

Fred. Bredel, Esq., Milwaukee, Wis.

DEAR SIR: Answering your inquiry of yesterday in regard to the ten "Kloenne" benches, recently put in our works, * * * I take pleasure in stating that they are giving *perfect satisfaction* in every way. We have had them in service for some sixty days, and thus far they have exceeded the guaranteed results by 25 per cent. They have averaged fully *eleven thousand* cu. ft. to the mouthpiece, and *fifty-eight* lbs. per 100 lbs. coal carbonized in coke, over and above the hot coke used in the furnaces.

Such results ought to merit the highest commendation for the "Kloenne" benches.

Yours respectfully,

(Signed)

B. F. ELLISON, Gen'l Supt.

ST. PAUL GAS WORKS, St. Paul, Minn.—Results of test of Bredel Benches from 3 p. m. Dec. 9th to 3 p. m. Dec. 12th, 1891 (72 hours.)

Total gas made, - - -	1,110,300 cu. ft.	Coke sold, - - - -	77,710 lbs.
Total coal carbonized, - -	212,400 lbs.	Coke used in generator of water gas wk's,	43,079 lbs.
Total coke made, - - -	143,724 lbs.	Total quantity coke left for sale, -	120,789 lbs.
Yield of gas per lb. coal, -	5.22 cu. ft.	Am't coke used for fuel of total coke made,	15.95 per cent
Yield of gas per retort per day, -	10.280 cu. ft.	Coke used per 100 lbs. coal carbonized, -	10.8 lbs.

Besides the above quantity, 5,691 lbs. of Breeze were left for sale and used under the boilers.

OFFICE OF DAYTON GAS LIGHT & COKE Co.

DAYTON, O., Nov. 22d, 1892.

Fred. Bredel, Esq., New York, N. Y.

DEAR SIR: The six benches of nine retorts each, with full depth recuperative furnaces, built by you for this Company have proven *very satisfactory*, fulfilling all the guarantees you made with us, such as per cent. of coke used for fuel, yield per mouthpiece and otherwise.

The retorts are now working on their third year, and seemingly in good condition, and will see us through until next season. As we are not ready yet to say what new work we will want the coming year, I will write you later.

Yours truly,

(Signed)

JOSEPH LIGHT, Supt.

Statement of results obtained with Kloenne-Bredel benches of nine retorts, at Works No. 2 of the CLEVELAND GAS LIGHT & COKE Co., Cleveland, O., during 51 days, from April 11th, 1892, to May 31st, 1892. No. of benches under fire—4 for 20 days and 5 for 31 days.

Total coal carbonized, - - - - -	4,233,410 lbs.
Total gas made, - - - - -	21,501,865 cu. ft.
Average yield per retort per 24 hours, - - - - -	10,168 cu. ft.
Average yield per lb. coal carbonized, - - - - -	5.08 cu. ft.

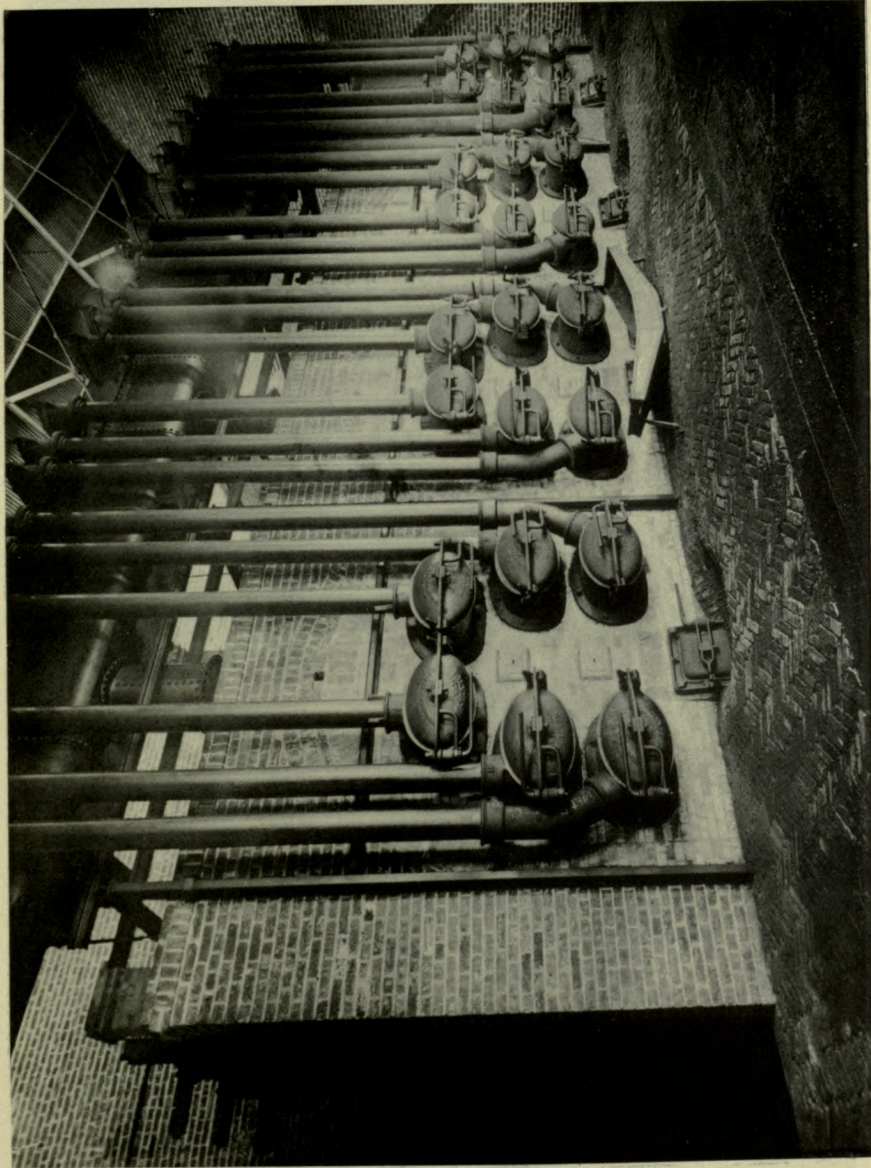
Statement of results of the CLEVELAND GAS LIGHT & COKE Co., during 3 days, from April 5th, 1892, to April 8th, 1892, at Works No. 2: CHAS. CHRISTIE, Supt.

Date.	Coal carbonized.	Oil used.	Gas made.	Yield per mouthpieces.	Yield per lb.	Candle power.
5 - -	74,640	141	404,000	11,222	5.41	18.89
6 - -	74,000	133	402,000	11,666	5.45	18.51
7 - -	74,000	117	401,000	11,138	5.41	18.66
8 - -	74,000	157	406,000	11,277	5.48	18.79
Total, -	296,640	548	1,613,000			
	Amount of oil used per 100 lbs. coal carbonized, - - - - -				0.185 gal.	
	Amount of oil used per 1000 cu. ft. gas made, - - - - -				0.340 gal.	

Benches of 6 Retorts each, "Kloenne-Bredel" System.

Construction without Stage Floor.

Clinkering Door at Rear.

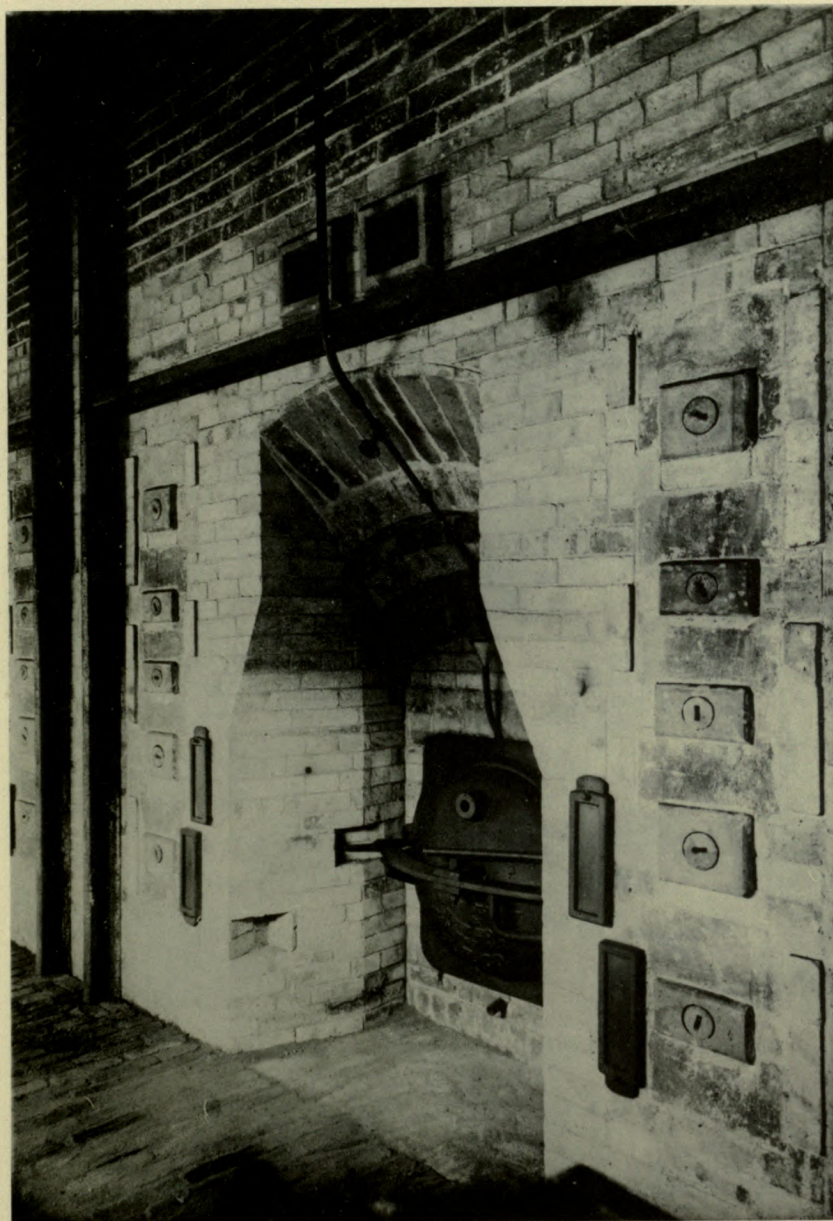


ERECTED FOR THE SAN JOSE LIGHT AND POWER CO.

1891.

4 Benches of 6 and 8 Retorts, "Kloenne-Bredel" System.

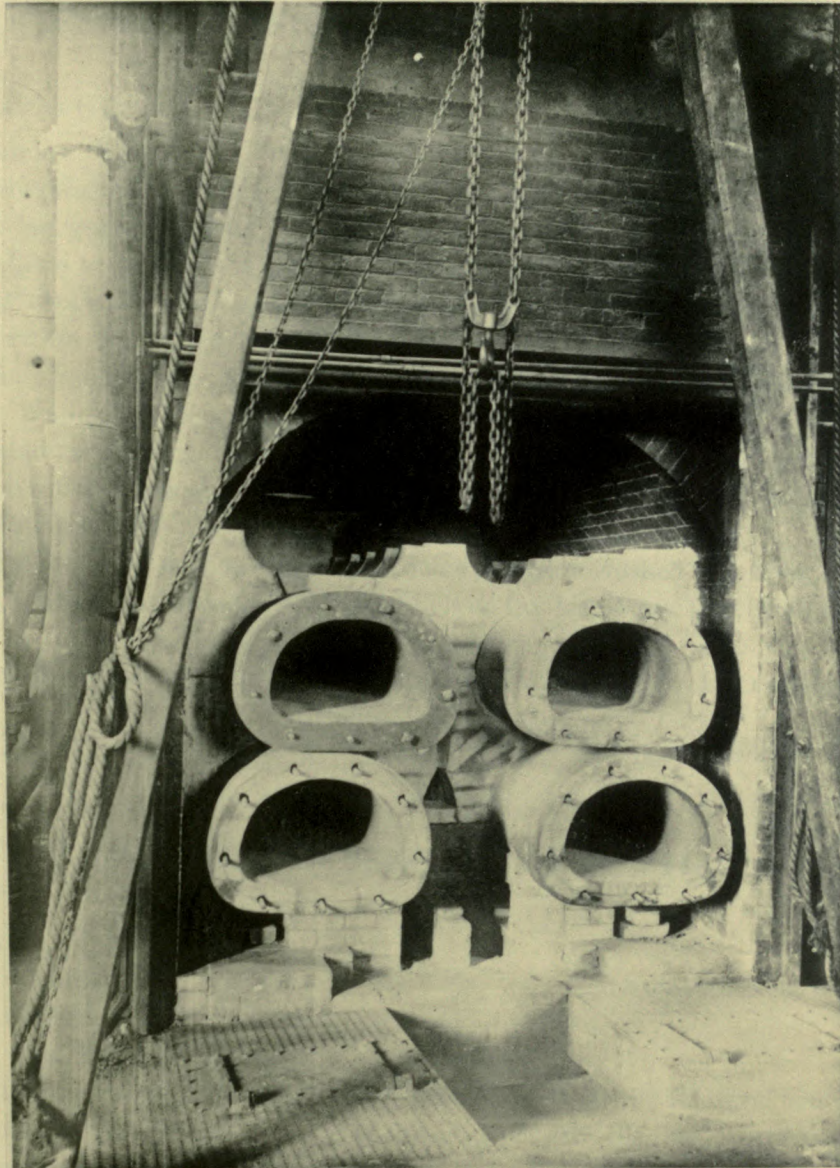
No Stage Floor. Showing Construction Clinkering Door at Rear.



IN COURSE OF ERECTION FOR FT. WORTH LIGHT AND POWER CO.

1890.

Bench of 6 double-12 Retorts, "Kloenne-Bredel" System.



IN COURSE OF ERECTION FOR NEWARK, N. J. GAS LIGHT CO.

1888.

RESULTS AND TESTIMONIALS OF BENCHES OF 6's, "WITH STAGE FLOOR."

OFFICE OF GALVESTON GAS CO.

GALVESTON, TEX., July 15th, 1892.

Mr. Fred. Bredel, Milwaukee, Wis.

DEAR SIR: I take pleasure in stating that the four benches of sixes which you have erected for the Galveston Gas Co. late last year are giving us *perfect satisfaction* thus far, and I have no reason now to believe but that they will continue to do so to the end.

The heats can be controlled and regulated with perfect ease in these benches, to any desired amount of coal to be carbonized within the capacity of the retorts.

We are making four-hour charges burning 400 lbs. per retort, and have no difficulty in making 11,000 feet of gas per retort. We have carbonized as high as 450 lbs. in four hours.

I believe your system of heating benches approaches nearer in practice the perfect theoretical idea of regenerating and recuperative furnaces. *Your Hydraulic Main has given us more comfort in making gas with high heats than any I have ever used.*

The new scrubber of one-half million capacity, which you also furnished this Company, is doing all you recommended for it. It has been working without a hitch or trouble of any kind from the day we started it until now.

The provisions for observing and getting at all parts seem to be perfect. I am pleased with the working of it in every respect.

Respectively yours,

JOHN GIMPER, Supt.

RESULTS AND TESTIMONIALS OF BENCHES OF 9's, "FIRING SLACK COAL."

Coal and Coke.

V^e Limousin & Descours.

LYONS, FRANCE, Dec. 26th, 1886.

GAS WORKS DEPARTMENT.

Mr. Fred. Bredel, C. E., New York.

DEAR SIR: In answer to your favor of the 13th we will say that the Kloenne bench *satisfies us above all expectations*. The amount of fuel used is 14 lbs. of fine coal per 100 lbs. coal carbonized. We have not changed the bench in any respect, and we cannot see how it could be improved upon.

The results obtained are *entirely satisfactory*.

Receive, dear sir, the best wishes from

Yours truly,

LIMOUSIN & DESCOURS.

RESULTS AND TESTIMONIALS OF BENCHES OF 4, 6 AND 8 RETORTS WITHOUT STAGE FLOOR.

OFFICE OF FORT WORTH LIGHT & POWER Co.

FORT WORTH, TEX., April 12th, 1891.

Fred. Bredel, Esq., New York City.

DEAR SIR: The bench of 8's of the Kloenne-Bredel full depth recuperative type as erected by you at the new station of our Company at Fort Worth is *proving eminently satisfactory*.

Inclosed you will find three days' test of date Dec. 28th, 29th and 30th, from *Texas* coal that had been exposed to outside influences and was somewhat damp. Our average yield was 4.58; consumption of eoke, 21 per cent.

I again refer you to test of thirty days, commencing March 15th, showing an average yield of 4.71. The consumption of eoke in this style of bench is uniform throughout, and does not vary, as is the case with some benches of recuperative type. The above tests were taken from actual working results, and not from picked coal. The character of work in the four benches is, in my opinion, *first-class from the top of foundation to the outlet of Hydraulic Main.*

Very respectfully,

Signed) J. C. LORD, Supt.

OFFICE OF FORT WORTH LIGHT & POWER Co.

FORT WORTH, TEX., April 12th, 1891.

Fred. Bredel, Esq., New York City.

DEAR SIR: I enclose you copy of one day's run carbonizing 2,100 lbs. to the mouthpiece, amount of gas per hour, and also showing the exact time at which the furnace was filled with eoke. Also make per mouthpiece and per cent. of coke used. If you deem it proper to publish same you can do so.

The inclosed results of one day's working shows that it is possible to increase the amount of coal carbonized 300 lbs. per retort. At the same time the consumption of eoke in furnace is reduced a half of one per cent. With kind regards, I am,

Yours truly,

J. C. LORD, Supt.

RESULTS WITH TEXAS COAL.

Make per mouthpiece per day,	- - - - -	9,537 cu. ft.
Per cent. of eoke used for fuel,	- - - - -	20.5 per cent.
Coal charged per retort per 24 hours,	- - - - -	2,100 lbs.

EXTRACT OF LETTER.

OFFICE OF FORT WORTH LIGHT & POWER Co.

FORT WORTH, TEX., March 31st, 1892.

Mr. Julius Buss, Representative of Mr. Bredel, New York City.

DEAR SIR: Our benches are *working splendidly* and are *giving first class results*. When I get on my feet again I will give you a synopsis of the working of the same.

Yours truly,

(Signed) J. C. LORD, Supt.

SAN JOSE, CAL., Dec. 5th, 1891.

Test of Kloenne-Bredel Bench No. 1 of six retorts, made at the gas works of the SAN JOSE LIGHT & POWER Co., erected by Fred. Bredel, C. E. Four days' continuous test, date Dec. 1st to Dec. 5th, 1891.

Total coal charged,	- - - -	44,575 lbs.
Total coke made,	- - - -	29,248 lbs.
Total coke left for sale,	- - - -	23,730 lbs.
Total coke used for fuel,	- - - -	5,518 lbs.
Coke used for fuel per	- - - -	100 lbs. coal carbonized, 12.38 lbs.
Percentage of coke used for fuel,	-	18.87 per cent. of total coke made.

Charges per retort per 24 hours, 1,857 lbs. Walsend (Austr.) coal—no cannel. One hundred (100) lbs. coal made 65.6 lbs. coke weighed hot and leaves for sale 53.2 lbs. coke (hot.)

The above recapitulation of test for four consecutive days in the works of the San Jose Light & Power Co. is correct and within the guarantee of Fred. Bredel, C. E.

The heats and working of the bench is satisfactory, and the construction of the brick and iron work are as contracted for.

(Signed)

PETER. E. DE MILL, JR., Supt.

OFFICE OF MORRISTOWN GAS LIGHT CO.

MORRISTOWN, N. J., Nov. 26th, 1892.

Fred. Bredel, Esq., New York City.

DEAR SIR: It gives me much pleasure to inform you that I am exceedingly well satisfied with your benches erected at the new works of this Company in October, 1891. The heat in the retorts is a very good and uniform one, and is absolutely independent of the ability of the workmen.

This summer I have made as much as 44,000 cu. ft. in a bench of 4's in 24 hours, but owing to our consumption I had to miss charges on certain days. Nevertheless, I am satisfied I could make 42,000 cu. ft. per day straight along with this bench. The consumption of coke is between 24 and 25 per cent. of coke produced

The main feature in the construction of your benches, as erected here, lies in the arrangement of clinkering the fire, which is done in the rear of benches, and which I must confess I like very much. The man doing the clinkering work in an open cellar, no stage floor whatever being above him. Also, the cost for an iron stage floor in front of the benches is saved by this arrangement, only a common floor being required, same as with the ordinary old-style benches. In conclusion I will say you may use this letter for any purpose you may desire.

Yours respectfully,

(Signed)

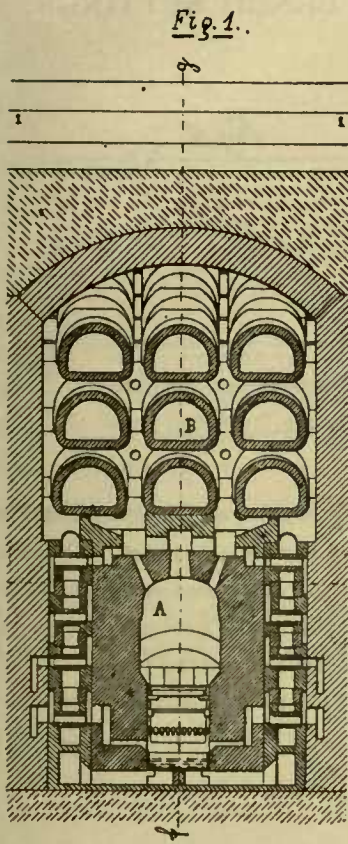
GEO. H. BROWN.

MECHANICAL COAL AND COKE HANDLING AND COKE SEPERATORS.

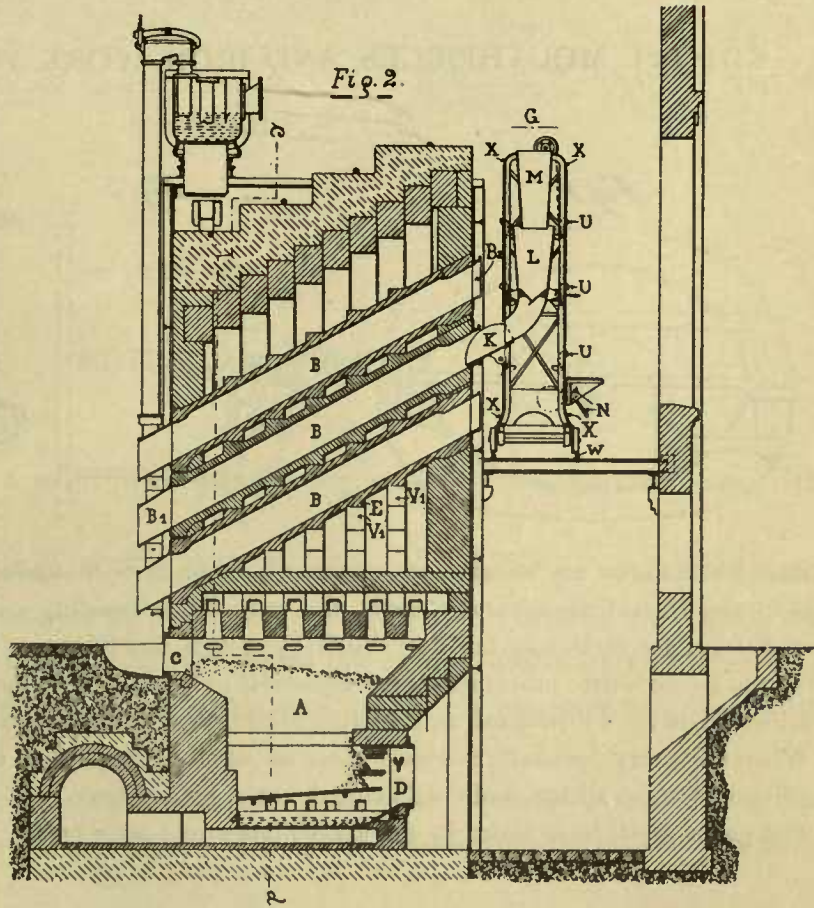
Special pamphlets for the mechanical handling and screening of coal and coke will be furnished on application.

INCLINED RETORT BENCHES.—SYSTEM BREDEL.

PLAN NO. 1.



Pat. Nov. 18th, 1890.



Pat. June 23d, 1891.

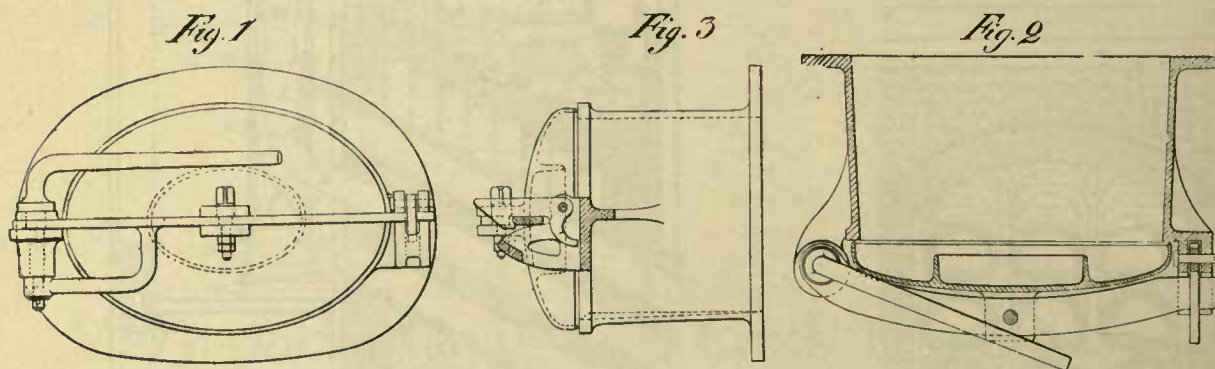
The above plan No. 1 illustrates my improved arrangement of inclined retort benches. The charging machine in the rear is so arranged that *any grade of coal* can be charged *evenly*, and a *greater incline* can be given to the retorts than if stationary charging mouthpieces are used. Inclined retort benches on this principle are now in *successful* operation in Europe and have nearly superseded the stationary charging mouthpieces.

These kind of benches can be all run by machinery, and for a production of 1,000,000 feet or over, the cost of labor is about *3 to 5* as compared with horizontal retorts using drawing machines. The *increase in first cost* is only *slightly* in excess of horizontal retorts of the *SAME CAPACITY*. The capacity of the retorts being from 14,000 to 15,000 ft. per 24 hours.

If an entirely new retort house is to be built, the inclined retorts can be built for the *same price* per *1000 ft. capacity* as the horizontal retorts using drawing machines.

RETORT MOUTHPIECES AND IRON WORK FOR BENCH SETTINGS.

PLAN NO. 2.



Plan No. 2 shows my retort mouthpieces which have been successfully employed on more than 20,000 retorts in the United States and Canada, the same are self-sealing and keep absolutely tight. There are *no screws employed for tightening the lids*, which by rough handling are *liable to bend and crack the lids*. All movements are eccentric movements and *adjustable* to take up the *wear and tear*. My bridgepipes, clinkering and filling doors are constructed on the same principle, and guaranteed to keep absolutely tight.

When using my *hydraulic condenser main* no stoppages by *pitch or thick tar* in the main can occur. From 80 to 90 per cent. of all tar made is deposited in the hydraulic.

The gas is at *all times sealed by ammonical liquor and never by tar*.

EXTRACT OF LETTER FROM MR. GIMPER.

GALVESTON, TEXAS, July 15th, 1892.

“YOUR HYDRAULIC CONDENSER MAIN HAS GIVEN US MORE COMFORT IN MAKING GAS WITH HIGH HEATS THAN ANY I HAVE EVER USED.

Respectfully yours,

“(Signed) JOHN GIMPER, Supt.”

RETORT HOUSES.

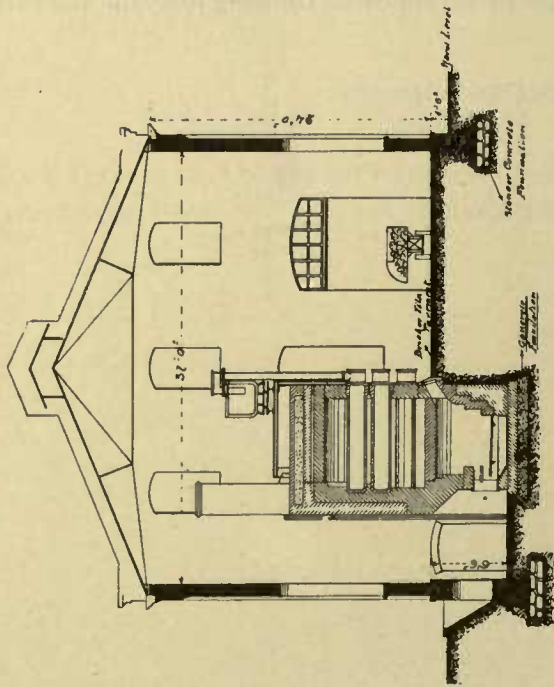
Plans Nos. 3 and 4 represent a retort house adapted for benches with clinkering doors in the rear WITHOUT STAGE FLOOR.

Plan No. 3 is for small gas works, and Plan No. 4 shows the arrangement for benches of 8 retorts, and the right hand side for benches of 9 retorts with mechanical coke conveyer. Charging and drawing machines can be employed. No stage floor is required, thereby making this arrangement cheaper than any other. In fact it is as cheap as ordinary benches provided with the same quantity of iron work on a basis of 1000 feet capacity.

Plan No. 5 shows a retort house of 2,000,000 feet capacity arranged for charging and drawing machines.

Plan No. 6 shows a retort house of 1,000,000 feet capacity arranged for drawing machine and turn tables.

PLAN NO. 3.



Cross Section

Helort-House, Inc.

Recuperative Furnace System "Klaenne-Bredel 20/91"

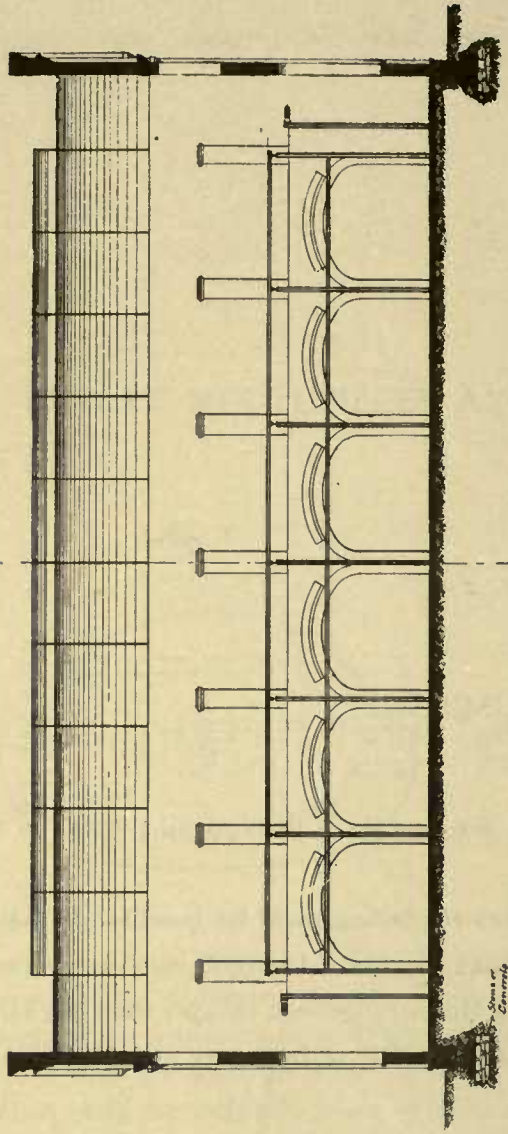
*Patented.
Capacity, Inc.*

6 Benches of A Helort's each

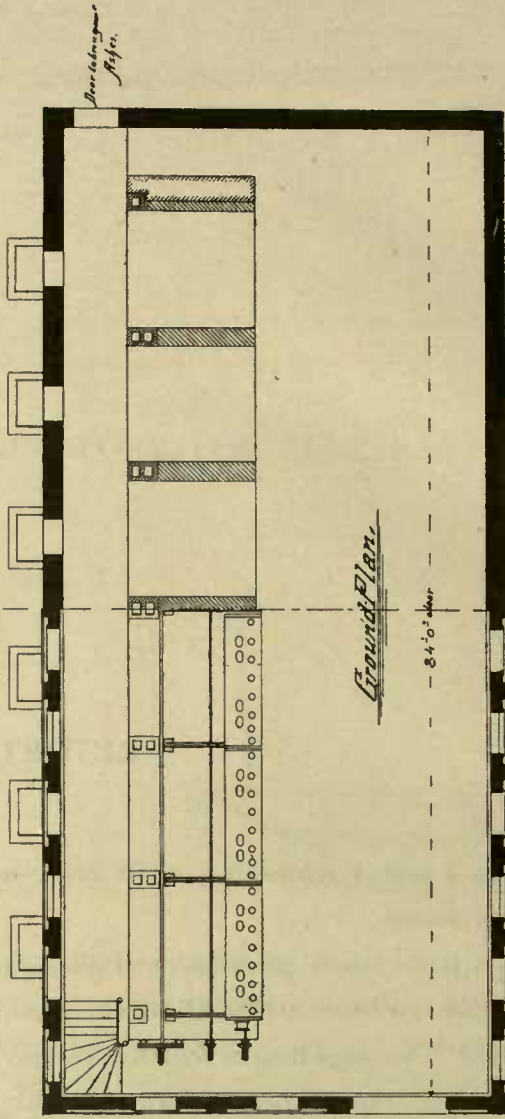
Scale 3/8" of one inch = one foot

New York, Jan. 1891.

W. & E. 294.

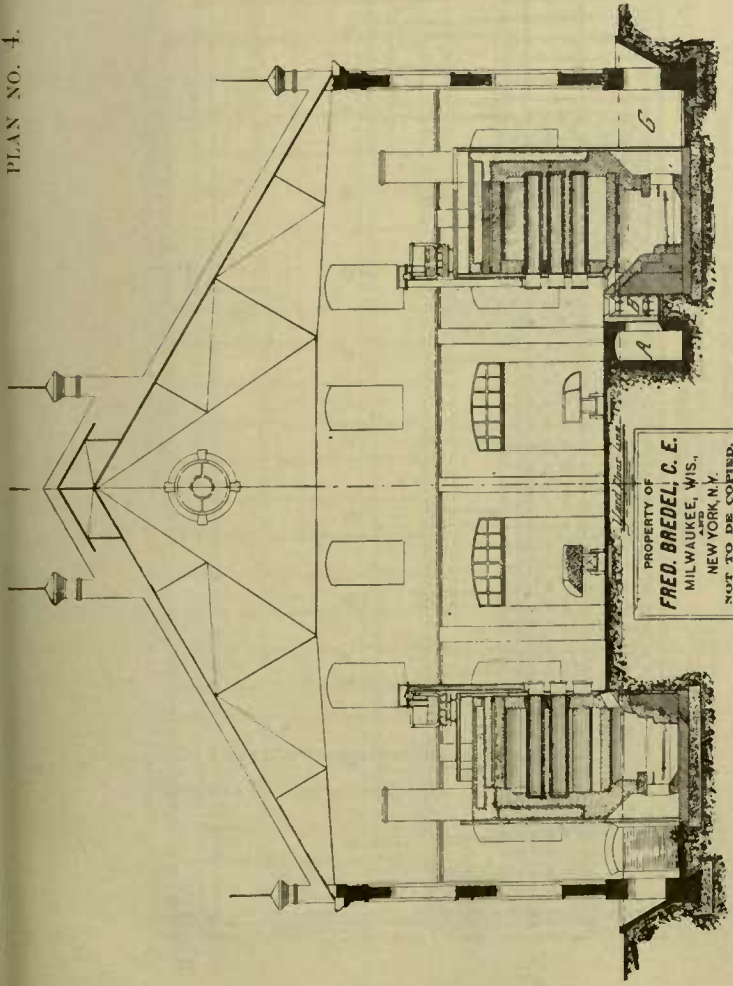


Side Elevation



Ground Plan

84' 0"



PROPERTY OF
FRED. BREDEL, C. E.
 MILWAUKEE, WIS.,
 NEW YORK, N.Y.
 NOT TO BE COPIED.

*Section of Retort House for
 Recuperative Furnaces System, Klenné Brede! '90/91.*

*16 Benches of B Retorts each - 15 Benches of S Retorts each
 Coke brought into Yard by*

Hand Carts Mechanical Conveyor

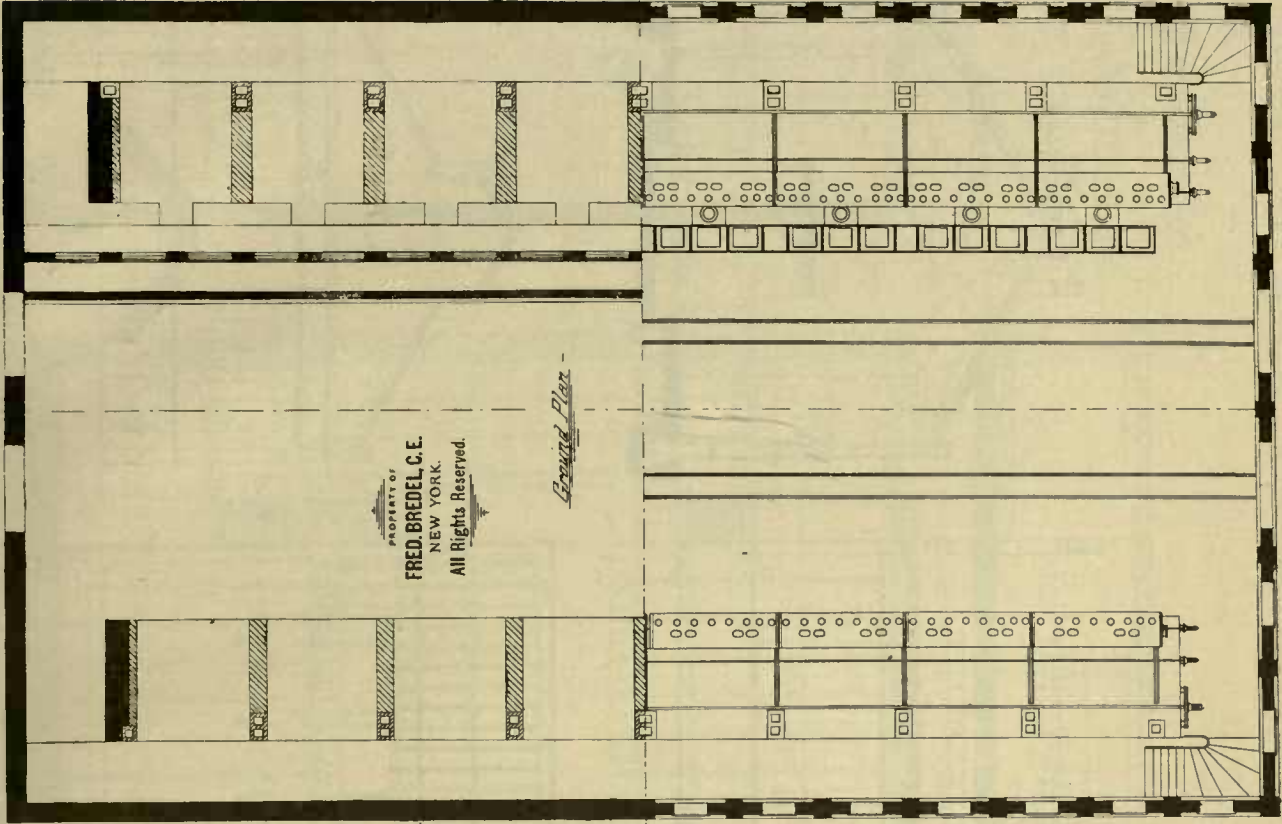
Scale 3/16 of one Inch = 1 Foot.

New York, Jan. 1891

Fred. Brede! C.E.

Fred. Brede!

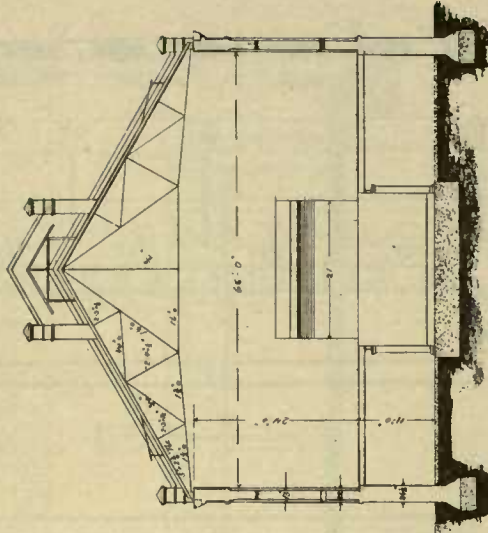
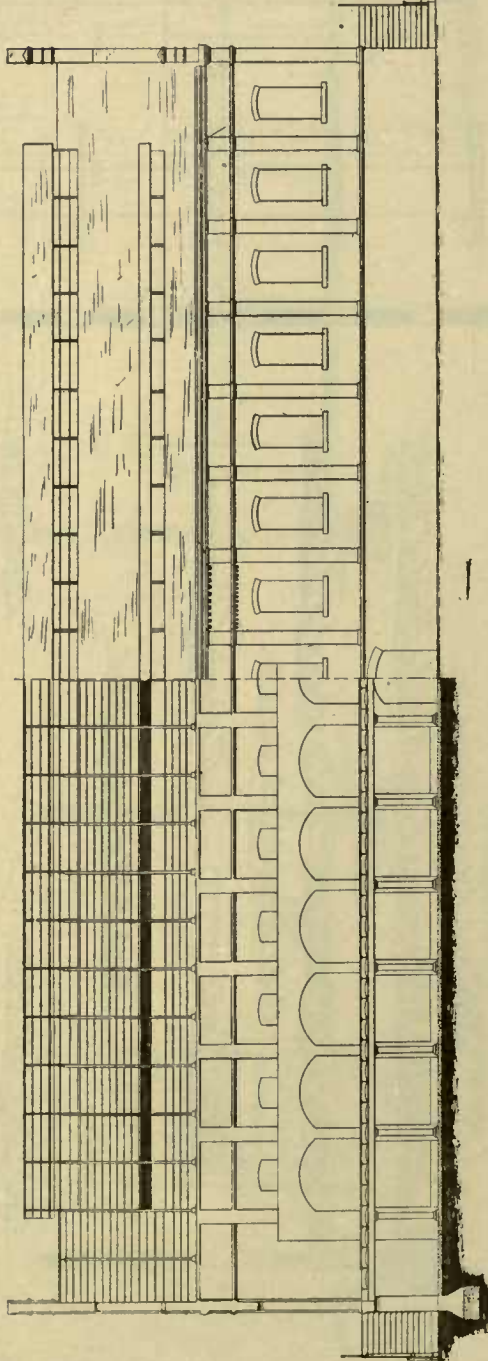
W. 993



PROPERTY OF
FRED. BREDEL, C. E.
 NEW YORK.
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Ground Plan -

PLAN NO. 5.

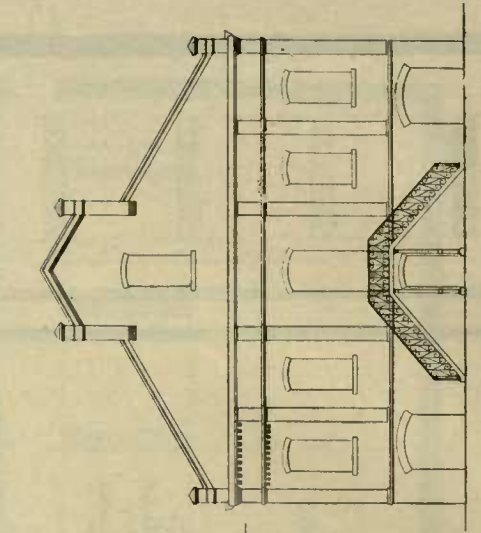
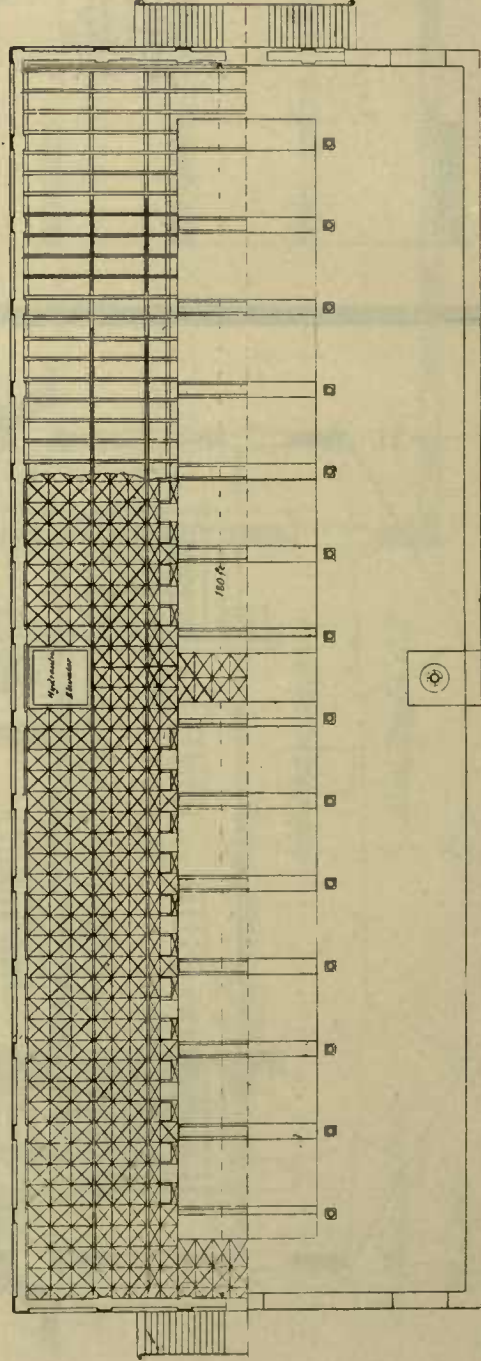


Restor. House for 12 Single inmates of Victoria

216 Patients, Capacity 2000000 ed/te

Scale 1/2" = 1' 2"

Arch. Bredel, C.E.

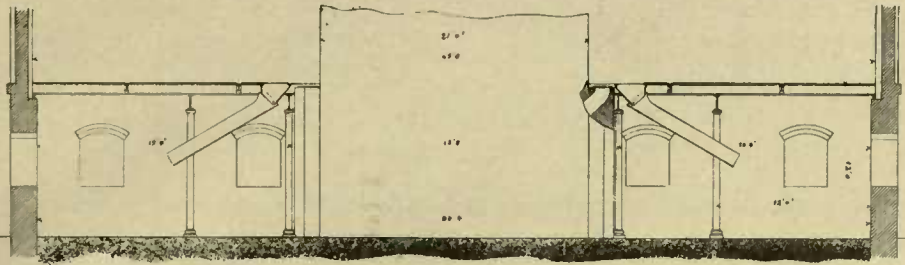
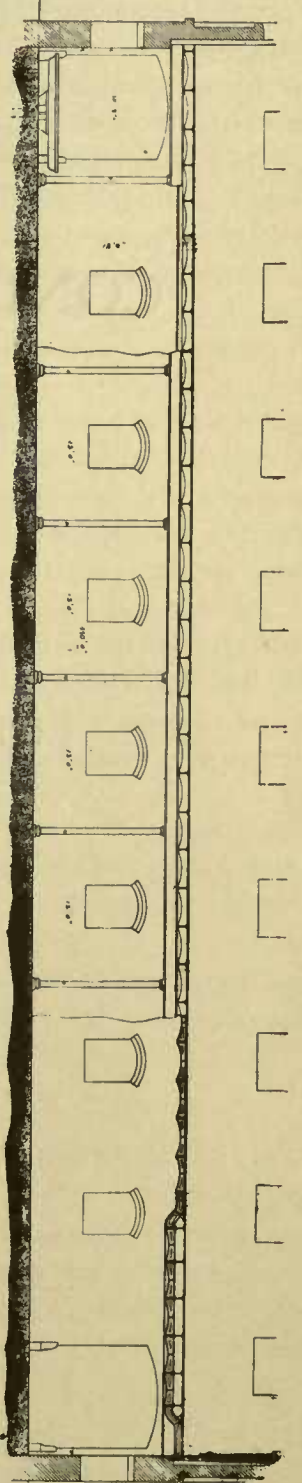


Relax House Floor

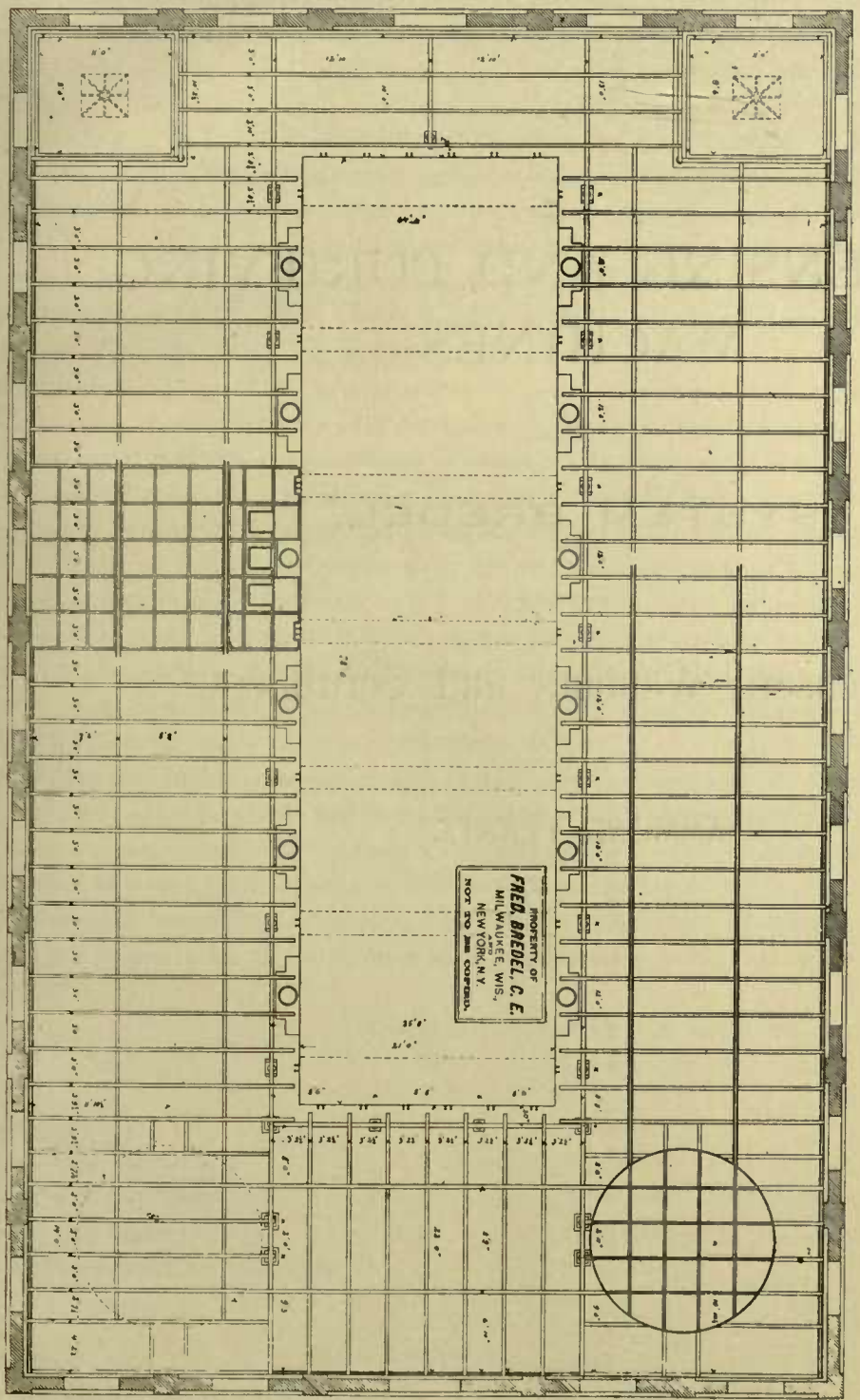
12 Benches & 9 Tables each

Scale 1/8" = 1'-0"

See Plan of Main Floor



11.6.76:250



CONDENSING AND PURIFYING
MACHINES.

SYSTEM BREDEL.

Condensers, Washers and Scrubbers.

AMMONIA PLANTS.

The yield of gas with my benches and my purifying machine is from 5.00 to 5.20 ft. from 18 to 20 candle power, according to quality of coal employed, no enricher being used. The average result is about 95 CANDLE FEET from best Pennsylvania gas coal without the use of any enricher.

These results are partly due to the benches, but the greater part is due to the new methods of handling the gas between the hydraulic main and the oxide purifiers. The gas is washed in ammoniacal liquor, and all the tar is extracted while yet hot. The air condenser is of a large size so as to decrease the speed of the gas greatly, and thereby depositing the coke dust and pitch impurities which are mechanically carried along with the gas. The tar contained in the gas is then *perfectly eliminated* by washing; at the same time from 60 to 80 per cent. of all the CO₂ originally contained in the gas is removed by forming carbonates of ammonia and as much sulphurated hydrogen and carbon by-sulphates as there is an chemical equivalent of ammonia. (The resulting ammoniacal liquor after having passed through the washer contains no *caustic or free ammonia*.) The gas is then cooled in a multitubular water cooler, or compensator, and the ammonia is removed by a washer or washer scrubber, whichever might be preferable or on hand. The process was patented to me on letters patent No. 467,605. Most of the apparatus employed are protected by letters patent of August 17th, 1880, March 27th, 1888, and August 28th, 1881.

The great advantage of this process is that the gas can *never come in contact with tar wetted surfaces during the process of cooling*, thereby *preventing the absorption of the benzol vapors* which act as carriers for the naphthaline vapors, thereby giving the gas a chance to retain all its illuminants and yet have enough hydro-carbons of the lower series to *prevent smoking when burned in a 60-candle power Bray burner*, which is a test a 19-candle power coal gas enriched with cannel coal or naphtha will not stand without smoking. A gas purifying machine of this principle has been in continuous work for over two years at the Cleveland Gas Light & Coke Co., with the exception that there is only one washer ahead of the cooler or compensator, instead of two. The results obtained at that point are from 90 to 95 candle feet per pound of coal carbonized without using an enricher. Since the time of first starting, the machine has only been cleaned once, and *no obstructions or stoppages were then found*, they being in as good and clean a condition as when first put up. NAPHTHALINE STOPPAGES NEVER OCCURRED AND CANNOT OCCUR WHEN THE COMPLETE SYSTEM IS USED.

There are now under construction two more purifying machines, one of 1,250,000 cu. ft. capacity for the Milwaukee Gas Light Co., which will be ready to start about February next, and a complete purifying machine of the newest arrangement will be ready to start about the middle of January at the Peoples' Gas Light Co. in Cleveland, having a total capacity of 2,000,000 ft. per 24 hours.

Combination immersion and friction washers for the removing of either tar, CO₂, sulphur impurities, or ammonia are in use, or in course of erection at the following works, where they have been working to entire satisfaction:

APPARATUS OF 2,000,000 FT. CAPACITY.

	No. Apparatus.	Total capacity per 24 hours.	Used for
Albany Gas Light Co.	- - - 1	2,000,000	water gas.
Peoples' Gas Light Co.	- - - 1	2,000,000	tar extractor—coal gas.
Peoples' Gas Light Co.	- - - 1	2,000,000	CO ₂ and sulphur impurities—coal gas.
Peoples' Gas Light Co.	- - - 1	2,000,000	ammonia extractor—coal gas.
Central Gas Light Co., New York	- 1	2,000,000	ammonia extractor—coal gas.

APPARATUS OF 1,000,000 FT. CAPACITY.

	No. Apparatus.	Total capacity.	Used for
Chicago Gas Trust - - -	14	14,000,000	water gas.
Albany - - - - -	1	1,000,000	water gas.
Wheeling, W. Va. - - -	1	1,000,000	tar, CO ₂ and sulphur impurities—coal gas.
Milwaukee Gas Light Co.	1	1,000,000	tar, CO ₂ and sulphur impurities—coal gas.
Milwaukee Gas Light Co. -	1	1,000,000	ammonia extractor—coal gas.
Cleveland Gas Light & Coke Co.	1	1,000,000	tar, CO ₂ and sulphur impurities—coal gas.
Cleveland Gas Light & Coke Co.	1	1,000,000	ammonia extractor—coal gas.

APPARATUS OF 500,000 FT. CAPACITY.

Galveston Gas Light Co. -	1	500,000	tar and ammonia extractor—coal gas.
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APPARATUS OF 250,000 FT. CAPACITY.

Wichita, Kansas - - - -	1	250,000	for all impurities.
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TOTAL CAPACITY OF 24,750,000 CU. FT. PER 24 HOURS.

With the use of my purifying machine or washer the purification with lime becomes unnecessary, as there is never more than from 0.5 to 0.75 per cent. of CO₂ in the gas. The much-used arrangement of four purifiers in connection with this apparatus is unnecessary and extravagant, and two purifiers is all that is required for water gas when using naphtha, and three purifiers when using crude oil. For coal gas three purifiers also will be found sufficient at all times, as this will leave one purifier in reserve.

OFFICE OF CHICAGO GAS LIGHT & COKE CO.

CHICAGO, February 3d, 1888.

Fred. Bredel, Esq., New York City.

DEAR SIR: The Kloenne Tar Washer which we have erected at our works, for the purpose of extracting the tar from the *water gas*, has given us satisfaction. It has now been in use for two months, and shows *no signs of clogging, or increase of pressure.*

Yours truly,

(Signed) THEOB. FORSTALL, Pres.

EXTRACT OF LETTER.

OFFICE OF GALVESTON GAS CO.

GALVESTON, TEX., July 15th, 1892.

The new Scrubber of one-half million capacity which you have also furnished this Company is doing all you recommended for it. It has been working *without a hitch or trouble of any kind* from the day we started it until now.

The *provisions for observing and getting at all parts seem to be perfect.* I am *pleased with the working of it in every respect.*

Respectfully yours,

JOHN GIMPER, Supt.

OFFICE OF CITY GAS WORKS.

WHEELING, W. VA., Dec. 20th, 1892.

Fred. Bredel, C. E., Milwaukee, Wis.

DEAR SIR: The washer erected by you in our City Gas Works has been in continuous use *since January, 1891*, and we are *very much pleased* with its working. It performs the work required to our *entire satisfaction*, and we *cheerfully* recommend it to any one in need of a *first-class washer*, as well for the removing of *tar, carbonic acid and sulphur as ammonia,*

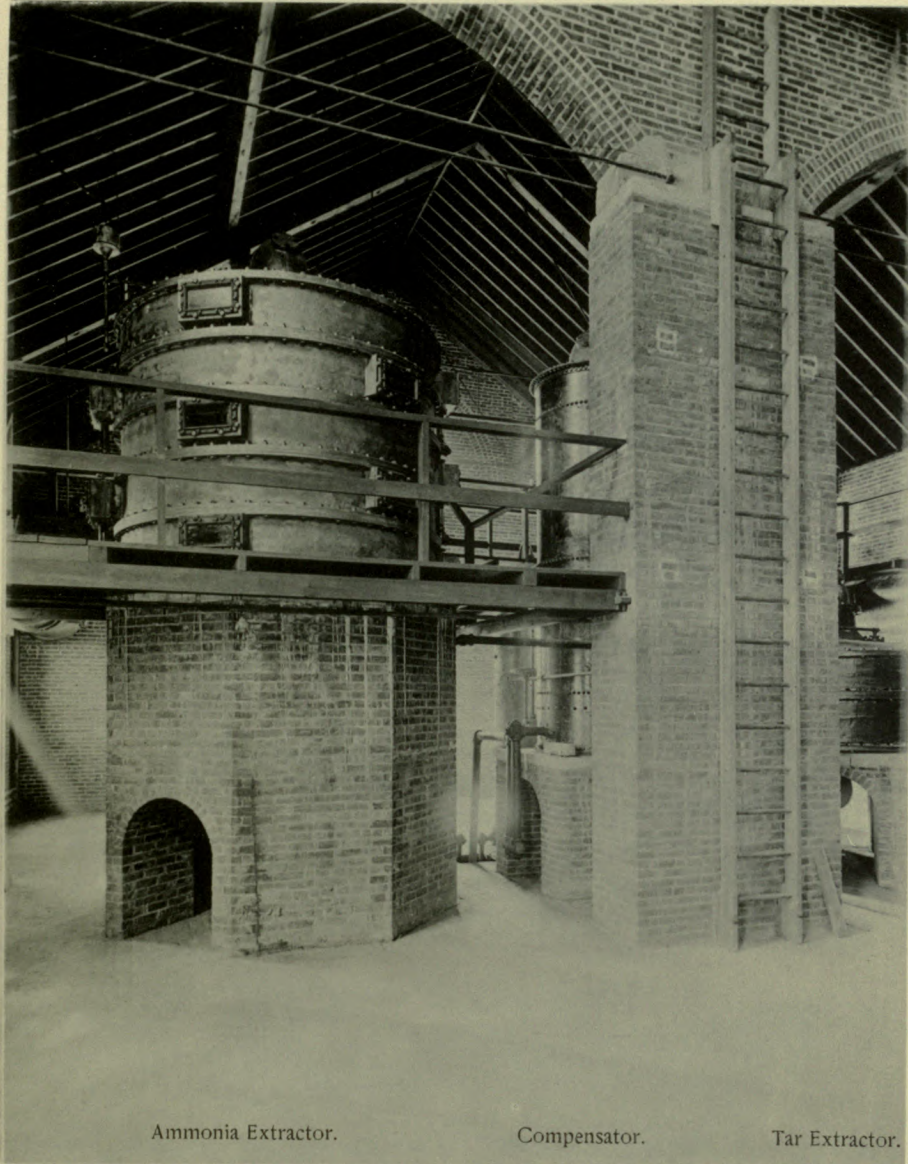
Respectfully yours,

(Signed) S. M. DARRAH, Supt.

AMMONIA PLANTS.

Plans and specifications for Sulphate, Aqua, and Anhydrous Ammonia Plants will be furnished on application, and plants erected under fullest guarantee.

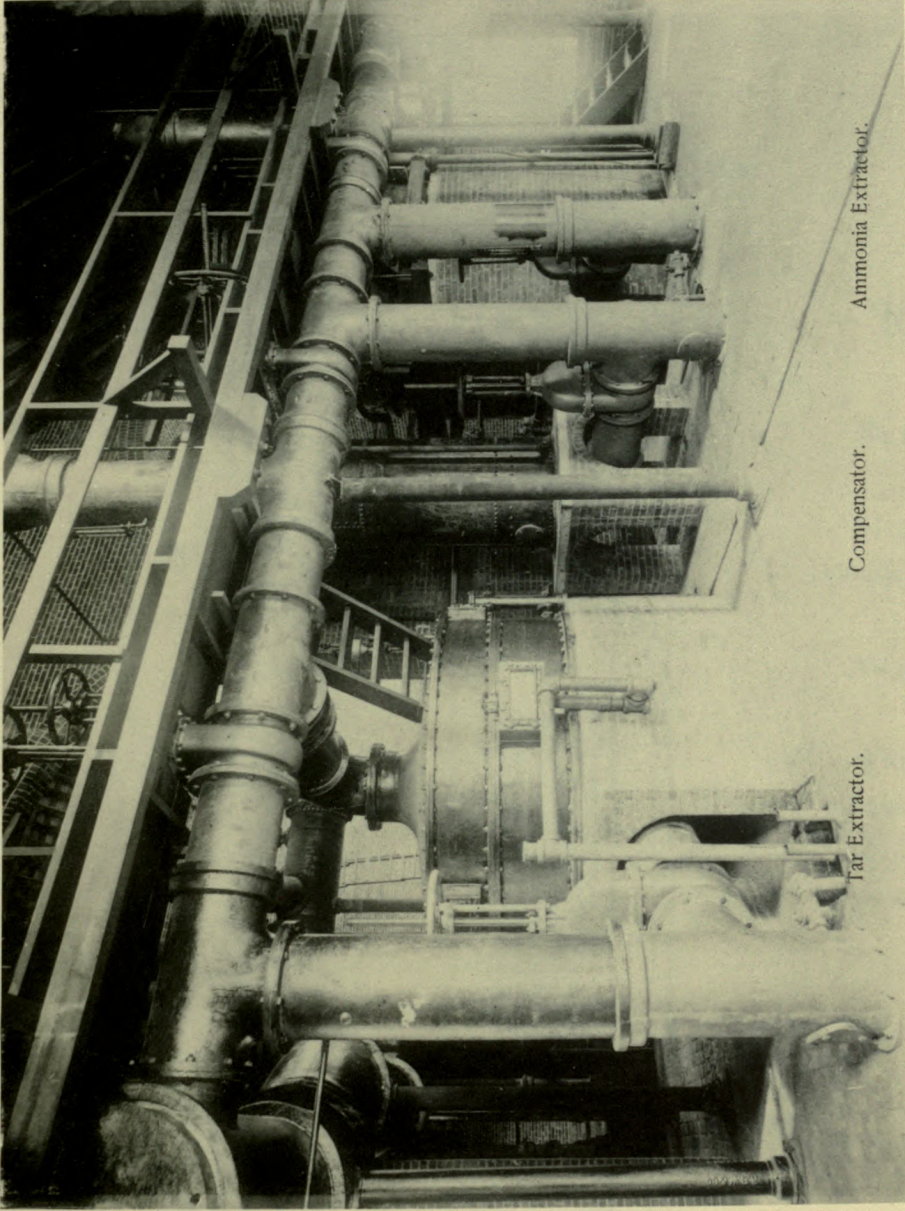
GAS CONDENSING AND PURIFYING MACHINE—Capacity, 1,000,000 cu. ft.
“Bredel” System.



ERECTED FOR THE CLEVELAND GAS LIGHT CO.

1889.

GAS CONDENSING AND PURIFYING MACHINE—Capacity, 1,000,000 cu. ft.
“Bredel” System.



Tar Extractor.

Compensator.

Ammonia Extractor.

ERECTED FOR THE CLEVELAND GAS LIGHT CO.

1889.

GAS CONDENSER, COOLER AND TAR SEPARATOR.—SYSTEM BREDEL.

PAT. AUG. 28TH, 1888.

PLAN F.

ADVANTAGES.

Great cooling surface.

Tar and ammonia liquor are removed as soon as condensed.

Hottest water in contact with hottest gas.

Easily cleaned.

Gas has to pass through all tubes.

Downward movement of gas.

Frequent changes of direction of gas current.

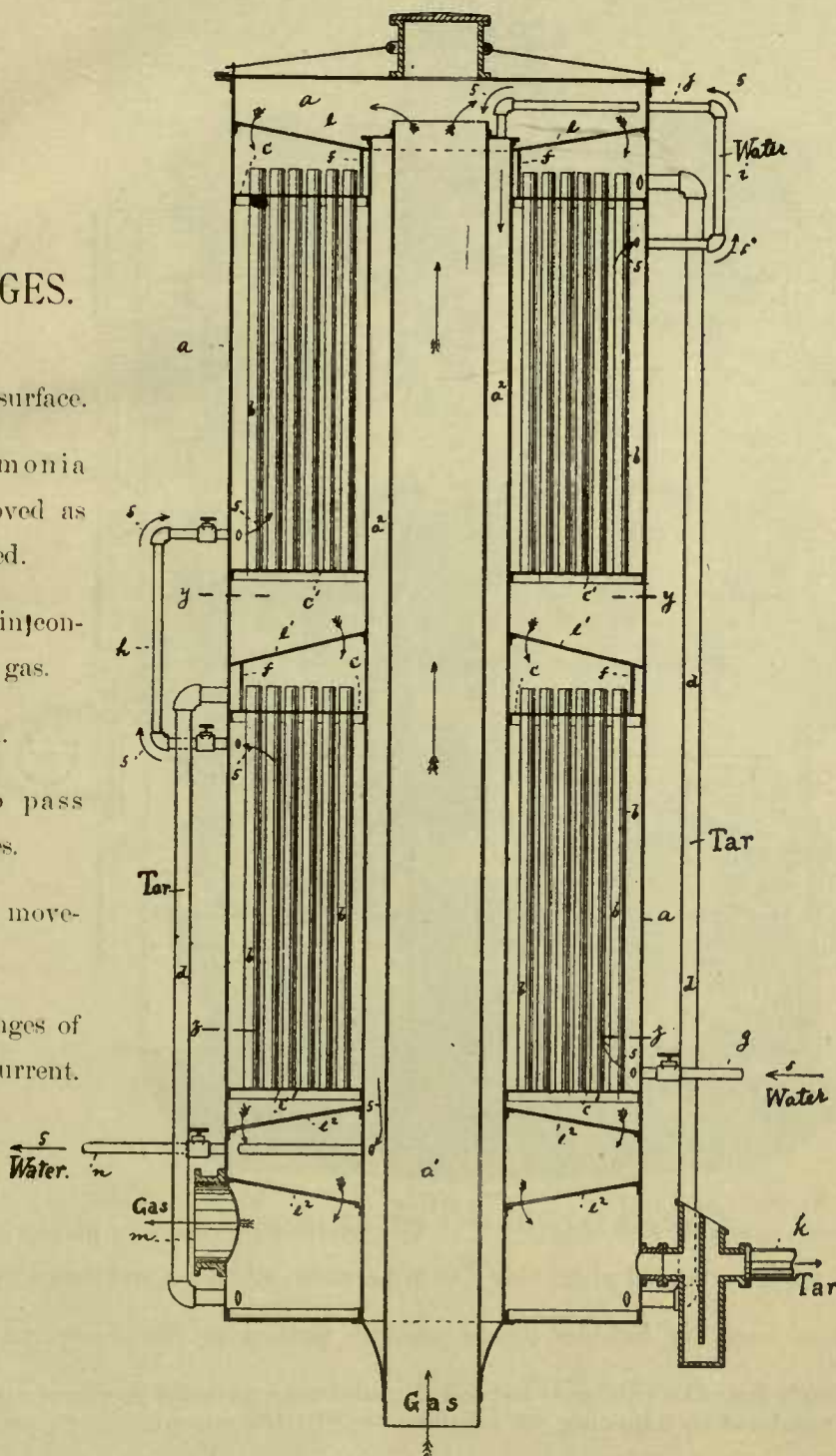
RESULTS.

No naphthaline.

Slightly higher candle power.

No pitch.

Will eliminate more tar than any other multitubular condenser of same size.

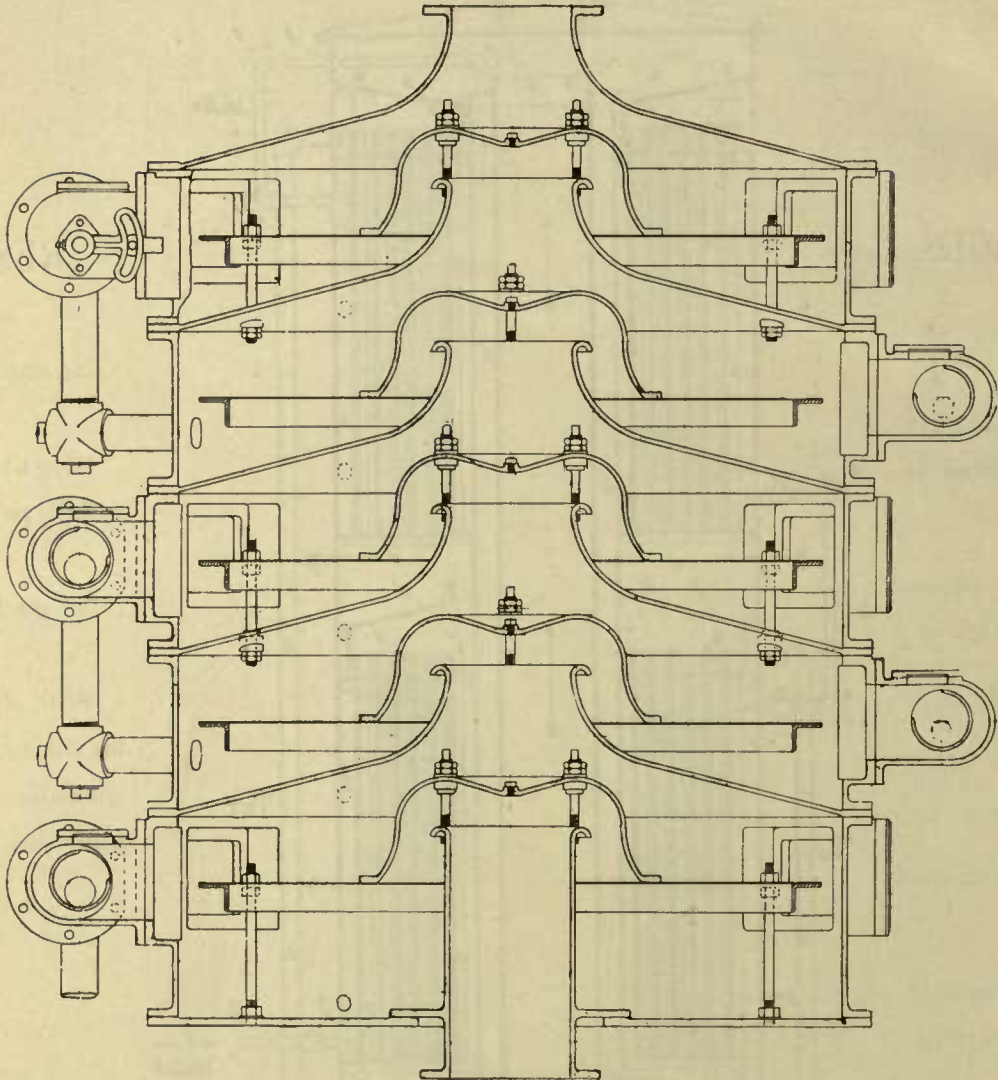


GAS WASHERS.

TAR, CO₂, SULPHUR COMPOUNDS AND AMMONIA EXTRACTOR.

PAT. MARCH 28TH, 1888.

PLAN NO. 8.



ADVANTAGES.

No moving parts. No wear and tear. No oiling. No attendance. No stoppages.
 No separate engine to attend to. The washing process is in plain view.

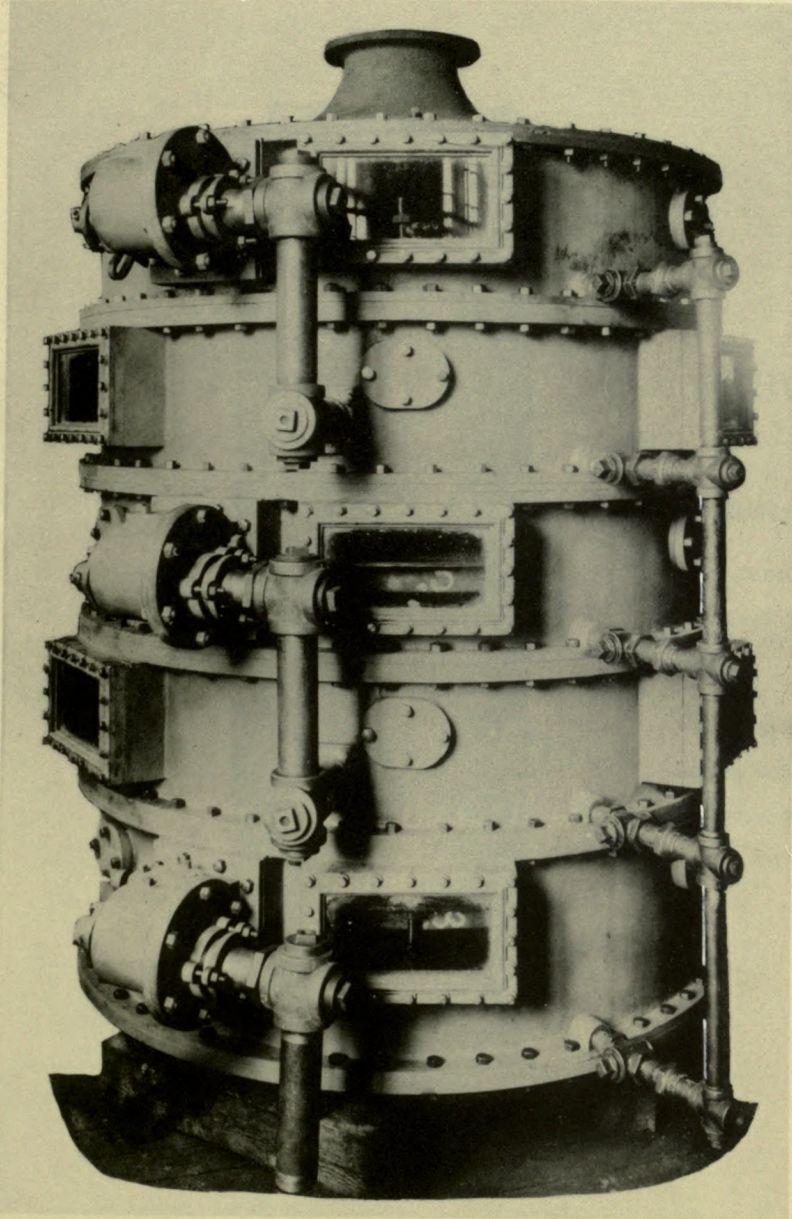
The gas has to pass a finely perforated plate, wetted with ammoniacal liquor, and then a very fine foaming spray of the same liquid.

The gas is broken up in very fine bubbles, thereby greatly facilitating the absorption of CO₂, sulphur compounds and ammonia.

The gas must be absolutely free of tar (coal gas) respectively oils (water gas) after passing one of these apparatus.

The washing can be regulated by adjusting the overflow, thereby throwing more or less water over the perforated plates.

GAS WASHER—Capacity 500,000 cu. ft.



ERECTED FOR THE GALVESTON GAS CO.

1891.

WASHER SCRUBBER—"CONTINUOUS" SYSTEM.

PAT. AUG. 17TH, 1880.

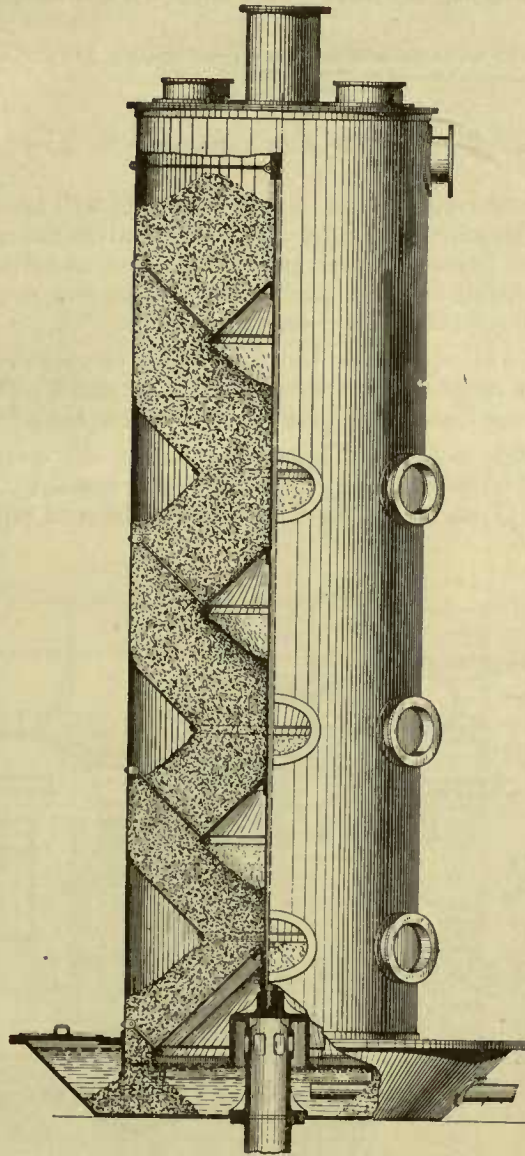
PLAN NO. 9.

ADVANTAGES.

NO MOVING PARTS.

NO WEAR AND TEAR.

Part of scrubbing material can be removed while apparatus is working.



ADVANTAGES.

ABSOLUTELY CLEAN GAS.

By removing a few bushels of gravel the apparatus cleans itself.

This operation can be performed while the apparatus is in operation.

The above is an illustration of a gas scrubber combined with one washer compartment.

The apparatus is used in coal gas works for removing *ammonia*, and gives *only one inch pressure*.

Ammoniacal liquor of any strength can be obtained.

It is *not absolutely necessary* that the gas should be *free of tar*.

For water gas the apparatus can be used as a combined cooler, tar and light oil extractor, and to wash out the greater part of CO₂.

PLANS AND DESCRIPTION OF DIFFERENT GAS CONDENSING AND PURIFYING MACHINES.—SYSTEM BREDEL.

Plan No. 10 represents my purifying machine with a capacity of 500,000 ft.

Plan No. 11 represents the same with exhausters combined in a very compact style, all in one building. The building is 28 x 28 ft. inside.

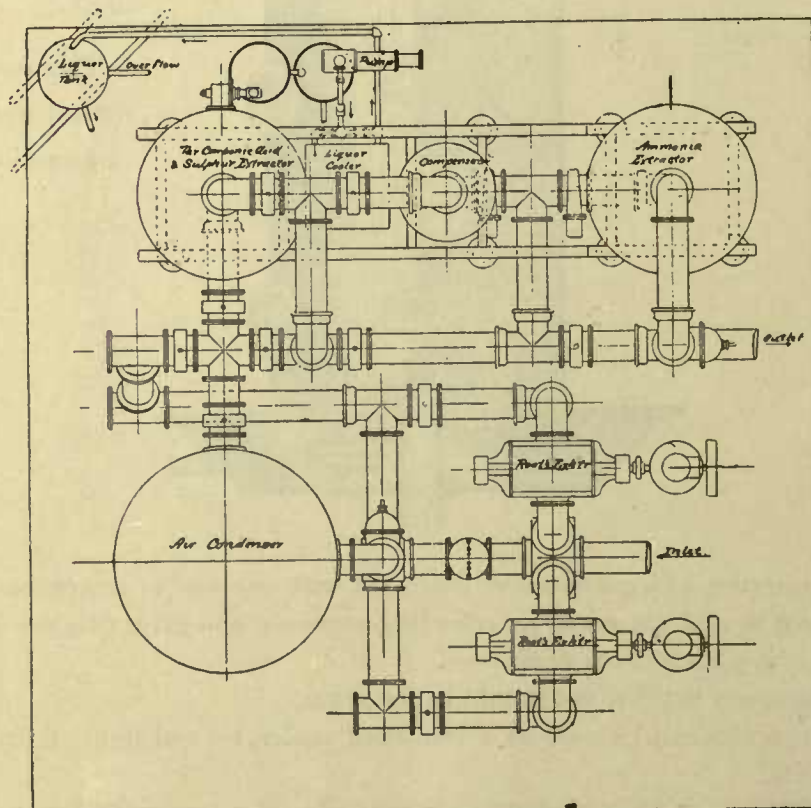
Plan No. 12 represents my purifying machine with exhausters for 2,000,000 ft. daily capacity.

The valve arrangement is a new construction of my own. It will be seen that all the valves for every two apparatus lay together in one bunch. The inlet and outlet valves are regular gate valves, while the by-passes are disc valves. The by-pass boxes are used at the same time as collecting vessels for tar, respectively water condensation. The inlet chamber or upper part of the by-pass box is connected with the lower part by means of drain pipes, which can be adjusted to any desired dip.

As soon as the pressure on one apparatus becomes too heavy by some reason or other, the gas passes through the dip pipes, thereby automatically by-passing the apparatus. The bubbling noise will draw the engineer's attention, and he will know immediately where the trouble is and attend to it.

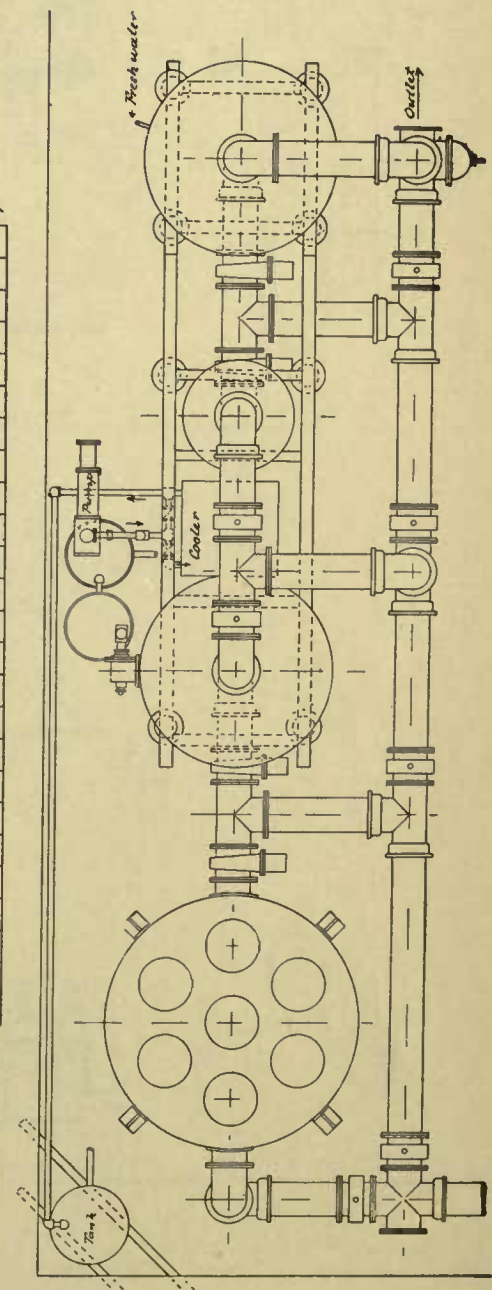
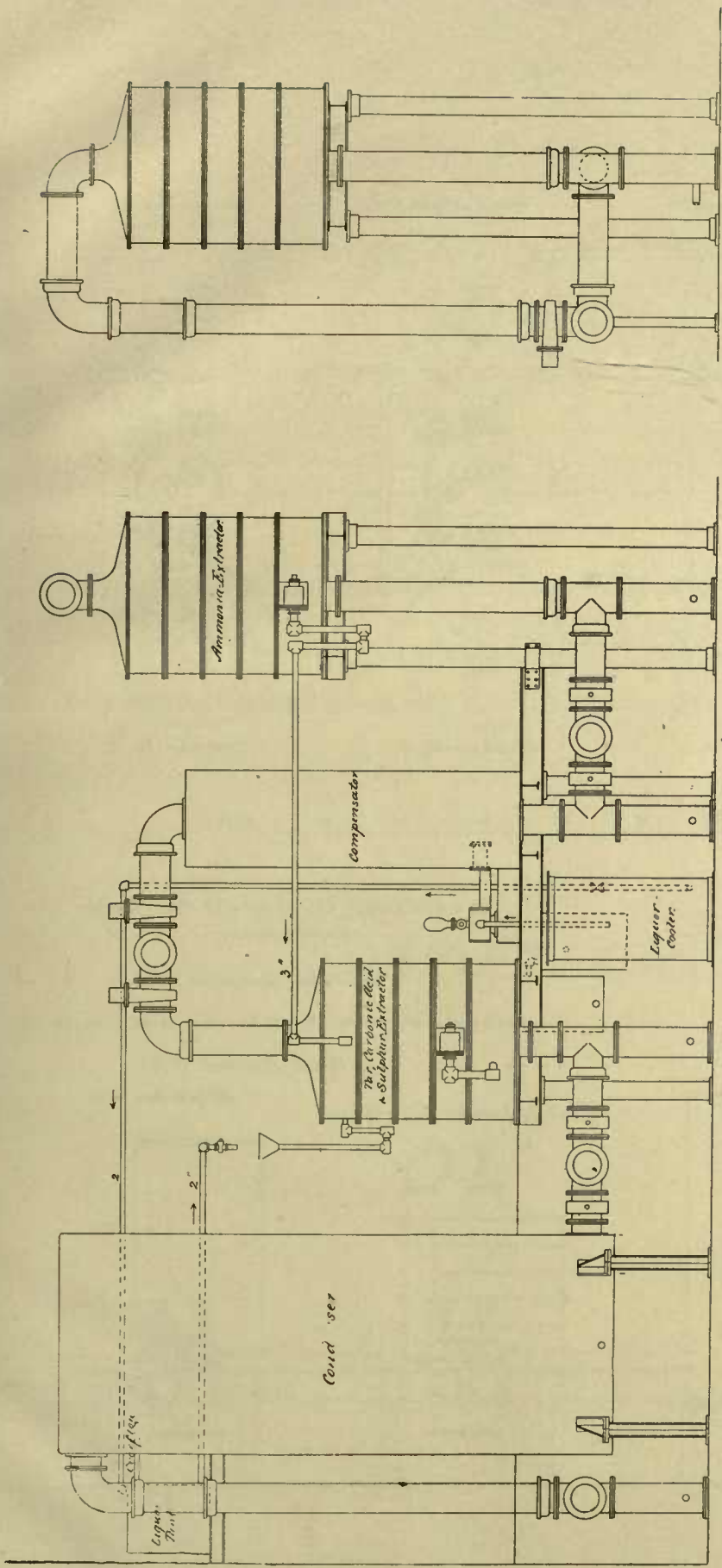
The pressure gauges delivered with these apparatus are of my own construction and provided with stuffing boxes throughout so that broken glasses can be changed instantly. They are also arranged with three-way cocks so that the pressure given by any one apparatus can be read off directly without subtracting the different pressures.

PLAN NO. 10.



GAS CONDENSING AND PURIFYING MACHINE. Capacity, 500,000 cu. ft.—SYSTEM BREDEL.

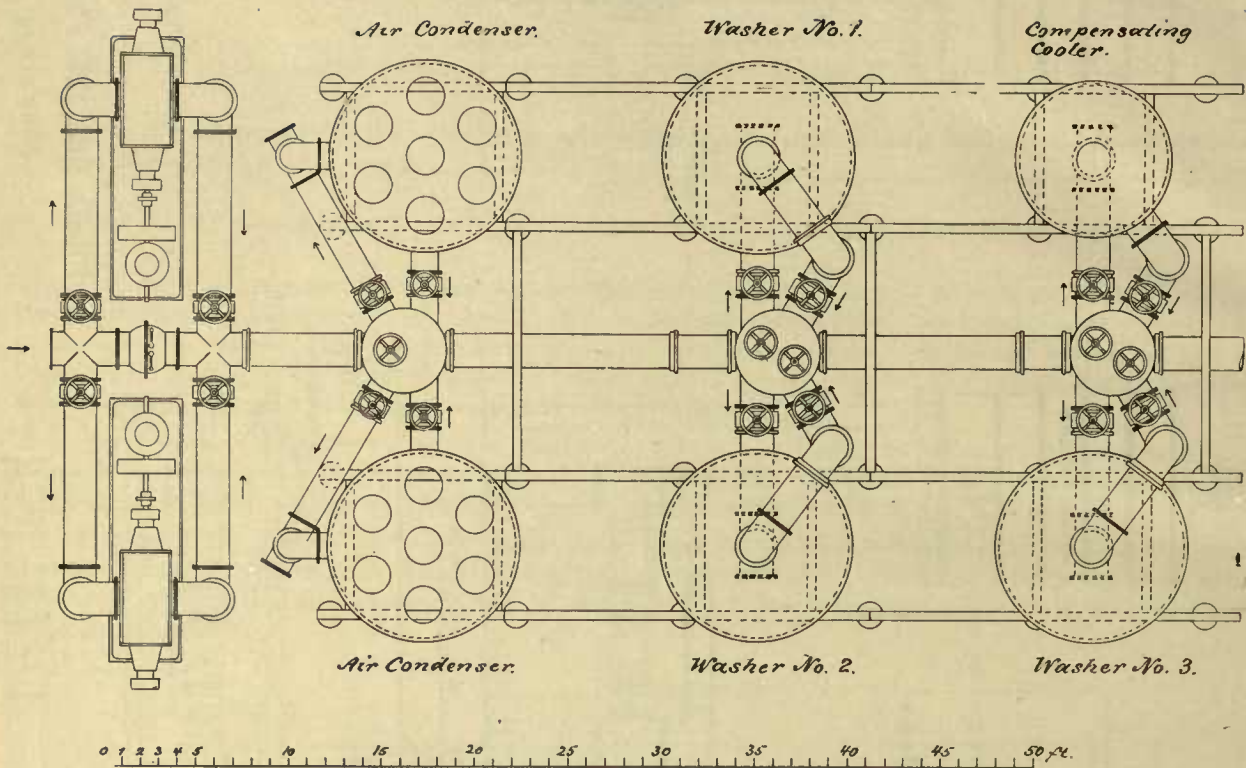
PAT. AUG. 17, 1880. MARCH 27, 1888. AUG. 28, 1888. JAN 26, 1892.



CONSTRUCTION 91.

FRED. BREDEL, C. E.,
MILWAUKEE AND NEW YORK.

PLAN NO. 12.



Condensing, Cooling and Purifying Apparatus.

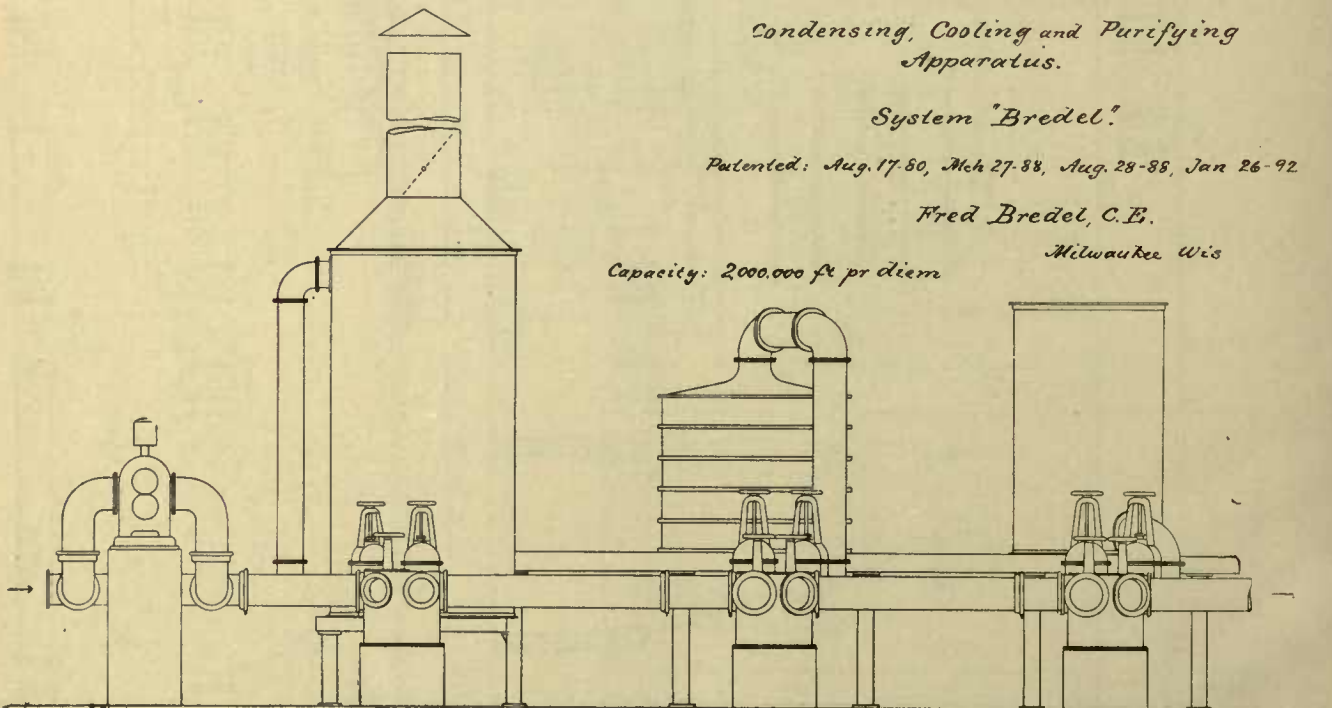
System "Bredel".

Patented: Aug. 17-80, Mch 27-88, Aug. 28-88, Jan 26-92

Fred Bredel, C.E.

Milwaukee Wis

Capacity: 2000,000 ft³ pr diem



WATER GAS PLANTS

. . . . AND . . . ,

COMPLETE GAS WORKS.

WATER GAS.

I have designed a water gas apparatus using retorts for fixing purposes. The apparatus consists of three cupolas, of which the center one is a *decomposition chamber* filled with a material consisting to a large extent of iron, and yet *absolutely refractory*. The water gas made by this process is nearly *absolutely free of CO₂ and water vapors*. This gas passes through a scrubber which will cool the gas and at the same time take out the last traces of CO₂, a great part of the sulphur and all of the ammonia (if there should be any.) From there the gas goes into a relief holder; after coming out of the relief holder the gas is heated by hot air to a very high temperature. It passes then through a separate chamber, where it takes up the naphtha, and from there it goes through fixing retorts.

In case crude oil shall be used as an enricher the apparatus becomes a little more complicated. By a special arrangement (which is an invention of my own), the crude oil is first divided up in very minute particles (in other words, it is mechanically evaporated without the use of heat); then it meets the highly superheated water gas and becomes itself superheated and thoroughly mixed with the water gas; it then passes immediately into the retorts and is there rapidly brought up to the necessary temperature for decomposition. *All the hydro-carbons are thereby decomposed*, and the gas is of a *better illuminating* power than can be obtained from the *same amount of gallons of naphtha*.

Deposition of pitch and lamp black is prevented.

The manufactured gas then passes through suitable purifying apparatus.

Either *gas coke, furnace coke or anthracite coal*, and if necessary steam coal can be used for making the water gas, but it is advisable not to use the latter on account of impurities.

FIXING BENCHES FOR RETORT WATER GAS PROCESS.

I have erected different benches for these processes, among others:

Three double benches of 6's for the Milwaukee Gas Light Co., of a capacity of 2,500,000 ft. per 24 hours. (Wilkinson process.)

Two double benches of 6's and one double bench of 4's for the Newark Gas Light Co., of a capacity of 2,250,000 ft. (Wilkinson process.)

One double bench of 6's for the New Orleans Gas Light Co., of a capacity of from 600,000 to 750,000 ft. (Their own process.)

The by-following is a copy of a letter received from Mr. E. G. Cowdery, Supt. Milwaukee Gas Light Co.:

Mr. Fred. Bredel, City.

MILWAUKEE, August 29th, 1892.

DEAR SIR: In reply to your question, I can say that your water gas bench of 6's with retorts 26"x16"x20' as built by you is doing the following work *each and every day*:

When using 58° naphtha—

Make per bench per 24 hours, commercial gas,	- - - - -	750,000
Gas coke used for firing, per 1000 ft. commercial gas,	- - - - -	9 $\frac{3}{4}$ lbs.
No. gallons naphtha fixed by bench per 24 hours,	- - - - -	3,375
No. feet oil gas per bench per 24 hours,	- - - - -	210,000
No. pounds coke to fix 1000 ft. oil gas,	- - - - -	35

When using 68° naphtha—

The make per bench per 24 hours, commercial gas, - - - - - 850,000

Coke a *little less* than the above per 1000 ft.

Candle power commercial gas averages 30.

Very truly yours,

(Signed) E. G. COWDERY.

COMPLETE GAS WORKS.

To parties desiring to enlarge their old works, or build complete new works, I will furnish on application plans and specifications under the following conditions:

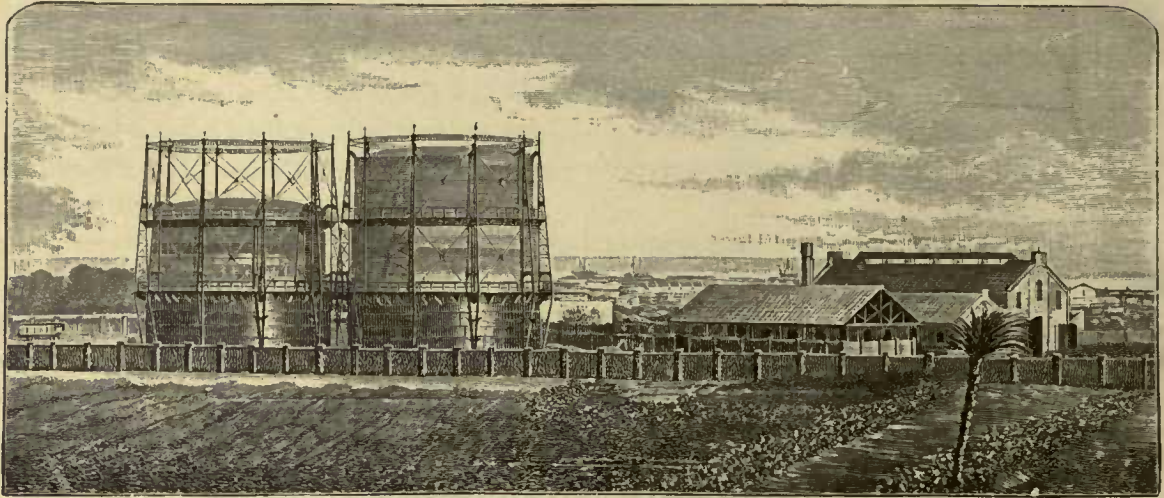
I either charge a fixed sum for the plans or I will undertake to build their entire works complete.

I have constructed and erected for the People's Gas Light Co. in Cleveland, the benches, etc., complete exhausters, condensing and purifying machinery for a capacity of 1,800,000 ft. per 24 hours.

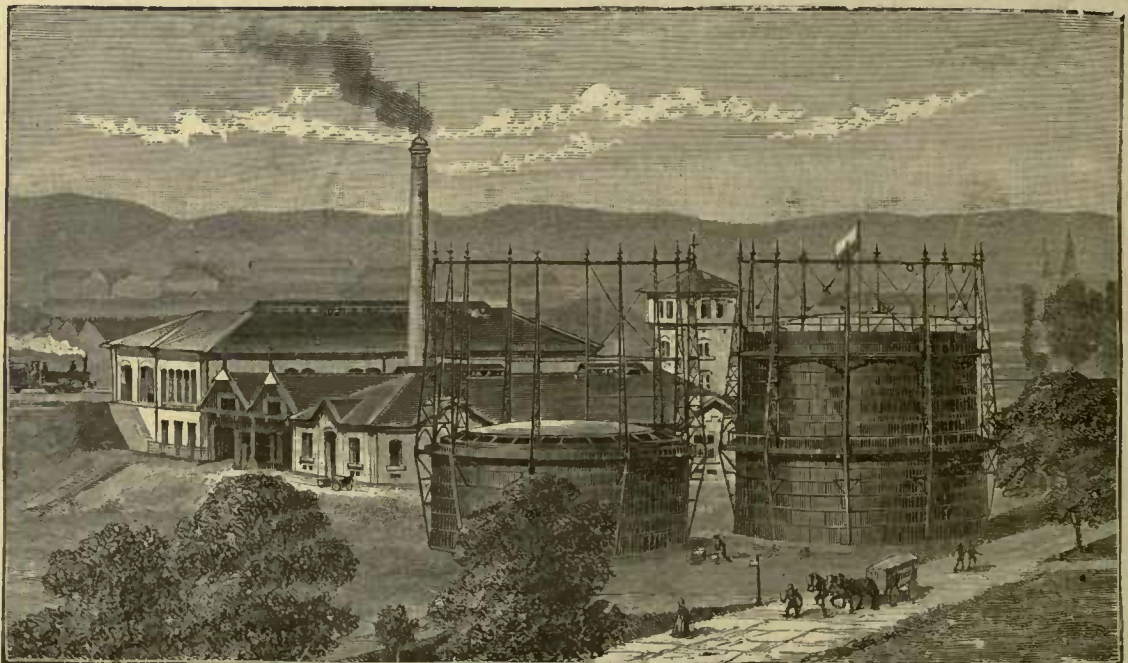
With my system I will guarantee that the total cost of a coal gas works will not be more than any other kind, and the gas can be made cheaper and of a better quality than with any other known system.

For complete water gas works by using my retort process I will guarantee to make a cheaper and better gas than with any other known system at a less first cost than any other retort process.

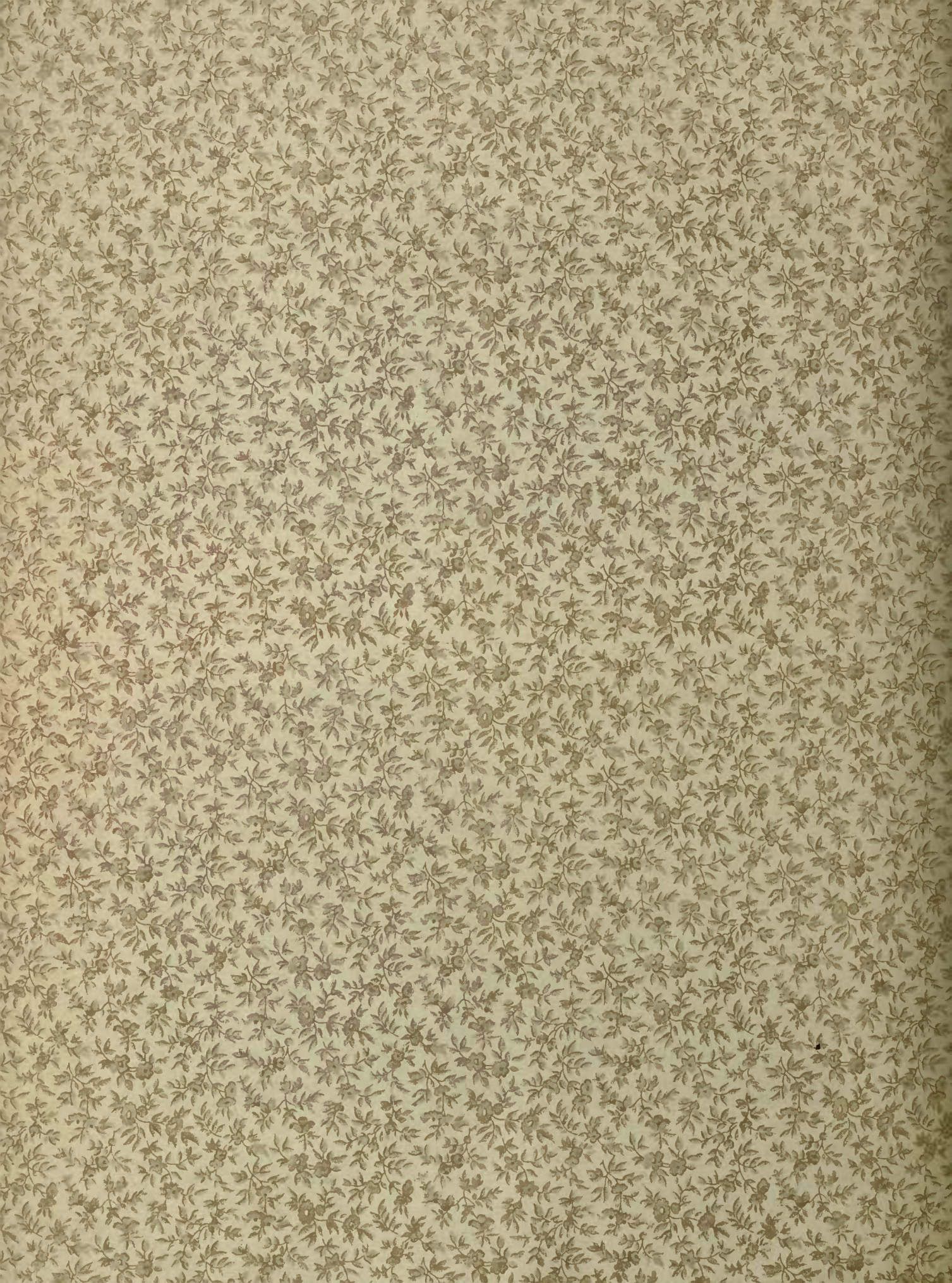
The annexed cuts are views of two complete gas works built by us:



GAS WORKS, CADIX.
CAPACITY 500,000 CU. FT. PER 24 HOURS. CONSTRUCTED AND ERECTED 1886.



GAS WORKS, KAISERLAUTERN.
CAPACITY 600,000 CU. FT. PER 24 HOURS. CONSTRUCTED AND ERECTED 1887.



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