E A R L Y H I S T O R Y

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T H E S O L V A Y P R O C E S S C O M P A N Y

B y

EDWARD N. TRUMP.

(In Chapters)

CHAPTER II

History of Improvements and Original Designs of Apparatus.
of THE SOLVAY PROCESS COMPANY
From March 6, 1882 to November 1, 1921.

The Works of The Solvay Process Company, at Syracuse, founded by William B. Cogswell, was commenced in the Fall of 1881.

Beginning of Construction:

The writer was recommended by John E. Sweet as the first Engineer to be employed, having been asked by Mr. Cogswell to find a man with similar experience.

In January, 1882, when he walked up to the property on the ice of the canal he found an excavation for the chimney, with some of the foundation stones in it, and a corner of the wall of N° 1 Element (the Southeast corner of the present Distillation Building) just started.

Mr. Cogswell had purchased the property known as the Gere Farm, and a small house with about an acre of ground around it, which had a fine spring in a hollow near the center surrounded by a grove of fine trees.

This property belonged to the Widow Throop, who continued to live there for three years. The spring drained through a culvert under the canal through the Blast Furnace property to the lake.

(See Map A) The property included the round-top hill, now occupied by the Brine Reservoir, and the area between Willis Avenue known as the Blast Furnace Road and the Fraser & Jones' piece had been purchased by Mr. Cogswell in 1881, from the Gere's.

The price had been agreed upon and an option taken by Mr. Cogswell, but it was raised by the Gere's over night, and was finally purchased at a much higher price. Mr. Cogswell would never allow any of the Gere's to purchase any of the

stock of the Solvay Process Company because of the bad faith shown in the land transaction.

Straight Line Engine Co.:

Mr. Cogswell had gone to Belgium to get detail plans, order castings and have a conference with the Solvays, and Prof. John E. Sweet gave the writer employment in the Straight Line Engine shops making detail drawings of a worm drive milling machine for Charles E. Lipe, until March 6th, when Mr. Cogswell returned, and he was engaged as an Engineering Assistant at a salary of $1000 per year--a good salary in those days.

French Plans, Metric Measures:

The plans which had been prepared by Solvay & Co., of Brussels, were all in French units, and wherever they were to be used by American workmen had to be translated.

The details of much of the apparatus required modification, or redrawing. The piping plans had to be made and the machinery ordered in the United States, arranged on the general plans.

The cast iron rings and passettes for the D.S., R.H., L.C.L. and L.C.S. and C.Ls, were nearly all ordered in Belgium because it was thought they could not be made as well here.

They proved to be very poor castings, and the defective ones were replaced by the Colwell Iron Works of New York, who also made many other satisfactory castings, and with the Straight Line Engine Co. supplied us with a large part of the next Elements.

FIRST OFFICE: We established an office and drawing room in the White Memorial Building, and built a small wooden building (90 ft. 6 in. by 32 ft.) in the middle of the works. The central portion (50' x 25') of one story, served as a store, and the two-story ends had a drawing room upstairs with office below at one end and laboratory at the other,

with a testing room below. This office served until the Main Office was built.

PERSONNEL: Mr. Royal E. Fox, under the direction of Mr. O. V. Tracy, who gave part of his time as Secretary and Treasurer, kept the books, and was Cashier.

Mr. F. M. Power, as Superintendent, looked after all outside labor, and watched the daily work of the construction. He had spent nearly a year in Europe studying the construction at Dombasle.

Mr. W. L. Neill, the first man employed, had also been at Dombasle for several months, and stayed there until nearly all the construction at Syracuse was finished, studying the chemistry of the Process.

Mr. Henry R. Cooper and Nicholas Bodot were sent over to study the operation, and Mr. J. William Smith was later sent over to study ammonia concentration in the Gas Works, which we expected to establish here to obtain a supply of ammonia liquors.

There were no By-Product Coke Ovens in existence in the United States, and we had to increase the ammonia supply by inducing the Gas Works to recover the ammonia which was being thrown away in the washing of the gas.

AMMONIA SUPPLY: We therefore furnished the concentration apparatus, and in many cases a man to run it. Mr. Smith had charge of this business, and accumulated the relative large amount of ammonia required to stock the works.

ENGINEERING: The writer was Assistant Engineer and Master Mechanic and Chief Draughtsman, with Frank Strahl as the only draughtsman, watched the construction, laid out the work, and helped Mr. Cogswell purchase the machinery. He designed the piping systems and arranged the details of the plant not provided for in Solvay & Company's plans.

Mr. Cogswell often directed the work, and was active in the purchase of supplies and making contracts. The writer helped lay out the buildings, inspected the work with the help of F. M. Power, who was Superintendent of the laboring force, and watched the work being done by contract.

This meant climbing to the top of the chimney nearly every day, and all over the C. L. Tower and Apparatus Buildings.

WALLS: The walls were of brick, laid in hydraulic lime; the brick were poor, and the contractor would dump them into the heavy walls without proper laying or filling of joints, if they were not watched constantly.

ROOFS: The roofs were of heavy planks on purlins carried by wooden trusses of 10" x 10" timber, supported on steel channel posts latticed on the open west side of the building where a temporary side was put in for the extension of N° 2 Element.

GENERAL ARRANGEMENT OF PLANT:

(Map B) The system of arrangement of Plant used by Solvay & Co. in 1882 was that of "Elements", as an example: Dombasle at that time had seven Elements, each having in one building its Engine Room, Distillation, 5 C.Ls, and equipment of Filters and round S.Hs.

DOMBASLE in 1882:

The lime kilns were in the same building, in one end, then the Distillation, then the D.Os, then Compressors, Vacuum Pump and Water Pumps; then came the brick-walled C.L.Tower, with L.C.L. high up, and the cooling R.F. for ammoniated brine on the lower floor.

C.Ls: The C.Ls were cooled by showers of water on the outside of lower third, and were 20.1 m rings high, with passettes an even distance apart in height. The center holes in

C.L.Rs: fauxfonds were 10" diameter. On the other side of the C. L. Tower were round tank Filters, with vacuum under the

flannels, which were filled with a bed of Bicarbonate 12" thick, washed, drained and dried, then shoveled out and dropped onto the floor below in front of the round S.H.

S. H. These S. Hs were flat round-bottom pans, over a furnace, with a small grate, and four outlets distributed around the pan connecting to the chimney flue. A ring set on top of the flange of the pan carried a conical cover with a water seal, and a frame above for the bevel gear drive to a vertical shaft. This shaft was 5" in diameter, and had a lower bearing in a heavy wrot iron spider with a central bushed hole. This spider was bolted to the ring, and the whole rig could be moved to one side when lifted up to allow the burned pan to be replaced. Two arms on the shaft carried heavy pivoted knives adjusted to scrape the pan.

The cooling and packing of Ash were also done in the same building.

D.D. D.S.: The Distillation in some of the Elements consisted of 4 C.D. arranged in a square, provided with a central valve, which connected three of them at a time with the R.H.

A cover over the opening in the top of each C.D. was opened, a charge of lime was introduced into a basket of iron rods below, the C.D. filled with filter liquor, and the covered and closed. Exhaust steam from the engines was introduced into the bottom of the C.D., the valve carrying it to the R.H. opened and the ammonia distilled off into the R.H. from the ammonium chloride. The excess steam distilled off the free NH_3 in the R.H.Heater, and was condensed, the gas with some water being absorbed in the absorber A.B. and the L.C.I., a second absorber, and passing to the air at atmospheric pressure. The excess gas from the C.L. was washed with brine in the C.L. and the brine, with its ammonia, went to the L.C.I. and A.B.

CONTINUOUS D.S.:

Mr. E. Hannon, then the Engineer at Dombasle, had designed a Continuous D.S., using milk of lime instead of solid lime, and several of these had been installed in place of the C. D., and were in successful operation.

Syracuse General Plan:

This Element system was adopted for Syracuse, and Solvay & Co. furnished a plan, Copy A, Map B, attached, which shows 8 Elements laid out on the property.

The Boiler Houses are shown separately, and the Lime Kilns taken out of the building are shown, convenient to a system of unloading from the canal.

Mr. Cogswell had decided to build the western 4 Elements first, and the first Element was started as the eastern one of this 4, expecting to grow towards the West. Experience has shown this to have been a mistake, as the later growth forced a congestion on the property in the narrow part, and did not utilize the eastern part of the property as well as if the eastern 4 had been selected.

Map C: The Map A-507, dated Sept. 9, 1882, shows the arrangement of buildings and tracks decided on and laid out by the writer. As we decided to get our stone by rail instead of canal the Lime Kilns were located south of the boilerhouse, and a trestle provided to unload the cars.

The coal was unloaded on another trestle close alongside the south side of the boilerhouse. The shipping track was along the canal, and shipments were made by boat in large amount.

Plan D-507: The Single Element Building had a heavy tower about the middle of its length, called the C.L. Tower.
(See Plan D-508 Nov.2,1882, drawn by the writer)

C.L.TOWER: The heavy walls enclosing the 5 C.Ls and 2 L.C.Ls, supported a large iron tank forming the roof. This had to be designed with internal trusses and riveted together in place. This tank is still in use receiving the water for the whole works, and the iron plates have lasted much better than steel used in N° 5 tank, which was built several years later and torn down in 1907.

WATER PUMPS:

The water supply came from the canal. A Knowles Duplex Pump, located in the engine room in the south end of the building, was regulated by hand to keep the tank full, the Engineer reading the height on a mercury gage at the pump. The water was distributed to the C.Ls, which were showered on the outside, and to the E.Fs for cooling the ammonia brine, which were in the C.L.Tower on the ground floor.

COMPRESSORS: A single Compressor in the southeast corner of the building, with horizontal steam cylinders coupled at right angles to a crankshaft, with a flywheel in the center of its length, with vertical gas cylinders coupled to same cranks, drew kiln gas and S.H. gas from the gas pipes and delivered from the ends of the two cylinders to the bottom of each of 4 C.Ls. The 5th C.L. was cleaned by steaming out as often as the scale made it hang up.

This Compressor was designed by John E. Sweet, and built by I. P. Morris, of Philadelphia.

VALVES: The valves were heavy rubber grids on a grating valve; water injection was used to cool the valves, and the gas in the cylinder. Corrosion of the valveseats and cylinders gave continual trouble.

4 S.Ps separated the water from the gas, and a pipe to the bottom of each of the 5 C.Ls was connected to one of the 4 S.Ps by a system of valves. A check valve was provided on each C.L. supposed to prevent the liquor from returning to the S.P. when the gas was shut off.

PIPING: The system of liquor piping allowed the changing of C. Ls by the pressure of the gas, and a feed about one-third of the C.L. down from the top.

SALT in C.Ls: A "Y" connection was provided about half the height of the C.L., and a pipe extended to the top floor, with a cock and funnel, which was used for the introduction of solid salt into the C.L., to increase the yield. This arrangement came near killing all of us, as will be told later.

VACUUM PUMP: A Vacuum Pump, with direct-acting steam cylinder, without fly-wheel, furnished vacuum for the Filter, the air being drawn through a water washer to save the NH_3.

FILTER: The Filters, located on the 2nd floor above the S.H. floor, were four long tanks arranged parallel to the C.L. Tower, with a vacuum reservoir connected below, and with small tracks between, on which small bottom-dump cars were filled by hand and pushed over turntables to above the S.H. where they dumped in piles convenient to be shoveled into the door of the S.H.

S.H.: The 4 S.Hs were a copy of those described above for Dombasle. They received the Bicarbonate shoveled in by hand, and the finished Soda was hoed out by hand and fell through an opening in the floor on to a brick floor in the cellar.

COOLING THE ASH:

The Ash was allowed to cool enough so that it could be shoveled into wheelbarrows and wheeled to the elevator for delivery to the packing bin (B.L.) if cold enough for packing. This was very seldom the case, as the S.H. charges were small, and being continually drawn onto the pile below.

The heat and dust made this cellar an inferno, and it was very difficult to keep men working there.

E. L. The elevators delivered the soda into tanks through two revolving 12 mesh wire screens on the top, and it was drawn off into barrels and bags at the bottom. Dumpers settled the ash in the barrels.

DISTILLATION:

See Plan D580)

The liquor from the filters was conveyed through tanks on which vacuum was maintained by the vacuum pump, to the four square filter tanks in a pit under the West side of Apparatus Room, where a considerable storage capacity allowed for fluctuation in the C. Ls and D.Ss.

A single vertical power engine drove a line shaft along the East wall extending the whole length of the building and driving the S.H. as well as all pumps for handling liquor for the D.S. and for the C.Ls. And several direct-acting steam pumps were installed for handling weak liquor.

A special direct distillation unit was devised for this plant by Solvay & Co. Two D.Ss, built of 10 cast iron rings, base and cover, provided with cast iron faux-fonds, with 18" centre holes, and passettes, and with small overflows from one compartment to the next. There were 10 of these compartments, the top one quite high, and a cover with a pipe leading to a header connected with an R.H. (Heater) alongside. Manholes each side allowed access to each compartment for cleaning.

C.H.L.: A special system for introducing the lime into the liquor after the R.H. was to be used. A large revolving cylinder, known as the C.H.L., located near the driving engine, but not shown on plan, was installed to receive and slake the lime in the liquor from the bottom of the D.S.

Because of the presence of salt and $CaCl_2$ the lime was granulated instead of being made into milk.

D. V.: This granulated lime was then elevated to a very large tank, 13 ft in diameter and 32 ft. high, which was provided with three stirrers with a series of arms revolving over plates, over which passed the lime, which was moved downward from plate to plate, the sand finally falling into three 5 ft. sand traps below where it was washed and extracted.

The hot filter liquor, after being passed through the H. H., was pumped into the bottom of the D.V. and overflowed into the D. C., a tank 12 ft. 6 in. diameter and 26 ft. high, with single stirrer, when the sand was still further settled out and time was given for the reaction between the lime and ammonium chloride.

D. C.: The D. C. overflowed into the D.Ss, one in run at a time and the sand was pumped back into the D.V.

C.H.L.: The C.H.L., 13 ft. diameter by 21 ft. long, was designed with 7 tires running on wheels, all keyed on one shaft on each side. These wheels were irregular, and the tires were not exactly the same diameter, so the shafts were twisted in two and the machine gave a great deal of trouble, although it slaked the lime very well and extracted the returns to be sent back to the kilns.

The cost of handling the lime from the kilns, and returns to the kilns, was excessive; also the operation of the D.V., and the handling of sand from sand traps, was also very expensive, so we abandoned the process very soon and moved the C.H.L. up to the lime kilns to make milk of lime with it.

MILK OF LIME: As a milk of lime apparatus it was a forerunner of the present M.L.T., and worked very well, except the breakage of the shafts, which finally became such a nuisance that we replaced it with the vertical M. L. Tanks, which were used until the improved M.L.T. was devised. It afterwards rolled around the yard so many times it received the name of "Jumbo.

The D. V. was then supplied with milk of lime, which, with the D.C., was used as a prelimer, and afterwards as a milk of lime reservoir for all Elements, and the D.C. as a storage tank when the milk of lime was pumped direct to the D.S.

UMPS: Mon. Henri, the Director of Dombasle, where most of the plans for the Syracuse Works were prepared, was very insistant on the policy of driving all the moving machinery from the Compressors. All the Vacuum Pumps, the Liquor Pumps, and even the S.H., were driven from the main Compressor , so that when the speed was changed by changing the Compressors governor, or throttle, all the other functions of the distillation changed together.

The adjustment of the pumps was made by changing the stroke of the plunger by sliding the pivot block in a rocking lever by means of a screw.

PUMPS: Six Pumps in one frame, located between D.C. and D.S., all driven by one belt from the main shaft, were provided as the only means of handling the liquors.

1	cylinder	for	F. L. Liquor.
1	"	"	R. H. "
1	"	"	Spare for F.L. & R.H.
1	"	"	Brine,
1	"	"	D.S. Liquor to C.L.
1	"	"	Spare.

A second 3-cylinder pump was provided, located between the D.S. & D.V., afterwards for milk of lime and cistern liquor, all driven with one belt, and a counter-shaft erected to drive the pumps.

ROUBLE WITH PUMPS:

These pumps gave us continual trouble. If the belt broke the Works stopped. The valves were made of 1/2 in. rubber, reinforced with plates, and held in to the back of the valve chest by inadequate tap bolts, with no means of locking them. The bolts were always getting loose and the thread stripping, so that the operation of the Works was governed by these Pumps, and after working 14 hours a day

we were continually called out in the middle of the night to get these pumps going and the Works started again. To put in those cap screws with hot R.H.Liquor from a leaky discharge cock running over one's hands was not a pleasant or quick job.

SINGLE APPARATUS PUMP:

We decided that individual pumps, with spare pumps for each service, was absolutely necessary for continuous operation, and we designed and built, with the help of John E. Sweet, the type of apparatus pump that proved so successful for many years. It was only after these were installed that we began to sleep at night, and to get continuous runs of 24 hours without stops.

We also provided a pair of small vertical engines to drive the pump counter-shaft, so that the main engine could be shut down when the S. H. shaft needed to be stopped without shutting down the distillation.

The absorbing system consisted of an A.B., and iron tank with conical bottom and top, with a cover of cast iron connected with the L.G.I., a cast iron passette washer receiving the inert gas from the A.B. and washing out the ammonia with the brine coming from the L.G.L. (Washer of gas from the G.L.)

No system of cooling this brine was provided, or of cooling the gas from the R.H.

D.B.: The brine from the A.B. overflowed to three wrot iron D.B.s, where the precipitated mud was settled out and this mud was drawn into a C.D.- a tank 5 ft. in diameter, with hemispherical bottom, where it was settled, the clear liquor blown back with gas pressure into the 1st D.B. and the ammonia distilled off with steam into the R.H. This was used for a year until it blew the roof off of the apparatus room and wrecked the plant for a month, and was abandoned for the system of pumping the mud into the R.H. direct.

The milk of lime was conveyed by a pipe to the pumps and pumped to the D.V.

The troubles with this distillation plant were numerous; we had to work 12 to 14 hours a day to keep it going, and we were frequently called out of bed in the middle of the night to wrestle with the pumps.

LIME KILN: See Plan L-795, and General Arrangement L-796.
L-795
L-796

The three Lime Kilns were simple cylinders 20 ft. high above a grate made of 1½ in. square bars resting on a rail across the center, and a bar at the side. The top had a central hole at the top of a cone of brickwork, 8 ft. 10 in. inside at the bottom, and 4 ft. high; the lining increased in inside diameter for 12 ft. to 9 ft. 10 in., and a bosh 4 ft. deep left a grate 6 ft. in diameter. This grate was 6 ft. above the ground, and delivered the lime into hopper cars underneath when bars were shaken.

A gas outlet at the top was connected to a water seal expansion joint, and a header at the bottom of the kiln, and two L.F.Rs connected to treader, washed the gas before it entered the main pipe to the Compressors.

STONE HANDLING: The stone was forked into bottom-dump hopper cars, of the standard size still used in the Works, on the small track leading from the stone trestle to an elevator, which raised them to the top of the kiln.

We designed a special ball bearing turn table, still standard in the Works, to turn the cars on the tracks and at the top and bottom of the elevator. The cars were pushed by hand.

LIME: The lime was handled in the same cars from the bottom of kilns, into a hopper in line with them and the same height. (see plan L-796), and was pushed to the apparatus room to the O.H.L., at first in the same cars;

O.H.L.: After the plan of distillation was proved to be a failure the O.H.L. was moved up to the lime kilns and erected as an M.L.T., in the position shown in Plan L-796, so it could receive lime directly from the hopper.

The C.H.L. was a cylinder 11 ft. 6 in. dia. by 21 ft. in length, with flat closed end. A smaller cylinder 5 ft. diameter, perforated with 1 in. holes, received the lime, and the water was kept at a level to just cover it. Pickups at the discharge end lifted the sand and returns up and delivered them to cars, to be returned to kilns or carried to waste pile.

The cylinder revolved on 7 tires, and the wheels supporting them were on shafts on each side. They were keyed to shafts, and the shafts broke frequently because of the differential motion caused by difference in diameter of wheels or tires.

The apparatus worked well as an M.L.T., made good milk, but washed a good deal of lime because there was no means for washing the sand.

The building was an iron floor at the top of the kilns, with corrugated iron roof over it, and corrugated iron side along the South side; a plank lean-to roof, with trussed rafters, covered the L.F.R. and C.H.L. at the North.

BOILER HOUSE: The main chimney was a well built, well designed structure, with square cut limestone base 20 ft. high, and octagonal taper shaft 150 ft. high. It had a flaring top with a cast iron cover, and was a handsome chimney.

Alongside of this was a Fan house, with a Sturtevant engine-driven fan delivering air into a long air tunnel under the boilers.

The Boiler House, parallel with the South side of Apparatus Building and 30 ft. from it, extended towards the West, and was 46 ft. wide by 150 ft. long; it had 4 - 205 HP. B. & W. Boilers (no Economizers) with room for 6.

A large cistern under the fire room floor received rain water from the buildings for use in the boilers, and a direct-acting plunger steam pump sucked up the water and delivered it to the boilers.

The main steam pipe were a collector of 10 in. diameter, delivering to a 12 in. pipe crossing the street to a steam receiver and separator in the engine room for each Element.

MACHINE SHOP: A Machine Shop 42 ft. by 100 ft., with a small equipment of machine tools, pipe threading machines, and a forge, was erected and equipped to help in the erection of the machinery.

AMMONIA STORAGE:

A 30 ft. diameter 250 M$_3$ iron tank was erected between the machine shop and office, to hold the concentrated ammonia liquor, and connected to the concentration apparatus marked "A.C." on the plan, which was used to distil ammonia from weak liquor hauled in a tank wagon from the Gas Works at Syracuse.

AS WORKS: A gas holder of 10,000 cubic feet capacity, and an oil gas retort, were erected in a building 40 ft. by 72 ft. An oil tank near by held a supply of oil. This oil-gas was used in the laboratory, and at first to light the Works, until electric lights were sufficiently developed.

RINE SUPPLY: The brine tanks were 4 in number, built of wood and covered by a building with a pitched shingle roof , 50 ft. by 100 ft. This building was used to store salt, which was bought from the Salt Blocks, which were very numerous around the East end of Onondaga Lake, or the waste salt from the Solar Salt Plants, which covered the flats in all directions.

The salt business of Syracuse was very extensive at that time.

RINE WELLS: The brine of from 70 to 75% saturation was pumped into the four tanks under the salt house from five wells, located North of Onondaga Creek, and East of the lake. See plan A-1150. These wells were like many other wells belonging to the State Salt Reservation plants, which pumped the brine from a bed of gravel at the end of the lake, which was

afterwards found to extend to Tully, and received the salt from the salt beds south of Cardiff.

This gravel bed was about 400 ft. below the lake level, and 6 in. pipes were driven down through the sand and drift, the sand inside being pumped out with a sand pump, and a vertical pump located over each well, with rods leading to a plunger through a pipe suspending the pump barrel, was actuated by a steam cylinder above to pump the brine into a wooden tank on the surface.

BRINE PIPE LINE:

Two boilers also furnished steam to a direct-acting pump, which delivered brine through a 6 in. pipe line laid along the railroad track to the Works. The brine, having about 224 g.p.l., was saturated by dissolving salt in wooden racks in the ends of the tanks in the center of the building.

SALT SUPPLY: The salt received in barges on the canal, or in cars in winter time, was unloaded into wheelbarrows by hand and wheeled into the ends of the salt house, or dumped into the salt racks in the tanks.

As the salt used per ton of Soda in those days was 2000 kilos the amount of salt dissolved was nearly 500 K. per ton of Soda made, and the labor of handling this salt from barges and rehandling into the dissolving racks was a considerable expense.

The racks filled up with debris, which came with the salt; the tanks had to be emptied and cleaned at intervals of a month, and the brine was not well saturated because it was not forced through the salt.

It was soon seen that this process must be improved, and as soon as the Works were well started the writer devoted some time to a study and erection of a handling and dissolving plant, which eliminated much of the labor and gave better brine.

1st Salt bed in NY State was found in 1878 at Wyoming. Also at LeRoy in Mar 1879

ROCK SALT: No salt bed was known in New York State, and Syracuse was the only salt supply. Rock Salt had been discovered in Michigan, and salt was being made there from brine obtained by pumping water down and evaporating the salt in grainers by the exhaust steam from the lumber mills.

GEOLOGY: Mr. Cogswell and the writer had many discussions about the location of a salt bed, which we felt sure must be under the layers of limestone to the South of us. The geological maps were faulty and showed an outcrop of limestone at the Indian Reservation, therefore the failure of the wells at Cedarvale and Jamesville was discouraging.

We used brine from the State pumps at first, and only drilled the 5 wells at the end of the lake in October 1555.

We hoped to continue the search later when we had time to study the subject, and money to drill more wells.

TRIP to DOMBASLE:

The writer, after seeing the Plant construction well started, and all the principal apparatus erected, sailed for Europe in November 1552, with W. L. Neill, who had come home some months before. We spent a month at Dombasle getting the latest detail plans of construction, and studying the operation of the Works. M. Gielen, now President of the German Works, spent the month there with us. We left for Brussels at Christmas, and the writer sailed for home January 1st, 1553, Neill waiting at Dombasle until Cooper and Smith had completed their study.

The Plant was completed on January 1st, 1554.

ntinued Search
r ROCK SALT: The Works were on the Red Salina Shales, which had once contained the salt; above this was a layer of Gypseous Shales, then the lower Helderburg Limestone, the Oriskany Sandstone, then Corniferous Limestone--the grey limestone of Split Rock, then the Marcellus and Hamilton Shales, and the Tully Limestone.

We decided to drill two test wells, one at Jamesville and the second in South Onondaga Valley, at Cedarvale. These were carefully sampled and the drilling watched. As it was in winter it was often necessary to wade over Split Rock hill and use snow shoes when a horse and cutter could not get through.

The wells were drilled deep enough to pierce the Red Salina Shales to the Niagara Limestone. We found a little brine and evidence of salt in the shale, but no bed of rock salt in either.

We then decided to go farther South, and started a well in the middle of the Onondaga Valley, at Cardiff, near the birthplace of the Cardiff Giant. We were surprised to find no limestone across the Valley, and a bed of gravel and boulders, which was very difficult to drive a pipe through. We only succeeded in getting down 700 feet when the pipe collapsed and we found no salt or brine, and abandoned the wells.

We then decided to go farther South to the end of the valley, at Tully Farm , where there was a water supply near at an elevation above the wells, high enough to force the wells without pumping. We again started in the middle of the valley, with the same result as at Cardiff--700 feet and a collapsed pipe.

Our Directors were now discouraged, and Mr. Cogswell had great difficulty in persuading them to let him try again. He finally said he would go ahead at his own expense if they would not consent, and they gave in.

We located this well on the rock on the East side of the valley at the foot of Christian Hill, and struck the rock salt at 1216 feet. The bed was 45 feet thick at this point. It was afterwards found that two other beds of nearly the same thickness were under the first bed.

Another well was afterward drilled four miles farther North, to locate the limit of the salt, but no salt was found.

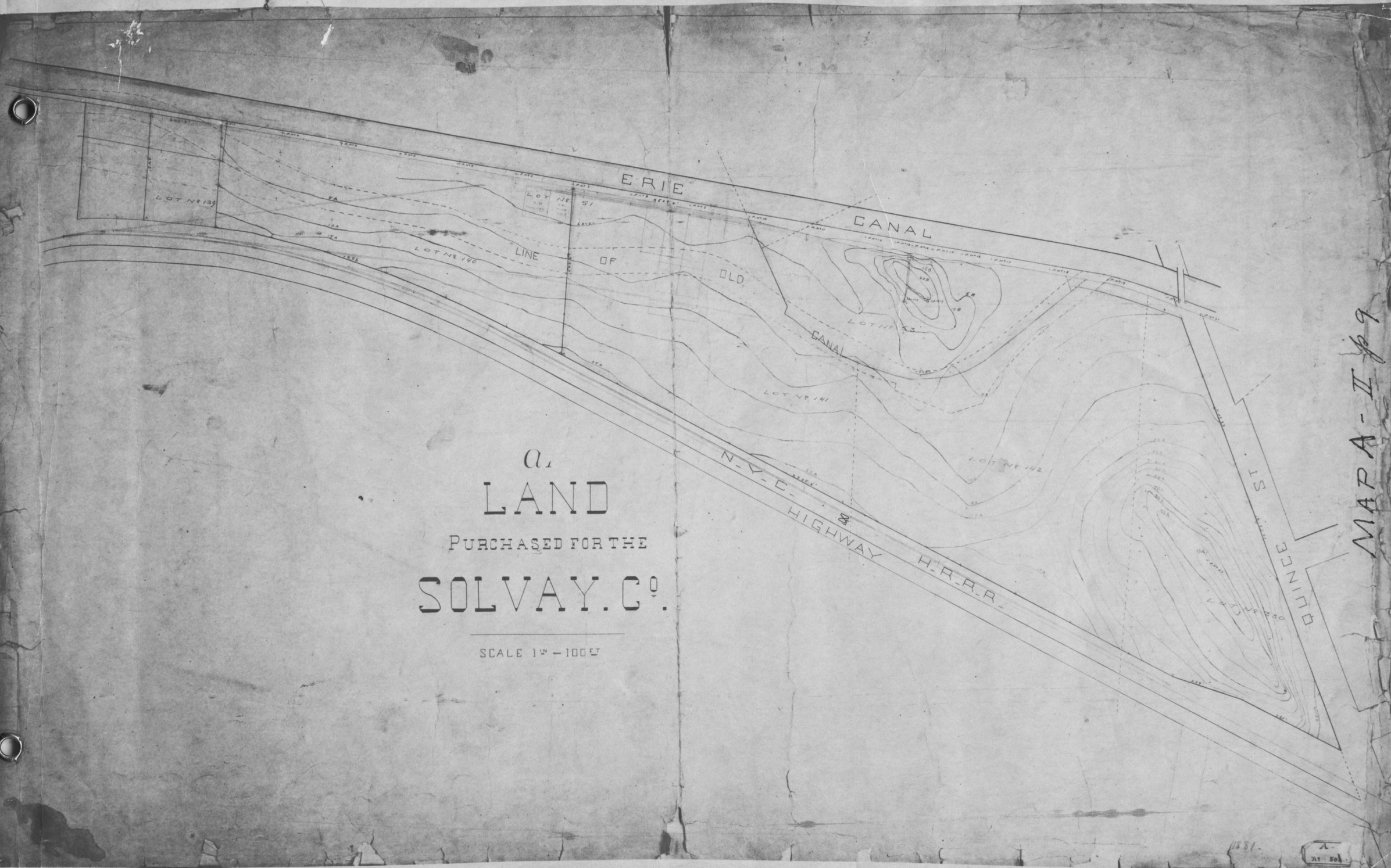
Other wells were drilled in groups 'A'to'F', for one mile North, and all found salt. Group "B" found beds up to 216 feet thick, some of them 1500 feet down, showing a fault or other irregularity in the beds, and others went through two or three beds, with 30 feet of rock between.

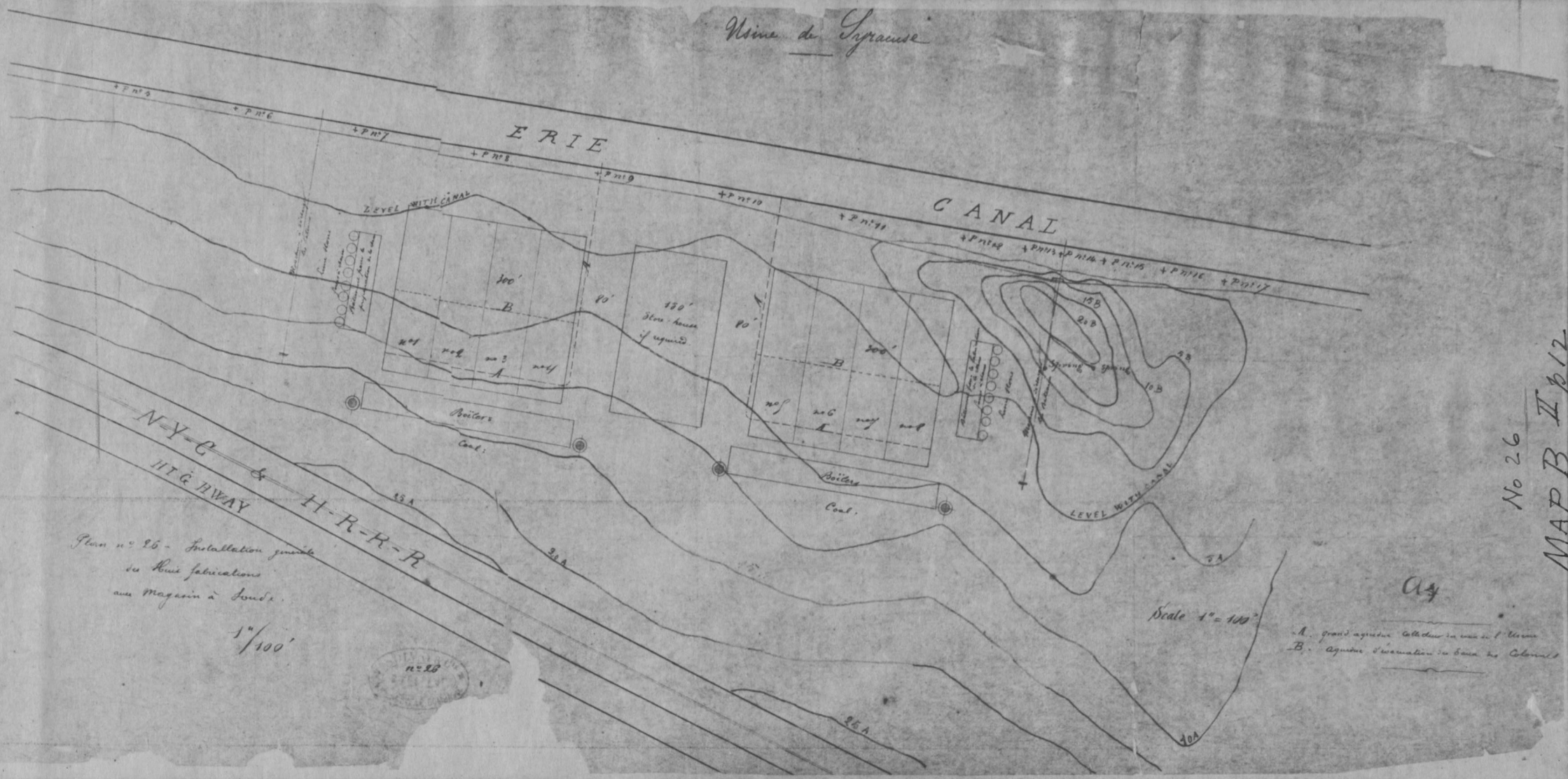
The Tully Lakes and Vesper Pond were purchased, and pipe lines laid to them. A Right-of-way was secured for these pipe lines before the drilling of the first 10 wells was commenced, and also a Company was incorporated, and a right-of-way secured along the highways and through the Indian Reservation from the tribe of Indians, to Syracuse.

Contracts were let for a 12 in. cast iron pipe line, with lead joints. Work on this line was begun May 14th, 1889, and the line was completed November 16th, 1889.

The reservoir at Tully, for receiving brine from the wells, and the storage reservoir in the hill at the Works, was constructed. The cost was as follows:

Reservoir at Tully, -	$ 6,133	
" " Solvay -	16,583	$ 22,716
Cost of Pipe, -	$146,692	
Specials -	4,129	
Lead -	9,514	160,335
Hauling, Trenching, Laying & Caulking -		41,255
Freight -		15,442
Engineering, Legal Expense & Right-of-way -		28,333
Interest adjustment -		17,689
		$ 285,770
Paving Solvay Reservoir with stone -		754
Extension of 10" brine line in 1890 -		1,443
" " water & brine line to Vesper(1895)		15,682
" " " pipe to Vesper mill dam (1896)		9,210
		$ 312,859


ERIE
CANAL
LOT Nº 139
LOT Nº 140
LINE
OF
OLD
CANAL
LOT Nº 141
LOT Nº 142
N.Y.C.
&
H.R.R.R.
HIGHWAY
QUINCE
ST
a
LAND
PURCHASED FOR THE
SOLVAY. Cº.
SCALE 1" = 100'
MAP A-II #9

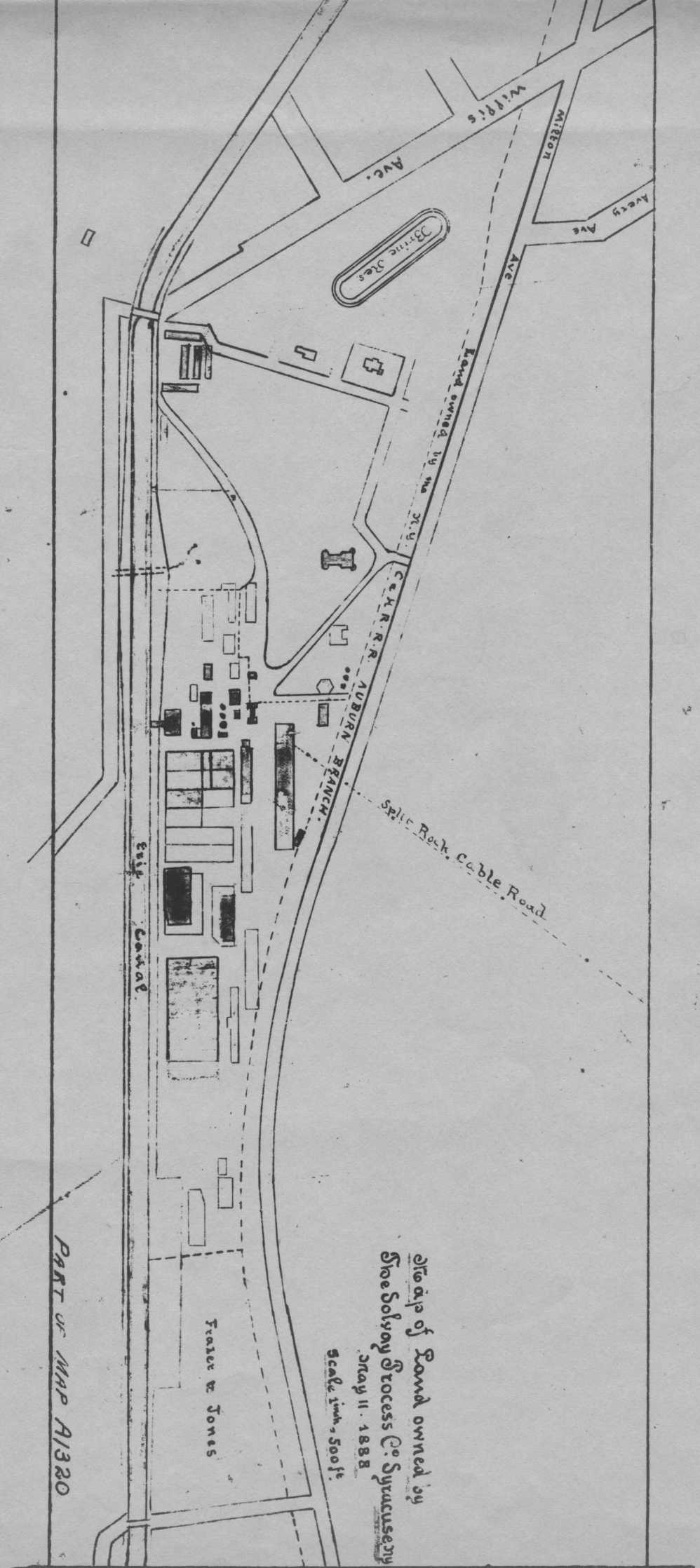


Plan n° 26 - Installation générale
des Nlle fabrications
aux Magasin à Sondes.

1"/100'

A. grand agrandissement du coin de l'usine
B. Agrandissement du bout du Colonnade

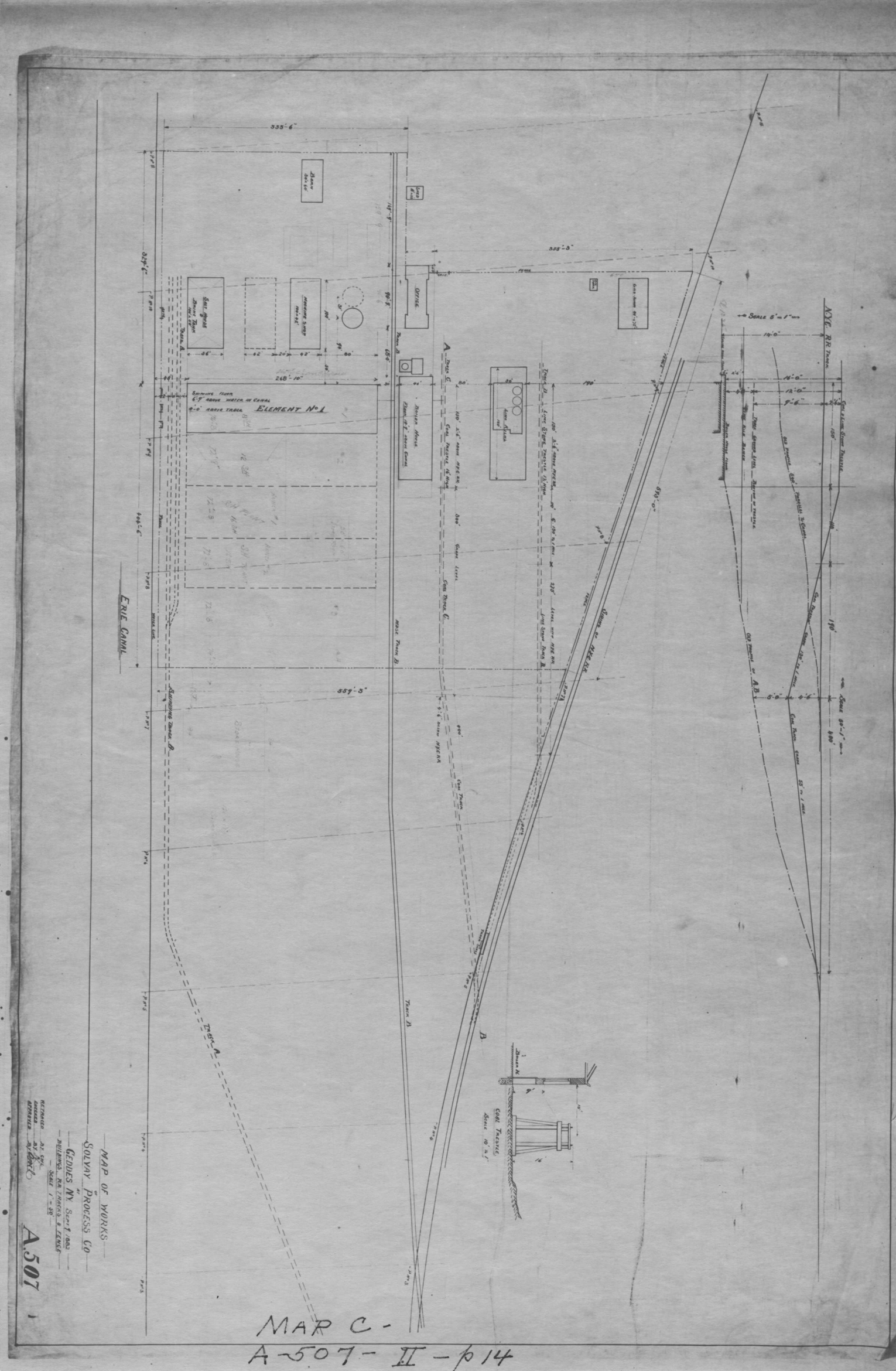
No 26
MAP B Z 612



Map of Land owned by
The Solvay Process Co. Syracuse, N.Y.
May 11. 1888
Scale 1 inch = 500 ft.

PART OF MAP A1320

COPY A (1320)
MAP B - II - p 14



MAP C-

A-507- II - p 14

The Solvay Process Co.

Syracuse N.Y.

October 30th 1882.

Triangs del.

Under ground Pipe Plan.

Scale 1" = 10 Ft.

Brine Tanks

Main Sewer

Machine Shop

3" Fire Plug

6" Pressure Mains

Office

6" Tile

18" Sew

Blower House

Pumps

Hot Water

6" Pipe

18" Sew

14" Suction pipe

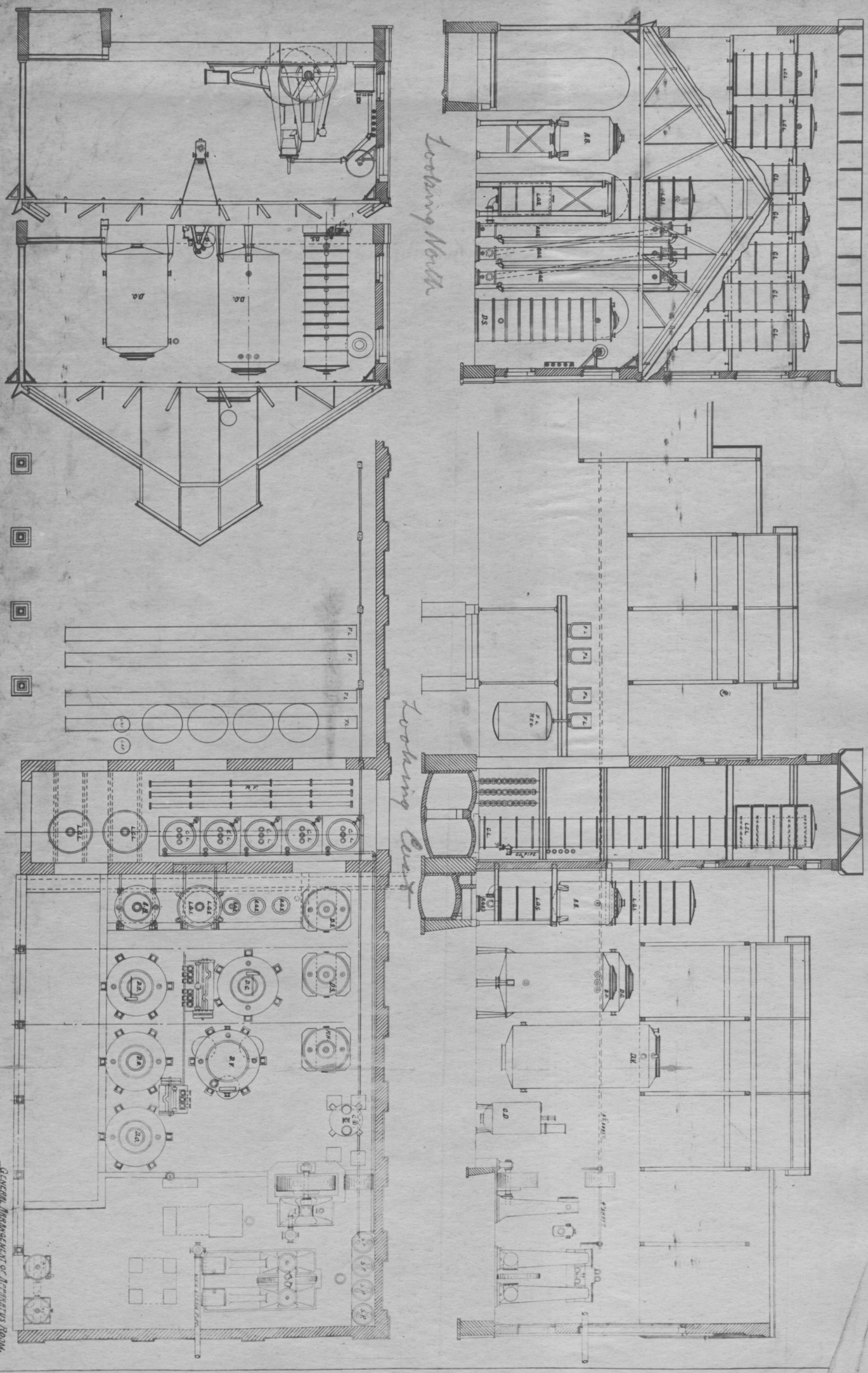
Element No 1

Stream

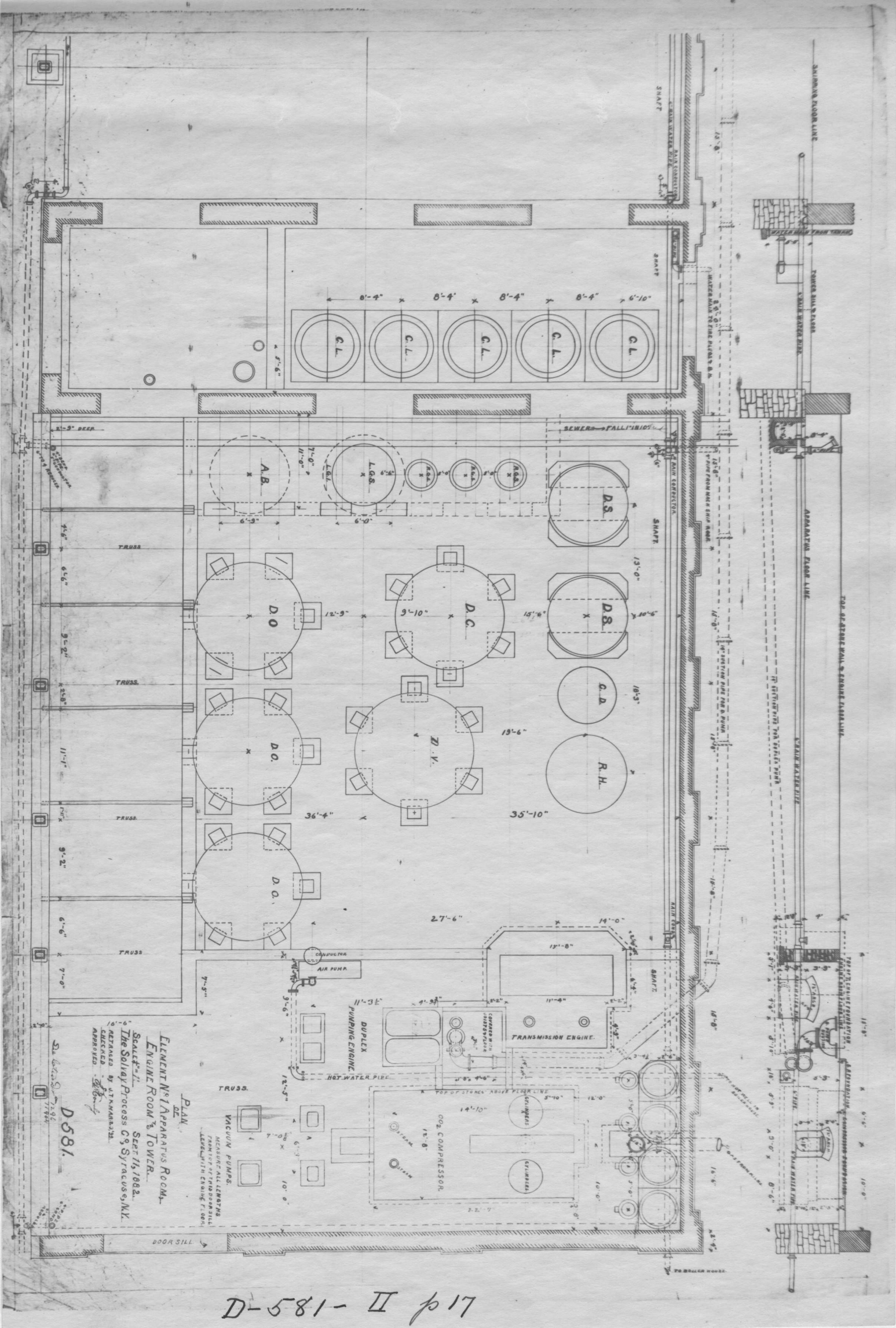
12"

Boiler House

A II
No 508.


Looking North
Looking East
GENERAL MANAGEMENT OF ALKALI WORKS
ELEMENT No. 1
The Solvay Process Co. Syracuse, N.Y.
Nov. 2, 1892.
D580

D-580 - II p 17



PLAN OF ELEMENT No 1 APPARATUS ROOM, ENGINE ROOM & TOWER.

Scale 1"=1'-0"

The Solvay Process Co, Syracuse, N.Y.

Sept 15, 1882.

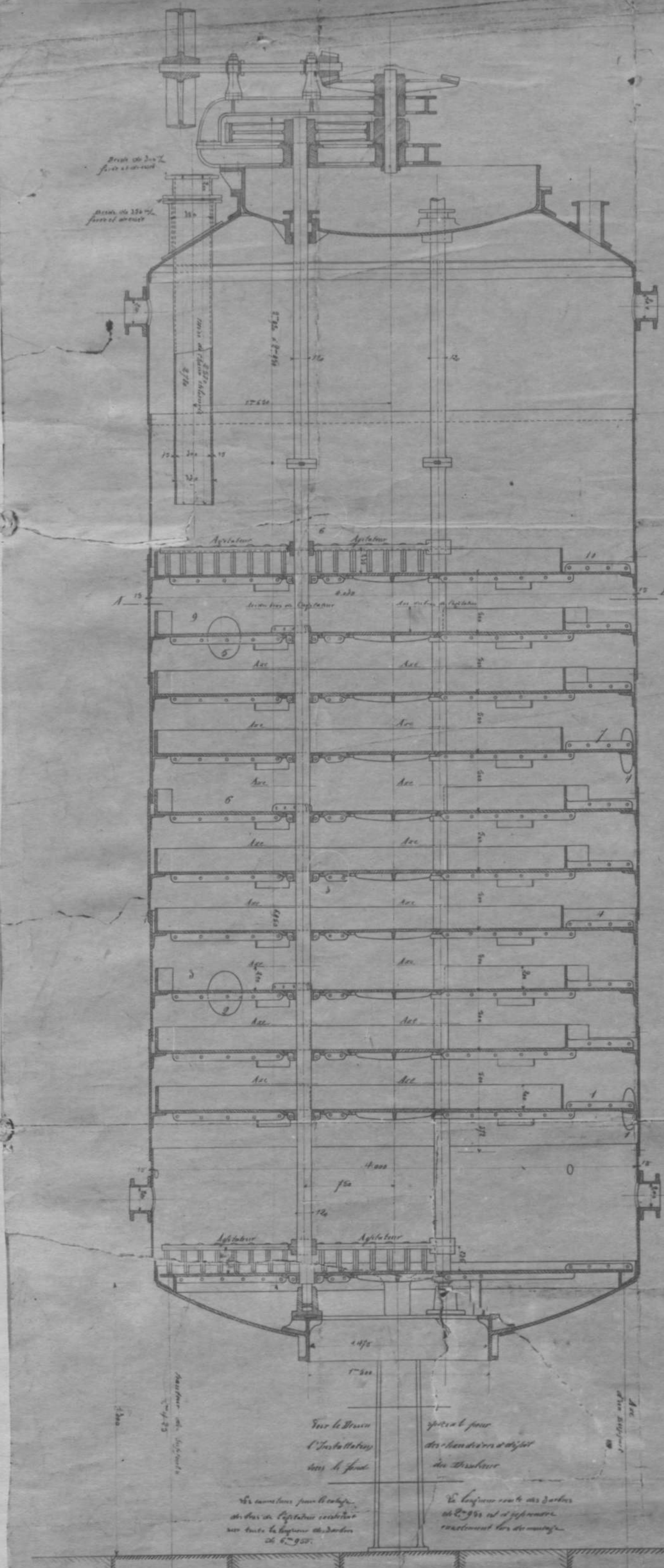
RETRACED BY J.T. MANAHAN '82.

CHECKED

APPROVED

D 581.

D-581- II p 17



Usine de Syracuse

Appareil Dissolveur en tôle de 15 m/m

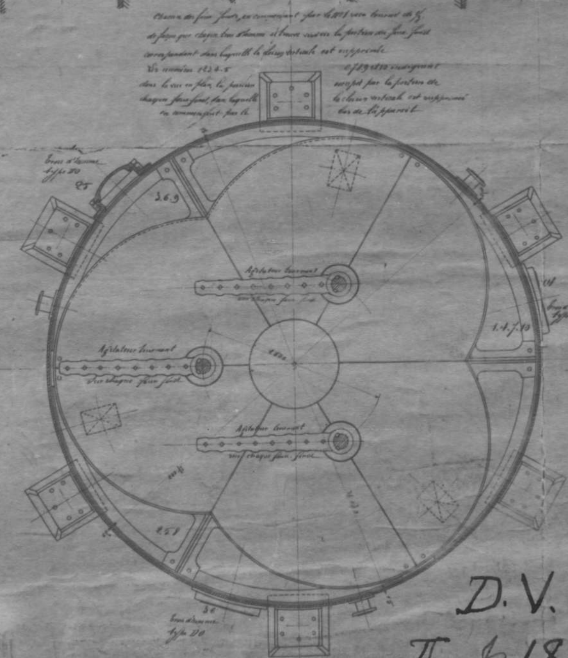
Plan d'ensemble

Echelle de 1/20

Pour un appareil complet et fini :

1 Appareil en tôle de 15 m/m d. 4m 000 avec tubulures rivées s/ plan de la tôlerie
1 Rondelle de 2m 500 en fonte rivée sur le couvercle pour porter la cuvette du mouv.t
1 d° de 1m 875 d° sur le fond pour supporter les arbres des agitateurs
6 Trous d'homme avec tampon type 40, rivés à l'appareil.
6 Equerres pour les supports d° d°
6 Supports en fonte h. 2.425 pour supporter le Dissolveur
3 Crapaudines en fonte avec grains en acier pour les 3 arbres
1 Fond infr. en fonte en 6 pièces avec tampon central en 1 pièce
3 Colliers à bride circulaire en 2 pièces pour le fond infr. comme pour les faux fonds
10 Faux fonds en fonte en 6 pièces avec tampon central en 1 pièce
30 colliers à bride circul. en 2 pièces pour le passage des arbres dans les faux fonds
3 Arbres verticaux d. 120 l. 6m 950 et 3 bouts d'arbres en acier d. 80
3 d° d° d. 120 l. 2.950 longueur à reprendre exactement au montage
1 Cuvette pour le mouv.t avec 3 boîtes à bourrage, bagues et presse étoupes
1 Gros croisillon à 3 branches symétriques avec bagues en bronze pour les 3 [illegible]
1 Petit croisillon à 3 branches symétriques [illegible] et 1 bague en bronze pour l'arbre [illegible]
3 Engrenages [illegible] d. 1200 l. 100 s/ dessin
1 Pignon d° d. 0.300 l. 160 d°
1 Engrenage conique d. 1000 d°
1 Pignon conique d. 0.200 d°
2 Supports à [illegible] coussinets bronze a. 70
1 Poulie d. 1,000 l. 250 fonte a. 70
1 Arbre horizontal l. 4.050 d. 70 et 2 bagues avec vis de pression
1 [illegible] l. 0.880 d. 100 et 1 bague d°
33 bras [illegible] pour agitateur.
1 Plongeur à 2 tubes d. 300 l. 2.780 pour la sortie de la chaux chlorurée

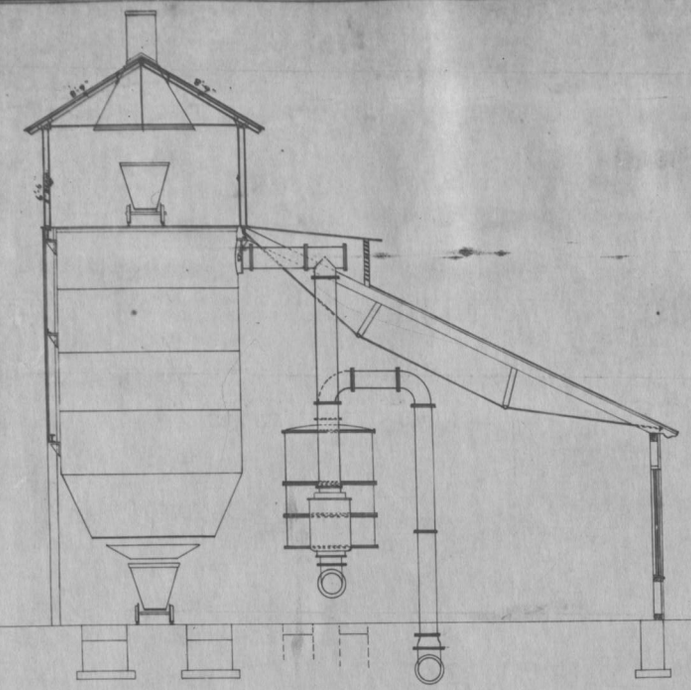
Nota Voir le plan spécial pour les chaudières à dépôt

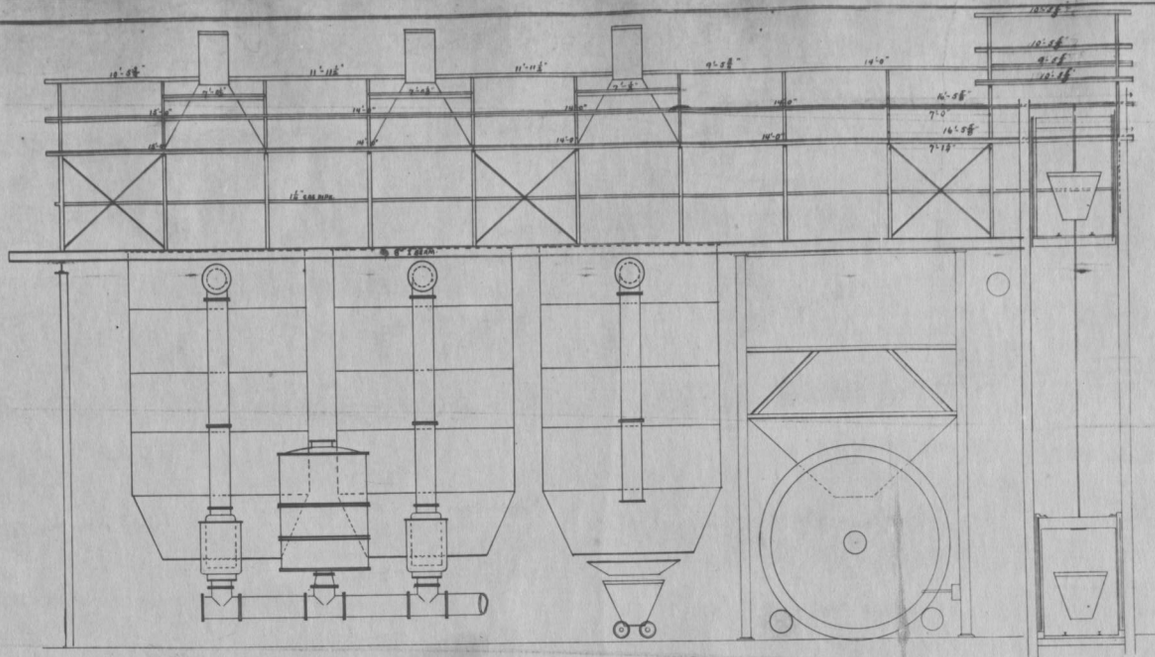


Coupe horizontale A.B.

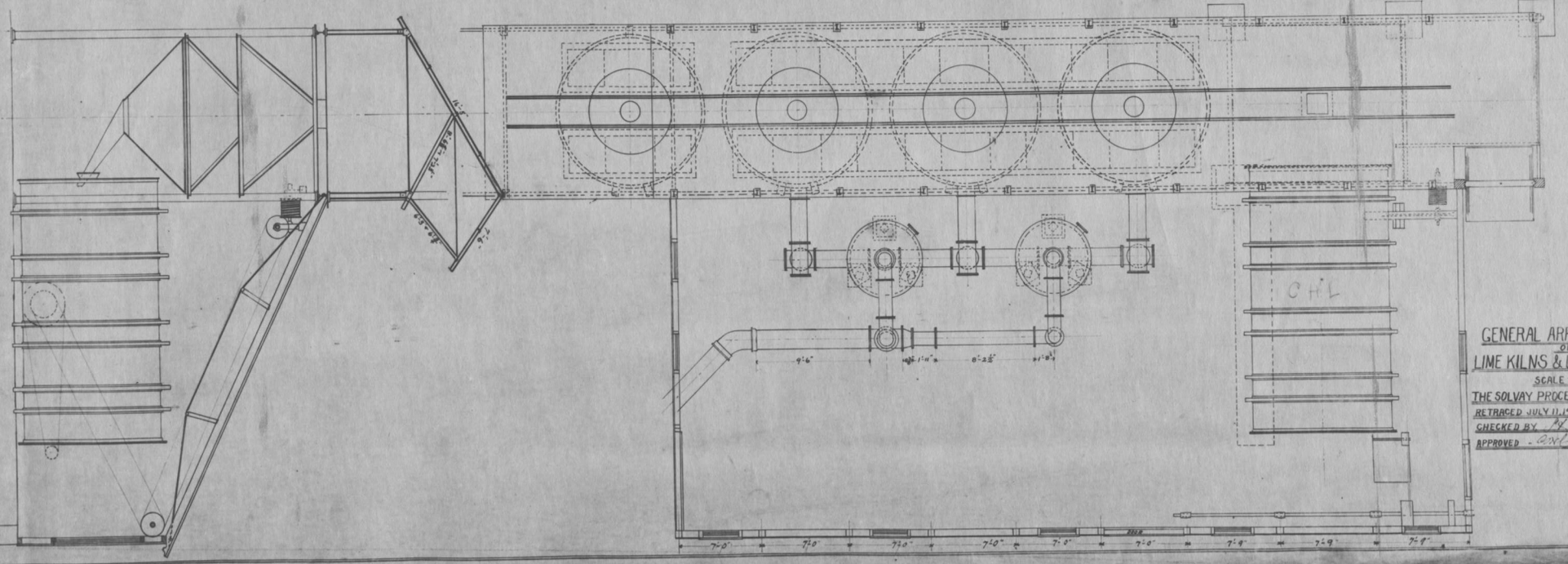
D.V.

II p 18





El Wolsung West



GENERAL ARRANGEMENT—
OF
LIME KILNS & LIME MACHINERY
SCALE ¼"-1 FT.
THE SOLVAY PROCESS CO. SYRACUSE, N.Y.
RETRACED JULY 11, 1900 BY G.A.E.
CHECKED BY [illegible] AUGUST 21, 1883.
APPROVED - O.H.L

L 796.

II

L-796 - II - fo 21

3 Lime Kilns & Fl. No. 1

THE SOLVAY PROCESS CO. SYRACUSE, N.Y.

SCALE 3/8" = 1'

Trumpael

Retraced by M.B.H.

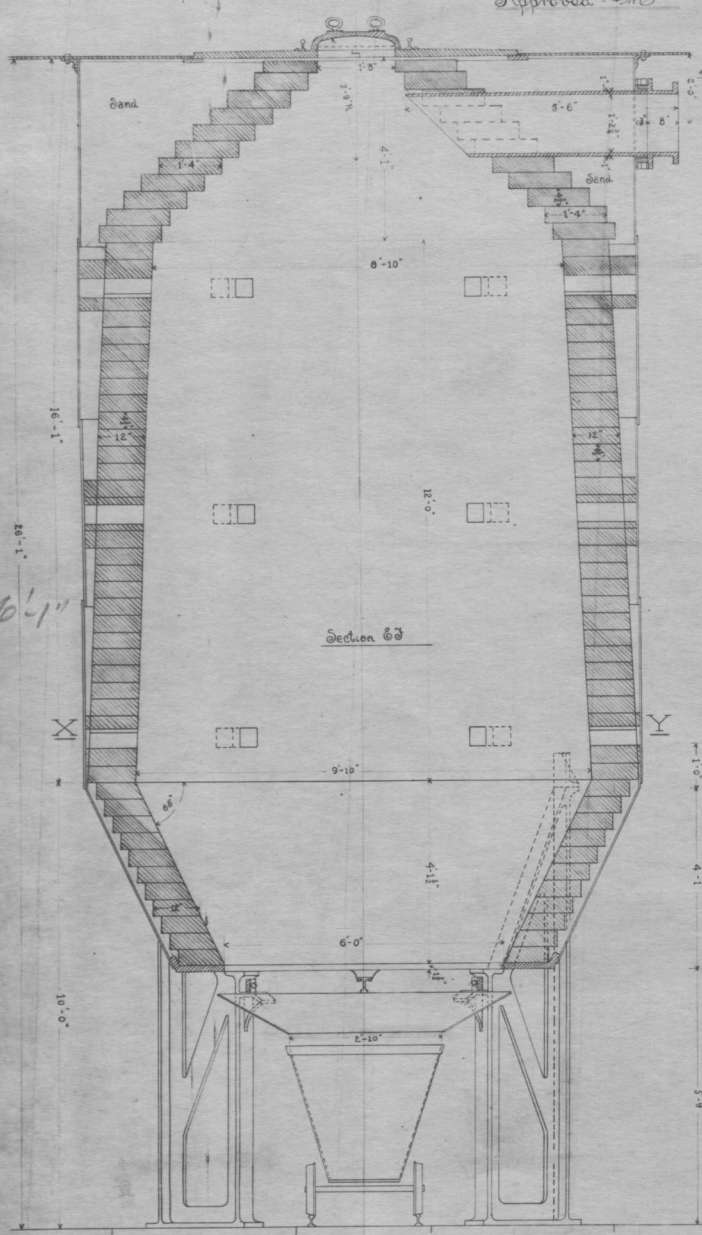
Checked - ff

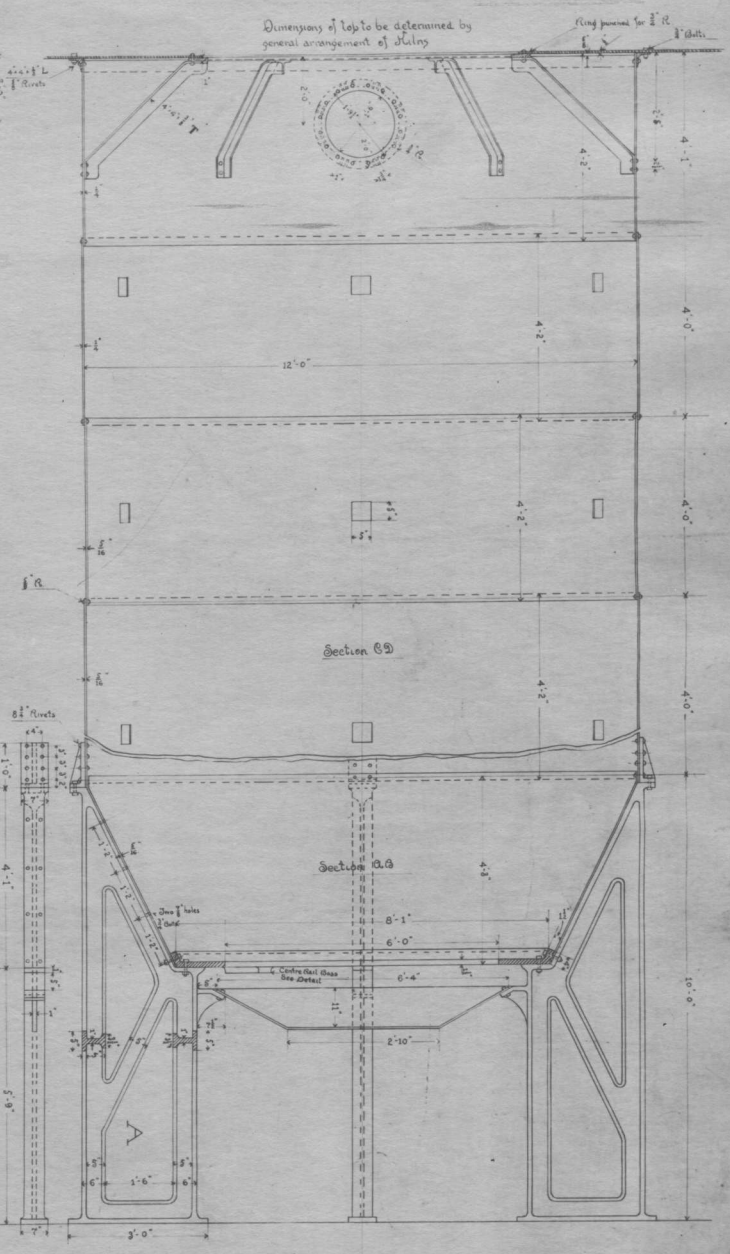
Approved - CMB

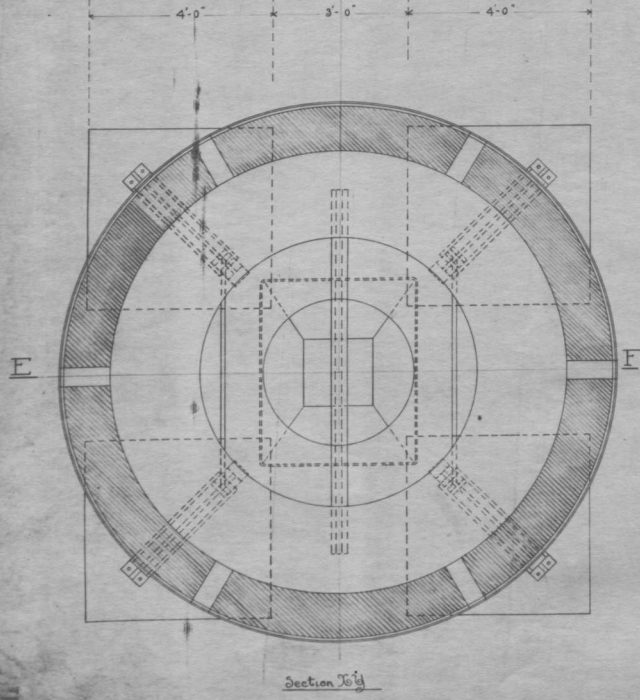
Mar 28th 1883

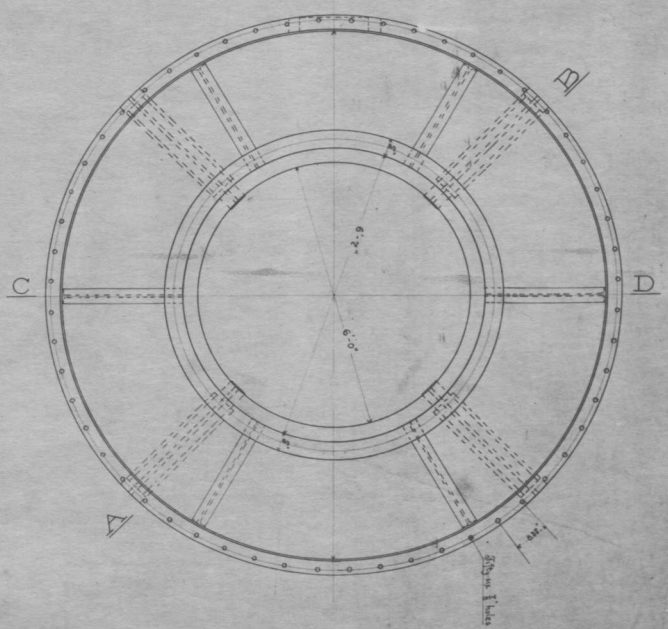
June 20th 1900

L-798.

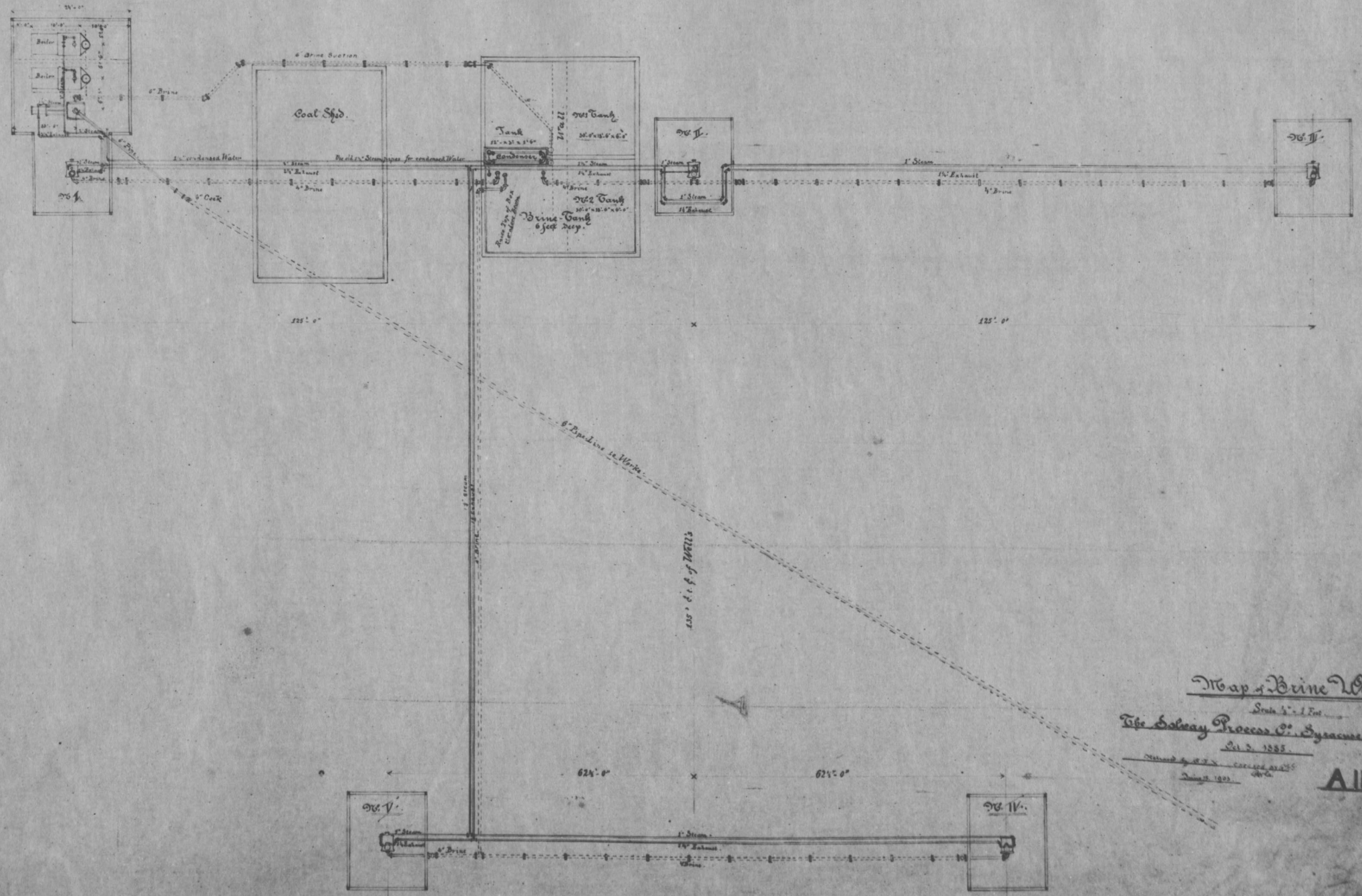








L-798-II-p21


Coal Shd.
Boiler
Boiler
No 1 Tank
No 2 Tank
Tank
Condenser
Brine-Tank & Salt Dry.
No. I.
No. II.
No. III.
No. IV.
No. V.
6" Brine Suction
6" Brine
6" Pipe
1½" Condensed Water
Pipe all 1½" Steam Pipes for condensed Water
1" Steam
1½" Exhaust
4" Brine
6" Cock
6" Pipe Line to Works
3" Steam
3" Brine
125'. 0"
625'. 0"
Map of Brine Wells
Scale ½" = 1 Foot
The Solvay Process Co. Syracuse N.Y.
Oct 3. 1885
A 1150.

A-1150-II-p 23