EARLY HISTORY

of

THE SOLVAY PROCESS COMPANY

By

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(In Chapters)

Chapter VII. C. S. PLANT - Caustic Soda Manufacture.

CHAPTER VII

C.S. PLANT CAUSTIC SODA MANUFACTURE

In June, 1887, we began to design a plant for the manufacture of Caustic Soda. We had studied the C.S. plant at Dombasle and obtained plans of this plant from Solvay et Cie.

DOMBASLE PLANT

The Dombasle plant was very simple. The soda ash delivered in bags was dissolved by wash water used for washing the mud in sand filters in tanks with stirrers called causticizers in which were baskets of lime which slacked and causticized the ash.

VACUUM FILTER

The mixture was boiled with steam and delivered into large rectangular filters with limestone of large size in the bottom covered with stone of smaller sizes and finally with a surface of sand to form a filter. These filters were 30 ft. long by ten feet wide and the bed of stone was nearly three feet deep with a long half pipe running the length of the tank in the center with teeth next the bottom of the tank which allowed the liquor to flow to the nozzle at one end and to a tank which was connected to a vacuum pump.

SETTLING

The filtered liquor was settled in large tanks and fed to a series of "boat" pans over a furnace where it was concentrated to 40° Be. Fished salts raked out, and the liquid conducted to round pots in furnace where it was concentrated, doctored and fused, bottoms settled out, and bailed into drums.

The "Doctor" was an important individual who knew what to do to make the color come white and put in small quantities of chemicals until his sample satisfied him.

SYRACUSE PLANT, PRELIMINARY PLAN S-1255, JAN. 5, 1887

We laid out the plant according to the Solvay plans expecting to use boat pans for the fishing operation. The manufacture of salt at Syracuse with the pots in furnaces was a similar operation, and a study of this showed that six pounds of water evaporated per pound of anthracite coal was the maximum. The writer had had experience in the use of multiple effect, and single effect vacuum evaporation in the manufacture of beet sugar and knew that it was possible to evaporate at least 14 pounds of water per pound of coal, if we could evaporate seven pounds of water in a boiler by the use of a triple effect using steam from the boiler, and 21 pounds with a sextuple effect.

The experience with boiling sugar in a single effect showed that a vacuum pan could be arranged to handle the fished salts.

PLAN S-1317, NOV.16,1887 - PLAN S-1654 & S-1651,DEC.,1887

It was, therefore, decided to lay out the plant on a system of growth and the arrangement of evaporators is shown in Plan S-1317, Nov. 16, 1887, which also shows the arrangement of the boilers, causticizer and piping for steam and liquor. This plan was modified after the trial of the No. 1 Vacuum pan which was first sketched out December, 1887, and are shown in plan S-1654 and S-1651 as finally developed.

#1 VACUUM PAN, JULY 29, 1890 and July 22, 1890

The vacuum pans shown are according to plan #1317 and the position of the Yar Yan and the first

M.E.V. and the vacuum reservoirs are shown also the C.C.S. and Pot Chimney.

ROOF

The bill of lumber for the roof was made out about July, 1887. The wooden roof trusses of 36 feet span were carried on latticed channel posts with the ridges running north and south. The light in center of building came from monitors on each ridge.

POT CHIMNEY

A special pot chimney with flue running parallel to the canal had a large economizer next the chimney and a row of pots on special furnaces arranged with a fire room on low level and with the pots high enough to give the boiling spouts proper fall to a circular row of drums.

C.S. POTS,PLAN S-1313,OCT.21,1887 - HEAT ECONOMIZERS

The pots were round about nine feet diameter and held about ten tons of finished caustic. We designed the furnace with chambers between to hold heaters to heat the air used for combustion thinking to economize the heat of the waste gases. The fuel was buckwheat coal with small steam blowers to furnish forced draft which was to be blown through the heated fire brick flues or cast iron stoves.

C.C.S.

Messrs. Parnell and Simpson in England had been experimenting with a causticizer under pressure and claimed a better causticization.

CAUSTICIZER FOR PRESSURE

We decided to try it and designed a special horizontal causticizer with conical ends and a special shaft running through it with a ball bearing in the middle and two baskets made of bars to receive the lime.

A side opening above the bars was used to draw off the unslacked returns from the lime and a cone valve in the top under a hopper could be lowered by a balanced lever to dump in a charge of lime.

A register valve in bottom could be opened to discharge to a row of filters on each side through movable troughs.

PLAN #S-1301

The sketches for this were dated July 6 to July 23, 1887, #120 to 124, Notebook #2.

The pot settling, Oct. 20, 1887, was also made in sketch book #2 which also shows economizer and flue for pots.

YAR YAN EVAPORATOR (See Cut)

As a substitute for the boat pans shown in S-1255 and following the experience of the paper manufacturer in recovery of soda from black ash, we decided to purchase a Yar Yan quadruple effect for the evaporation from 20° Be to 30° Be and follow this with a special vacuum pan with a fished salt receiver below.

SKETCH #145 - VACUUM PAN

Sketch Book #III shows the first sketches #145 for the Vacuum pan which are dated December 29, 1887 and the arrangement in Sketch #161, January 25, 1888. A special valve for the vacuum pan which was closed to empty the Salt Receiver was controlled by hand wheels at the top of the pan.

SKETCHES 100, 161 and 166

Sketches 161 and 166 show the two elevations of vacuum pan shown in section in sketch 145. Sketch #100, sectional view of headers with 4" tubes and B&W boiler caps. These were all designed July, 1887 and completed drawings #1654 and 1651 dated July 22, 1890.

show the final form with corrugated tubes. The operation of the Yar Yan and this vacuum pan was quite successful. We had more or less trouble with the two vertical joints and had to replace the gaskets several times. After trying different qualities of rubber, we found that the purest rubber gaskets were the best.

The fished salts were taken out of the catch-all at the bottom after they had been washed as clean as possible from the strong caustic by putting in weak liquor, redissolved and returned to the causticizers. As the production increased, it became necessary to have more evaporators and we designed a form of pan shown in plan #1780 dated June 30, 1891 and #3672, March 25, 1892 which had vertical cylinders with tube nozzles and cast iron headers. This pan had a large catchall attached to the conical bottom and was used with or without the valve as shown.

PLAN #1725 - FEBRUARY 18, 1891

The above plan shows the complete arrangement of one of these pans with its counter-current condenser. The very large elbow at the top had below it a spray catcher suspended in the pan consisting of vertical slats. The counter-current condenser had trays and dishes similar to the shower R.H.'s in the soda plant, the water entering at the top and falling through in showers so that the air left in the steam was cooled by the incoming water which found an exit into the hot well below through the leg pipe. The valve at the bottom preventing vertical oscillations of the water column.

The large vacuum pans had cellular headers made with a heavy tube sheet and caps like B&W boilers for each four inches of tube.

HEADERS

COPPER TUBES

These headers were strong enough to stand full boiler pressure.

We began with iron tubes which only lasted a few months with 60° Be liquor, then we tried copper tubes which gave trouble because of difference in expansion from the cast iron shell. We then tried corrugated copper tubes which lasted better but finally gave out at the ends just back of the tube sheet.

CORROSION OF TUBES

The tubes gradually corroded away and the air in the liquor oxidized the copper and the liquor dissolved it off.

The contact between the cast iron headers and the copper tubes also produced some electrolytic action which not only ate away the cast iron header but also the joints between the manifold and the rings.

We tried a set of silver plated tubes, which did not last any better then the copper ones and while solid silver tubes were entirely satisfactory, they were prohibitive by the high cost.

COPPER TUBE SHEET

We finally put a heavy copper tube sheet between the nozzle and tube headers expanding the tube into both, using a rubber joint between the copper tube sheet and the ring and spacers between the tube sheet and the manifold. The rubber joints gradually ate out and had to be replaced. Pure gum gaskets lasted the best.

The evaporation of the quadruple effect in the Yar Yan was quite successful, the tube lasted well and the small amount of scale was easily cleaned out.

The economy was good compared with the boat

pan or single effect but not up to the modern quadruple

A combined test of one 208 H.P. boiler directly connected to the Yar Yan showed the following results:-

No. of hours of test	7	9
" " 208 H.P.boilers	1	2
Total lbs.coal (Anthracite)	8825	13600
Temp.of Feed Water	75°C	75°C
Lbs.of Water evaporated per hr.	15395	17918
" " " per lb.of coal	12.2	11.8
" " " " sq.ft.per hr.	4.25	5.8
Average pressure of steam per sq.in.		
Around #1 Effect	45.1#	63.5#
In #1 Effect	22.23	31.86
" 2 "	11.83	17.74
" 3 "	-1.81	+0.0
" 4 "	-11.04	-10.75
Difference in Temp.	142°F	157°F
" " Boiling Pts.	63.	65.
Effective Difference	79.	92.
" " each effect	20.	23.

PLAN #2579 - DECEMBER 29, 1884

The above plan shows a cross-section view of the Caustic Plant including causticizer with large filters on each side and settling D.O.'s, the #3 vacuum pan, vacuum reservoirs on each side of it and the oval pots. The vacuum reservoirs were used to receive a charge from the pan which was allowed to settle. The settled liquor drawn off and fished salts washed and taken out. To reduce the carbonate of soda in the liquor as much as possible these reservoirs were used to settle for a period four times as long as the operation of the pans.

PLAN #2580 DATED JANUARY 2, 1895

The above plan shows pans #3 and #4 and a section of the wooden roof building.

PLAN #1366 - MARCH 24, 1896

The above plan shows the growth of the plant up to that date. At that time all of the round pots had been replaced by oval ones to give greater capacity; the four large vacuum pans were in place; the Yar Yan had been

abandoned and the M.E.V. installed; a furnace had been put in for drying the fished salts for sale; a third causticizer added and we had in use 18 of the large filters.

The drums were being handled by the drum buggy shown in the sketch.

Sketch 147 shows a set of 15" eye beams which were used to handle the caustic pots before we had any cranes.

The settlers were increased to 36 in number.

SODA ASH

The handling of soda ash from a hopper supplied by a rotary conveyor was a dusty operation. The cars were weighed on scales and dumped into a hopper on the top of the C.C.S.

LIME HANDLING

The lime was loaded into cars at the lime kiln, shovelled out into hoppers from railroad trestle south of the building and drawn into cars. These cars were pushed by hand onto elevators, hoisted up to the floor above the causticizer and pushed over the hopper valves where they were dumped into the cages below. The unburned stone remaining in the cages was drawn out into cars through the side openings, pushed to elevator and hoisted and dumped into carts to be hauled away. A hopper was afterwards built so that this stone could be hauled away in the day time only.

The causticizing was done under low pressure so that the exhaust steam could be used directly in the causticizer.

The labor of handling these materials was such a burden that we began to use milk of lime from the M.L.T. and to dissolve the ash in the wash water. After the M.C. was started we used M.C. liquor enough to relieve the B.C.

Department of the salt and dilution caused by the steam of the M.C.D.S.

The sand filters were agitated when the mud was washed with hot water by ploughs on a frame which was adjustable vertically and carried on wheels running over rails on top of the filters.

These carriages were hauled back and forth by wire rope wound on a reversible windlass overhead which was driven by open and crossed belts and a shifting mechanism operated by hand or by the carriage at the end of its stroke.

Sometimes the men rode on the carriages and turned the hand which up or down to plough up the mud which settled for a change of the C.C.S. which completely filled one filter.

The liquor was settled and drawn off by a syphon on top also drawing through the filter, followed by a charge of hot wash water which was agitated and also drawn through the filter.

Cold water was then put in the filter with no vacuum on the agitation started and mud pumped to waste.

The lime sand was shoveled out into cars between the filter and hoisted to hoppers to be carted away.

The sand forming the filter had to be leveled and raked frequently and three inches which hardened, broken up and shoveled out and replaced monthly.

The liquor was settled in the several series of D.O.'s and sent to evaporation as clear as possible.

The 10% of carbonate of soda in the caustic liquor was precipitated in the vacuum pan and the charge was transferred with the fished salt to the vacuum reservoir alongside. The settled liquor drawn off and the fished salts washed with weak liquor and drawn off and wheeled to a dissolver to be pumped back to the C.C.S.

The 45° Be liquor was fed into a separate pan concentrated to 60° Be and sent to the pots to be fused and doctored.

PLAN #1313 - OCTOBER 21, 1887

Plan #1313 shows the 9 foot round bottom pot with its settling which we used for many years until the need for more product required the use of the oval pot of 17 ton capacity.

The economizers were never installed except in one or two pots because it was found that a great deal of heating surface was required to reduce the gases to a low enough temperature to pay.

FISHED SALTS - FURNACE & FILTER

We later installed some small rotary fished salt filters with hand agitation and nickel cloth and filtered the 45° Be liquor direct from the vacuum pans so that we could run them continuously and use the vacuum reservoirs for settling only. We afterwards tried a full sized filter of the same type used for the bicarbonate ,which was successful,and the rotary furnace dried the salts which we sold for a time as a separate product.

We also put in some centrifugal pumps driven with Westinghouse vertical engine to give pans a good water supply from the canal. These were located close to the Pot Chimney.

Plan #-1366 shows the condition of the works in March 24, 1896.

PLAN #F-1899 - OCTOBER 24, 1891 - GENERAL ARRANGEMENT OF M.E.V. - SYRACUSE

As the production increased, it became necessary to increase the capacity for the evaporation of the liquor from 18° to 30° Be.

The Yar Yan apparatus had some weaknesses - was difficult to clean:and the operation of the vacuum pans with horizontal tubes was so satisfactory, that we decided to try a quadruplicate effect built on the same principle of the evaporation outside of the tubes with steam in the inside.

The M.E.V. resulted from the wish to try this form of evaporator. We built two of them and used them for a considerable period supplementing the Yar Yan.

Plan #1899 shows the general arrangement of the four cylinders with tubes through the lower half longitudinally and steam and liquor connections with automatic regulators between each effect.

These regulators were too complicated and gave trouble and the efficiency was not as good as the Yar Yan because the circulation was much less rapid.

We were enabled, by means of this apparatus, to bring our production up to the full capacity of the four large pans.

SKETCH #1102-A-1

To increase capacity of the above pans with horizontal tubes, we designed a tube ring which was an immense cross having tube headers on each side.

Two of these were erected as a double effect for the evaporation from 30° to 45° Be with heaters for the liquor using the condensate and a heater for wash water before the condenser.

The above sketch shows the arrangement of these pans with the circulation of liquors in diagram.

The same type of pan is shown in Chapter VI and is still in use in the B.C. Department and in the Calcium Chloride Plant.

PLAN #13997 - APRIL 1, 1909 - ARRANGEMENT OF S.E.V.

To keep up with the increased production required we designed the apparatus known as the S.E.V.

The general arrangement shows this apparatus which was a sextuple effect with a series of heaters designed to give very high efficiency with live steam at high pressure on the first effect.

PLAN F-5122 - MAY 22, 1900 - SHELL FOR EVAPORATOR

This plan shows the sectional view of the tube nest, which was a simple cylinder with tube heads into which the three inch tubes were expanded, tubes being made of lap welded charcoal iron 4" diameter, 18' long for each cylinder.

SKETCH 979-A-1 - SEPTEMBER 6, 1906

This sketch shows the method of circulating the liquor and feed arrangement for each effect.

We note that the tubes were a series of cascades, the liquor being fed into the top row and overflowing from one row to the next, the steam having an outlet at each end of each tube.

SKETCH #1104-A-1

This sketch shows the circulation of steam and liquor in the S.E.V. with the heaters.

This apparatus worked very well. It was easy to clean and very accessible but the circulation would, of course, limit the actual flow of liquor through the tubes and it was, therefore, not as rapid as in the Yar Yan.

A series of careful tests were made which showed good efficiency but not as great as should be expected from a sextuple effect.

Because of the efficient heaters, it was much better than anything we had before used.

It was kept in constant use until it became necessary to still further increase production and we were influenced by Messrs. Solvay & Company's insistance on the Yar Yan to replace it by an improved type of that apparatus which had a reputation for much better efficiency.

The introduction of the Solvay D.E. in triple effect was also partly responsible as this apparatus did not work on liquor of 30° Be because scale would deposit on the tubes of the first and second effect unless the liquor was kept at 45° in the pan.

The gradual increase in the number of these pans and difficulties with this scaling caused us to get away from the principle of evaporation in three stages, in favor of the evaporation in two stages; namely, 18° to 45° Be and 45° to 60° Be.

Solvay and Company had watched our success in the use of vacuum pans and had them adopted for Dombasle using an English built Yar Yan, which was said to give an evaporation of four kilos of steam per kilo of water used, although the regular reports only showed 2-1/2 and three kilos.

Because of the trouble which we had with joints with gaskets, they designed a pan called the D.E. with the cast iron bodies without joints and with vertical tubes for the center circulating tube.

PLAN #13739 - 1/20/1900

This plan shows the type which became

universal and several triple effects were erected at Syracuse.

Live steam of about 100 lbs. would be used in the first effect which gave a pressure of nearly 45 lbs. inside of the cast iron body.

These bodies were protected with rings shrunk on but as they were supposed to have life of only about three years on account of the eating out of the interior, there was bound to come a time when they would be dangerous.

Although we kept very careful track of them and tested them regularly, we were alwaye anxious about them.

The abandonment of the evaporation from 18° to 30° Be as the first stage of the process always seemed to the writer as a step backwards and when it became still further necessary to increase the production very suddenly, we designed an apparatus for use with exhaust steam, of which we had a considerable supply,

We picked up some old rings and dome heads and conical bottoms of apparatus from the old A.L. plant, and building a calandria of long tubes erected the triple effect.

PLAN #11299 - GENERAL ARRANGEMENT OF TRIPLE EFFECT EVAPORATOR DATED DECEMBER 30, 1906

This plan shows the general arrangement of the apparatus with the heaters and pumps for a plant which gave very large capacity for the effective difference in temperature.

DIAGRAM SK-1103-A-1 - MARCH 25, 1908

This diagram shows the circulation of the gases and liquors and the temperatures found during one of the tests.

It will be noted that the level of the

liquor in glass gauges, around the outside of the apparatus which indicated the head on the bottom end of the tubes, in the first effect was about one-third of the height; in the second effect about two-fifths and in the third effect about one-half.

The liquor entering the bottom was circulated through the top and out directly into the next effect by the action of the bubbles of steam in the interior of the tube making a sort of climbing action of a film of the liquor with the bubbles of steam inside, which moved upward with very high velocity.

It can be readily calculated from the relative volume of the steam and liquor which must have passed through the tubes.

A diagram "A" dated March 20, 1909 shows the volume of liquors in the different effects, the relative height and the calculated velocity through the tube as compared with the S.E.V. and the Yar Yan.

This apparatus gave us much the best efficiency of any type which we had used and the effect of the steam loop action in the interior of the tubes was clearly established by careful tests.

The efficiency for the triple effect was higher then in any of our other apparatus.

There were no complicated feed mechanisms or floats. The liquor that was put into the first effect traveled through to the last concentrating as it went and automatically feeding from one effect to the next, because of this climbing action, which was limited by the head of the liquor on the bottom end of the tube.

A very efficient set of heaters connected as shown utilized the heat in the condensate in series and put the liquor of 55°C. into the bottom

of the first effect at 86°C., very nearly the boiling temperature.

As shown in the diagram C+D dated March 15, 1909, a suggestion for sextuple effect, the writer proposed the extension of this T.E.V. system to the type of apparatus like the D.E., but Solvay & Company evidently had doubted the possibility of the climbing action, which we had established and objected to the use of this type of apparatus preferring to stick to the type which they were using. We were, therefore, encouraged to try the type suggested.

A comparison of the two types is shown in the following plan.

PLAN #15923 - PROPOSED EVAPORATOR DATED JULY 5, 1910

This plan shows the type T.E.J. with internal cast iron bodies and outside steel jacket arranged either as a T.E.J. or as a film evaporator.

PLAN T.E.J. #21584 - MARCH 18, 1913

The T.E.J. above referred to was designed by the writer to overcome the objections to the cast iron bodies under high pressure, which we were afraid of.

After careful study, it seemed that the most efficient and effective evaporator from the point of view of maintenance would be a machine in which the evaporation of caustic liquor was done in tubes connecting cast iron bodies, which would only be subjected to compression and the steam around the tubes would be confined inside of a steel jacket, which would never be exposed to any of the caustic liquor.

Careful study was made of the strength of such an apparatus, even to the extent of building a full size dome with a jacket around it and subjecting it to a pressure of 350 lbs. to the sq. in. in an effort to crush the body inside. This was done be-

cause of doubts expressed by Messrs. Solvay & Company, who were afraid the body would collapse.

Their engineers saw the test and were convinced and we have adopted the policy of building this type of apparatus for all evaporators requiring pressur inside. The ordinary D.E. is all right for vacuum vessels.

We have a large number of these in use at Syracuse and Detroit and have built only this type for several years utilizing the old D.E.'s for single effect under vacuum and last effects of the triples.

In a report,dated October 31, 1921, "A History of the Vacuum Pans which have been built for the Solvay Process Company" is shown the development up to that time and a report dated August 25, 1922 shows the arrangement of caustic evaporators which has gradually grown up at Syracuse and Detroit and makes a plea to the return of the three stage system of evaporation.

SKETCH OF A T.E.V. DATED AUGUST 15, 1922

This sketch shows the adaptation of the present T.E.J. to a type of T.E.V. which would use iron tubes of 20 to 22 ft. in length, converting the present T.E.J.'s into this type by the addition of ten or 12 ft. of jacket in the center, the idea being to return to the evaporation in three stages; namely, 18° to 32° Be, 32° to 45° Be, 45° to 60° or 64° Be; and erecting the apparatus in a single lime instead of two lines as was proposed.

The pressure losses between effects which was pointed out and which was doubted in the report, was found upon further investigation to be due to errors in reading pressures because of a water leg on the gauges and subsequent tests showed that the losses were about the same as shown by the report

from Detroit.

PLANS #15767 - APRIL 30, 1910 - #17708 - APRIL 7,1911 -
THE YAR YAN EVAPORATOR

The failure of this apparatus in our plant at Syracuse is difficult to understand.

The Yar Yan sextuple effect was built by Mireles Watson & Company of Glascow. It had been in use at Dombasle for several years and was said to have an evaporation of 40 kilos of water per kilo of live steam and operated well on liquor from 16° to 32° Be.

While it gave some trouble because the covers of the manifolds had to be removed to clean it, half of it could be run as a triple effect while the other half was being cleaned and get nearly the same evaporation.

Messrs. Solvay & Company's engineers were convinced that it was the best apparatus for our use and insisted on our purchasing one against our protest.

Our experience with the T.E.V. led us to advocate this type of apparatus as being as efficient and much more practical as it could be cleaned by opening one manhole at the top and one at the bottom.

It was free from any feed mechanism control and without outside joints.

It will be noted from plan #17708 that the return bends in the coils are made by special castings bolted fast to the steel tube sheet into which the tubes are expanded.

These manifolds are held in place by long stud bolts but are few in number and the joint between them and the tube sheet must depend on a soft gasket. The joint of the door outside must also be made by means of a soft gasket.

When this machine was started up, it began to give trouble immediately, developing leaks between the tube heads and the manifolds and this was followed by the

breaking of studs which seemed to be embrittled with contact with the caustic.

We tried all kinds of steel and iron, nickel steel, but the difficulty continued and the apparatus after running a few days was always found to be shutdown and the operators were evidently afraid of it, expecting to have manifolds let go with a disastrous explosion.

We put on special men who ran tests on the apparatus and tried their best to develop it. We made changed in the studs and in the manifolds but without results.

We were never able to get the operators to use it any length of time.

It was finally taken down. One-half of it was re-erected in the calcium-chloride plant where the trouble with the embrittlement of the studs ceased, but the difficulty of cleaning, and rapid formation of scale had the same effect as in the caustic works. The plant remained idle.

It is difficult to say whether the failure of this machine was due to its construction or to the operators in charge. Changes in the operators did not seem to produce the desired result.

S-11269 - JANUARY 7, 1907

This plan shows the double effect consisting of two pans with large round tube nozzles, which were called pans #7 and #8, these pans being erected in the west end of the building provided with special condensers and heaters. They gave very satisfactory results in the evaporation of the caustic liquor from 30° to 45° Be.

The fished salts were at first drawn off into a montjus and forced by steam pressure into the fished salt tanks or vacuum reservoirs where the salts were fished out, until the advent of the small rotary filter covered with nickel cloth with hand agitators mentioned above.

PLAN #7394 - PART 1 - DECEMBER 26, 1903

Shows section through C.S. building with boiler house and #1 and #2 vacuum pans and the vacuum reservoirs, the causticizers and filters, pot furnaces and the loading floor.

PLAN 7394 - PART 2 - DECEMBER 26, 1903

Sectional view showing #3 and #4 vacuum pans with S.E.V., the fished salt tanks, also side view of the S.E.V., the apparatus pumps, pot furnaces and loading floor.

PLAN 7393 - PART 1 - DECEMBER 26, 1903

Inside view showing drum machinery and inside view on the pot firing floor showing pot fires.

PLAN 7393 - PART 2 - DECEMBER 26, 1903

Inside view showing drum platform and balance of the pots.

The above plans show the type of roof which was designed to take the place of the old wooden peaked roof, which by this time had become so deteriorated with contact from caustic that it became necessary to replace it with steel.

The caustic appeared to have so much effect on the fibres of the wood that the roof became dangerous. We also feared very much a disatrous fire, which would have practically annihilated the plant.

We, therefore, began plans and the construction for an entirely new roof for this building, which differed somewhat in detail but in the main was carried out according to the above plans, but the plans show the old apparatus, which was in use in 1903.

Soon after the above dates the changes in the evaporating apparatus which have been discussed above, began to be made, the S.E.V. being replaced by the Yar Yan and the vacuum pans with horizontal tubes being

replaced by the Solvay type of D.E., T.E. and S.E.

PLAN 21159 - OCTOBER 31, 1912 - PLAN 21149 - OCTOBER 25,1912

These plans show the S.E.'s and T.E.'s, single effects and triple effects with their heaters both in plan and elevation.

ENTRY #10623 - JUNE 15, 1909 - PLAN OF APPARATUS

Shows the transition stage in which the S.E.V., sextuple effect is still in use.

The triple effect of the T.E.V. had been erected and four Solvay T.E.'s and four S.E.'s had been put in place to take the place of the horizontal vacuum tube pans.

The pots had grown to 40 in number. We had begun to install large additional settling D.O.'s; had changed to the use of milk of lime in vertical tank causticizers; had begun the installation of a special engine room.

In March, 1906, we tried an experiment in continuous causticizing.

PLAN #9768 DATED MARCH 17, 1906 - PLAN #9629 DATED MARCH 17, 1906

These plans show a type of column causticizer with special type of pasaette which is designed in an effort to continuously causticize the liquor with agitation by the use of exhaust steam.

This apparatus was erected but had only limited capacity and was finally superseded by a series of tanks with violent agitation with revolving stirrers, which are still in use.

PLAN ROTARY FILTERS 15716 - 2 parts - 1st Filtration
15791 - 2 parts - 2nd "

Section and side view of Rotary Filter for filtering caustic mud.

The large number of sand filters 10 ft. x 30 ft. which we had in use cost a great deal to operate. The washing of the mud was not as thorough as it should have been.

Messrs. Solvay & Company had developed the use of rotary filters at Dombasle filtering twice and washing on the last filter.

They were so successful that we adopted them for Syracuse, making a special design of filter following their practice.

These filters with the general arrangement are shown on the above plans and are very successful although expensive to operate and keep in repairs.

To help this operation we have within the last three years installed two large Dorr settlers, which take the mixture of lime carbonate and liquor from the causticizers, giving them a preliminary settling, the mud being pumped to the filters and the overflowing liquor put into the final settling D.O.'s.

Two of the standard soda ash filters are in use for separating the fished salts from the 45° Be liquor, and special settling tanks have been provided to take out as much of the salt and soda as possible thus making great improvement in the quality of our product.

The old fashion system of pot boiling has been superseded by a pumping system, which empties the pot directly into the drums by means of a small air driven portable centrifugal thus doing away with the laborious hand operation, which required considerable skill and at the same time avoiding the stirring up of the bottoms, which was apt to occur.

Improved machinery for making drums and machinery for making granulated caustic have been installed.

The filters required large vacuum pumps and the increased number of evaporators a water pumping engine, which drawing water from the canal delivered it through surface condensers, which saved some of the entrained liquor, which use to find its way into condenser water.

ENTRY #38495 - JULY 19, 1916

This plan which has been somewhat improved since its original date shows the plan of the present caustic plant with its long line of filters; its evaporators including several T.E.J.'s; its special dissolving plant with weighing hoppers and measuring machines; two Dorr thickeners and its large installation of settling D.O.'s.

The Detroit Caustic Plant, which was laid out from the experience gained at Syracuse, has all of its evaporators in one line.

The arrangement is believed to be much better then the arrangement at Syracuse and it is hoped that in the future, the Detroit plan will be adopted.

It has also been suggested that we should return to the system of evaporation of the liquor in three parts; namely, 18° to 32° Be, 32° to 45° and 45° to 63° or 64° Be., as allowing the last 60% of the evaporation to be done in quintuple effects with high pressure steam, the 32° to 45° in triple effects and the 45° to 63° in double effects.

This system would make a considerable advance as it would increase the economy of the evaporation.

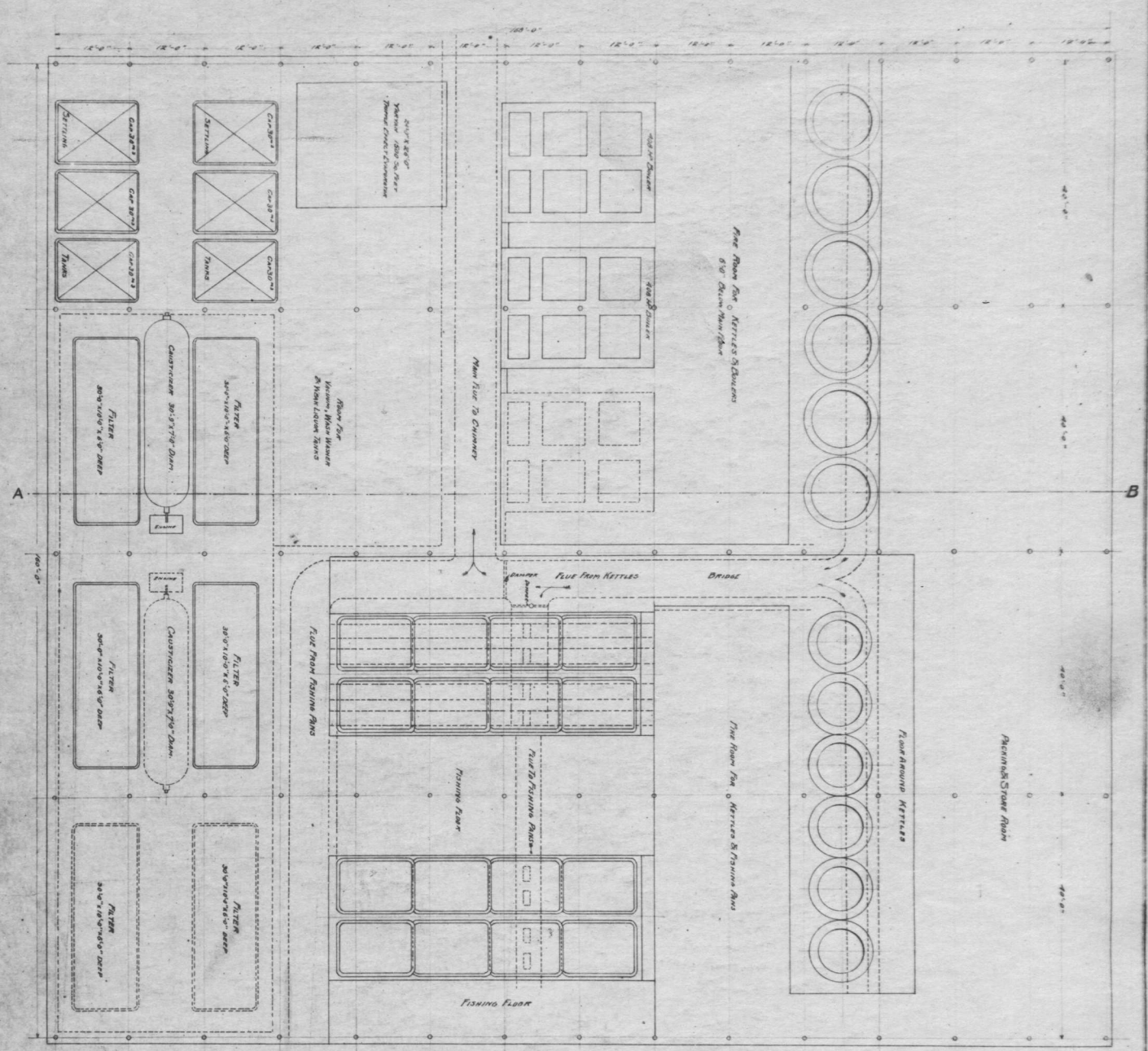
If further improvement is to be made of the utilization of the waste heat from the caustic pots, either for evaporation or for drying the waste lime with the utilization of the water evaporated in further evaporation of liquor, several systems of continuous causticizing and washing are under study. With a view to the elimination of the expensive filtering plant and systems of continuous pots or with economizer evaporators supplementing the pots are also being considered.

Plant

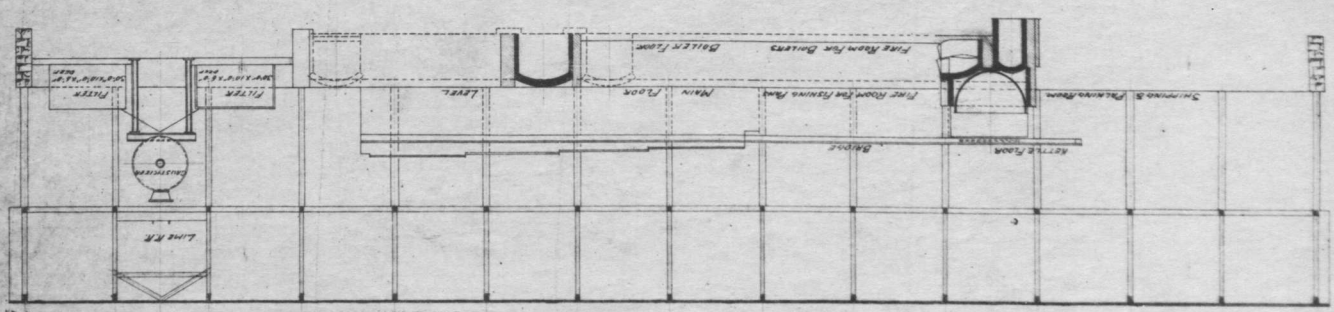
The old boiler/has been eliminated and the steam is now taken from the great north boiler house

on the other side of the canal.

Surplus exhaust steam from other parts of the plant might be utilized and rearrangement of the plant which will give less congestion making more room for the operators, is very desirable.



SECTION on line A.B.



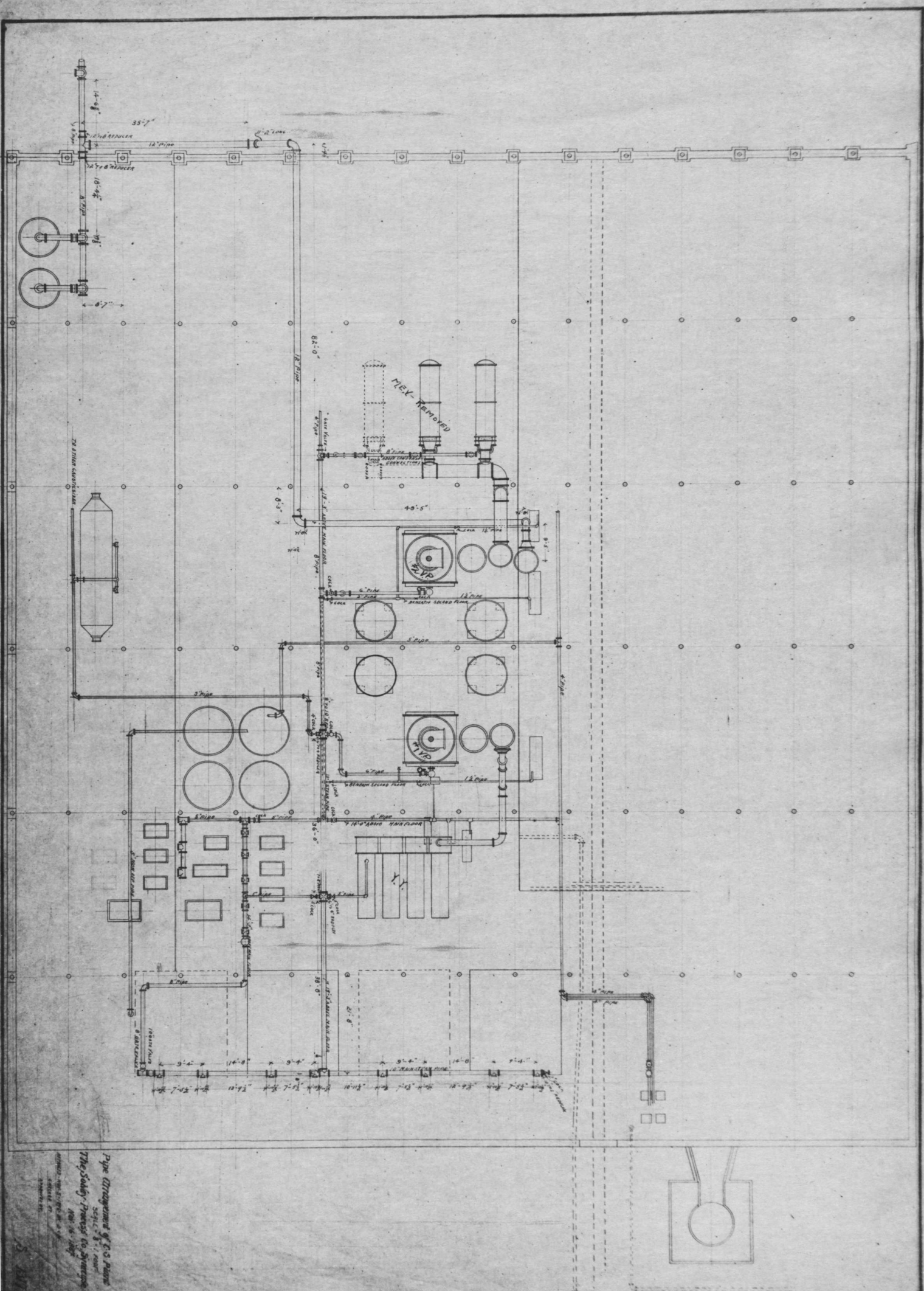
Preliminary Plan
Caustic Soda Works
THE SOLVAY PROCESS CO. SYRACUSE N.Y.

SCALE 1/8" = 1'-0"

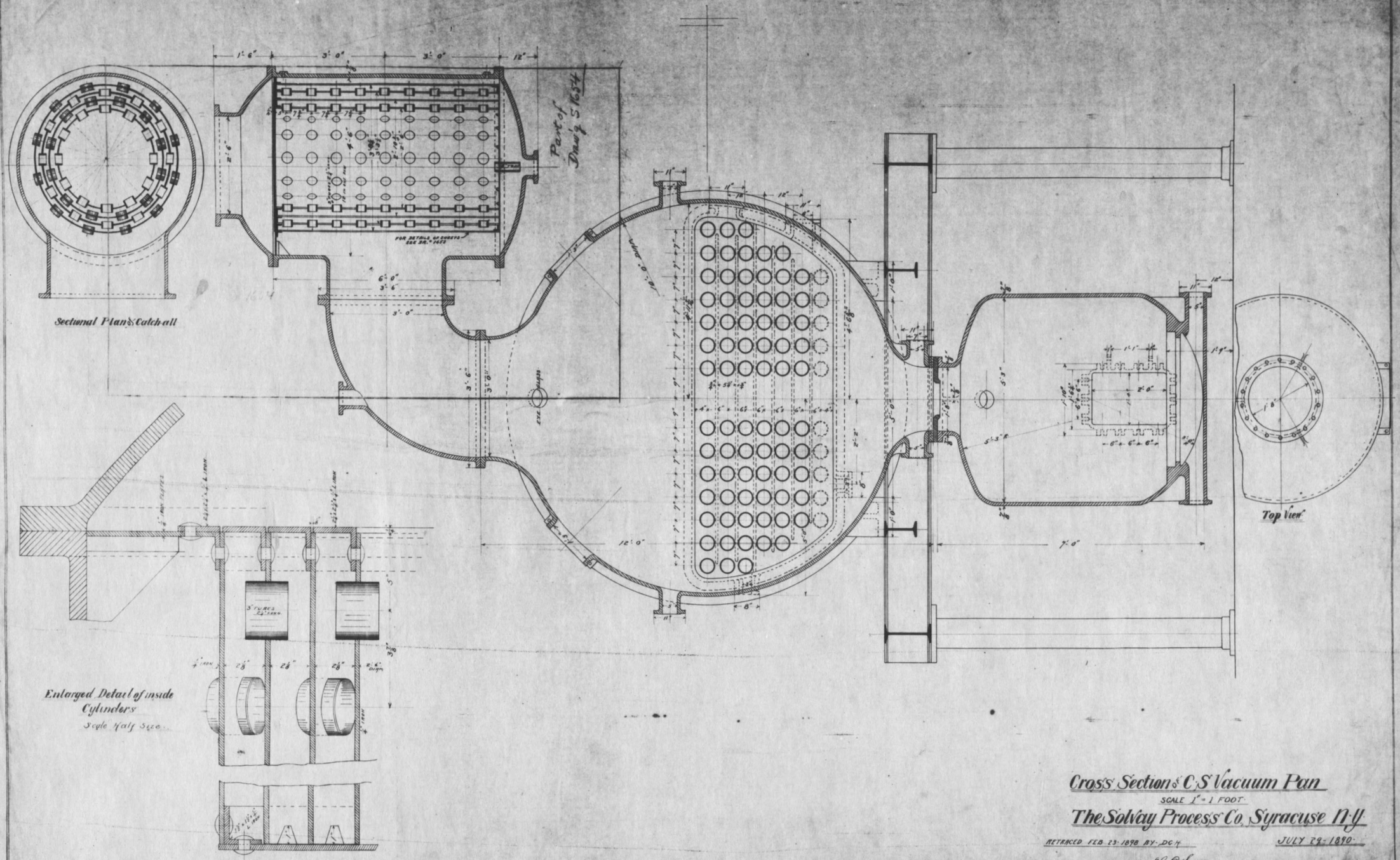
DRAWN BY A.B.L. DATE Dec. 28, 1898
CHECKED BY [illegible]
APPROVED [illegible]

S-1255

1255-P93


M.E.V. Removed
P.V.P.
T.V.P.
Y.Y.
Pipe Arrangement of E.S. Pump
The Selby-Pratt Co. Syracuse N.Y.

1317 - P93



Cross Section of C.S Vacuum Pan

SCALE 1" = 1 FOOT

The Solvay Process Co. Syracuse N.Y

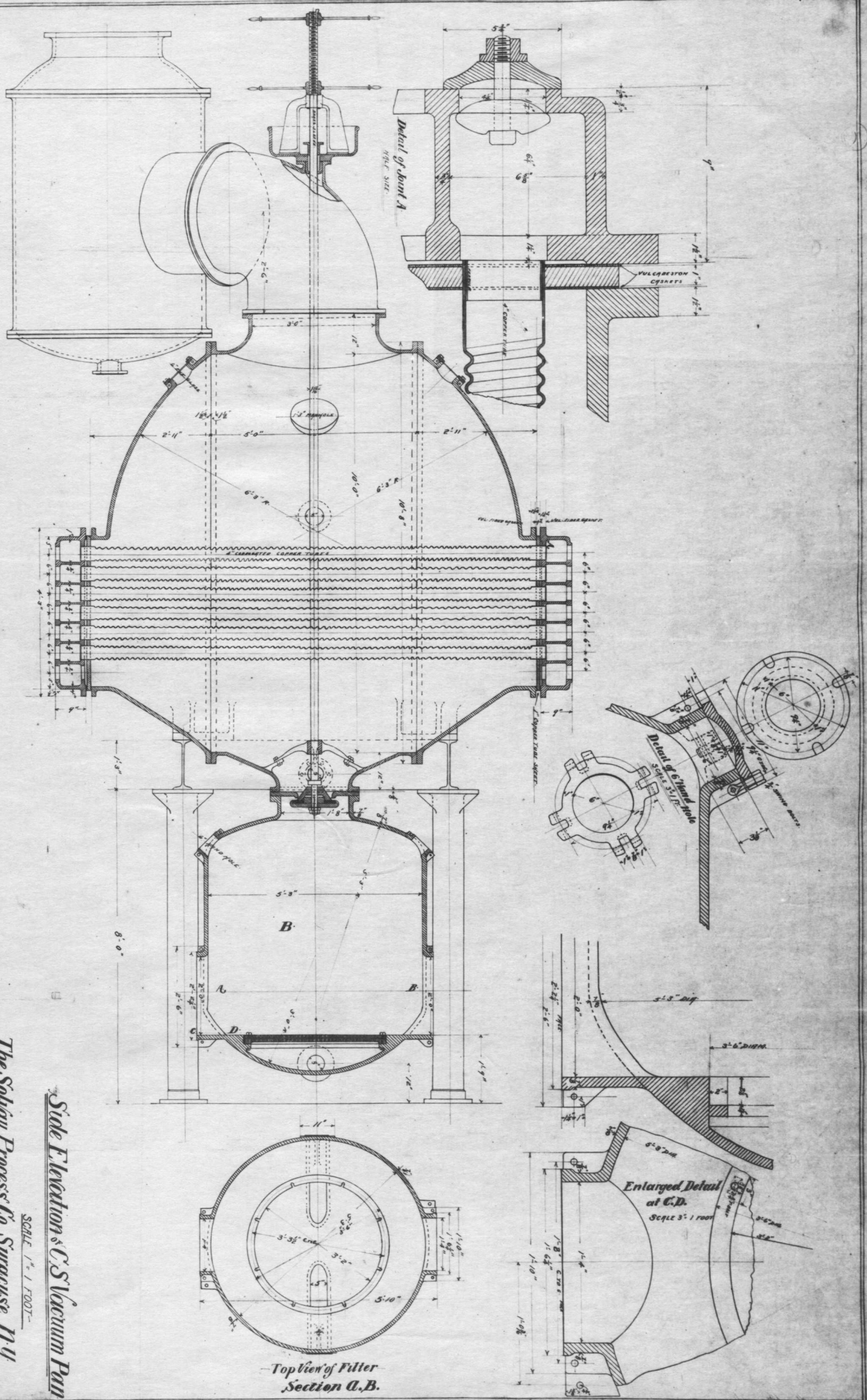
RETRACED FEB. 23. 1898 BY. DCH — JULY 29. 1890.

CHECKED BY JHCS

APPROVED BY RHC.

S 1654

16554 - 693



Side Elevation of C.S. Vacuum Pan

SCALE 1"=1 FOOT

The Solvay Process Co. Syracuse N.Y.

July 22 - 1890.

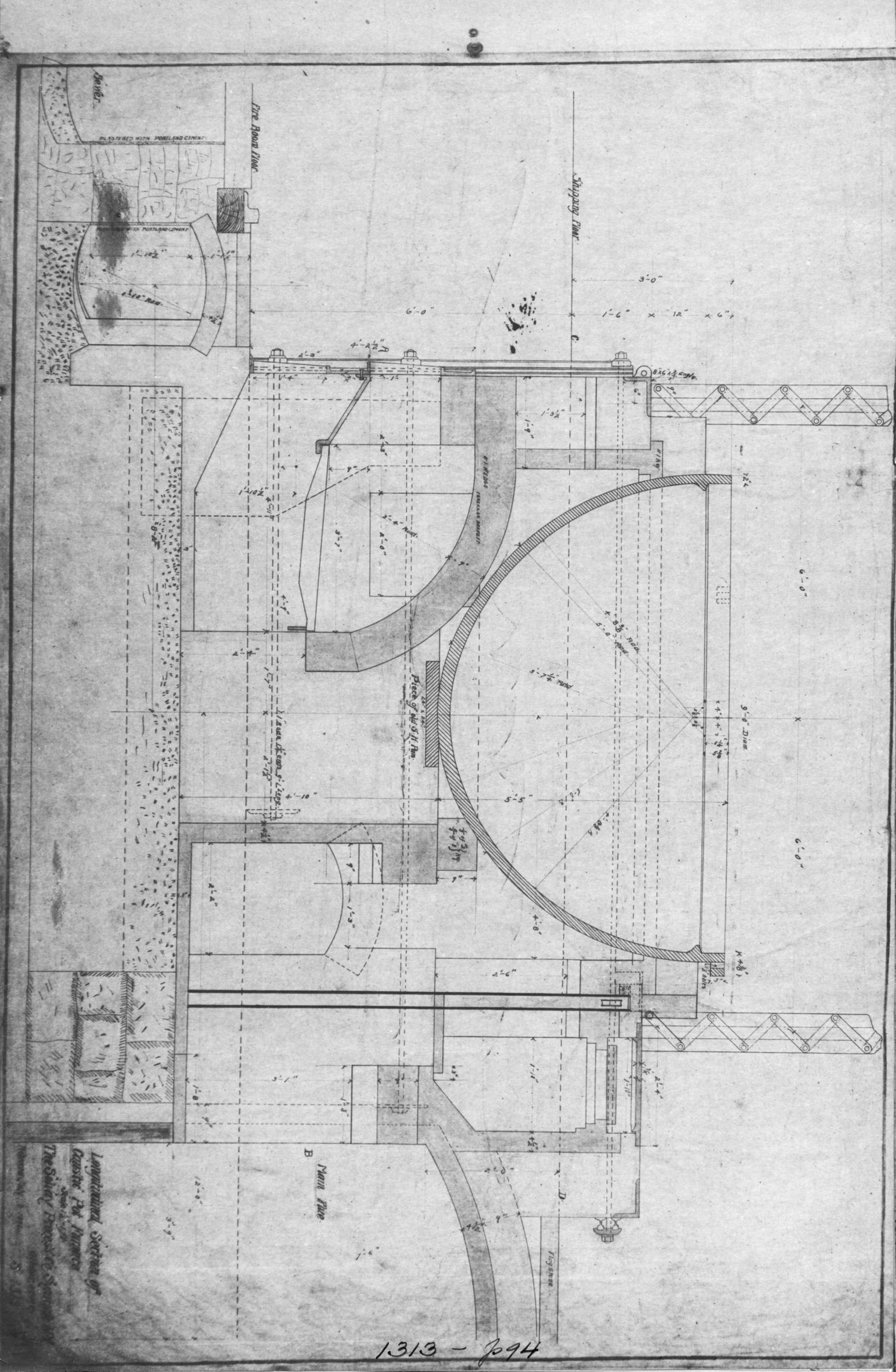
DETRACED FEB-17-1897 BY D.C.K.

CHECKED BY - J.K.C.L.

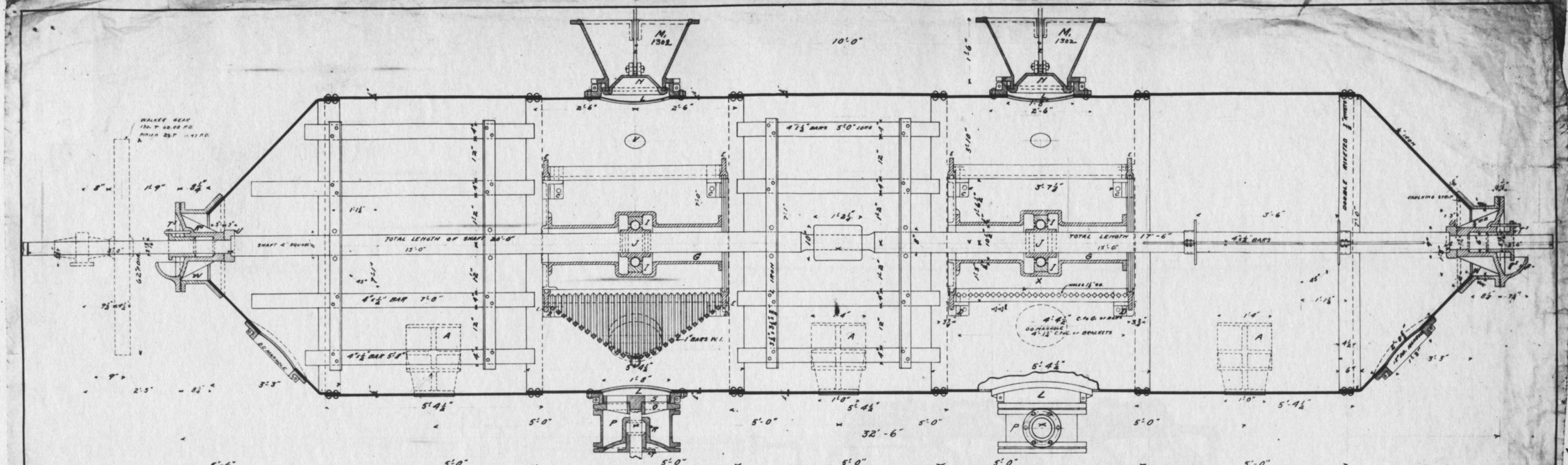
APPROVED BY Chas.

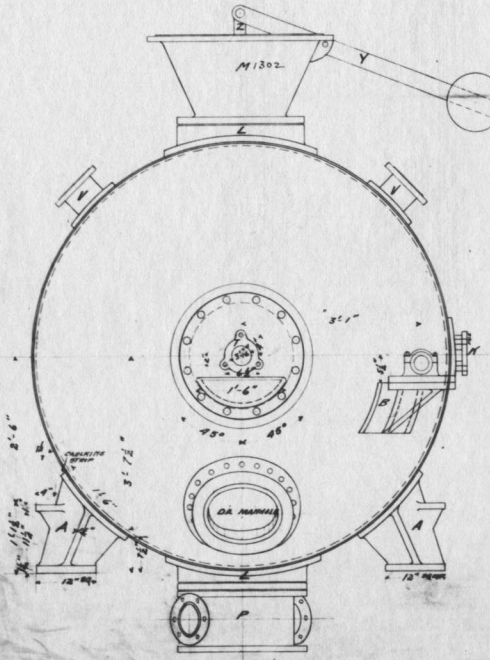
S. 1651. V

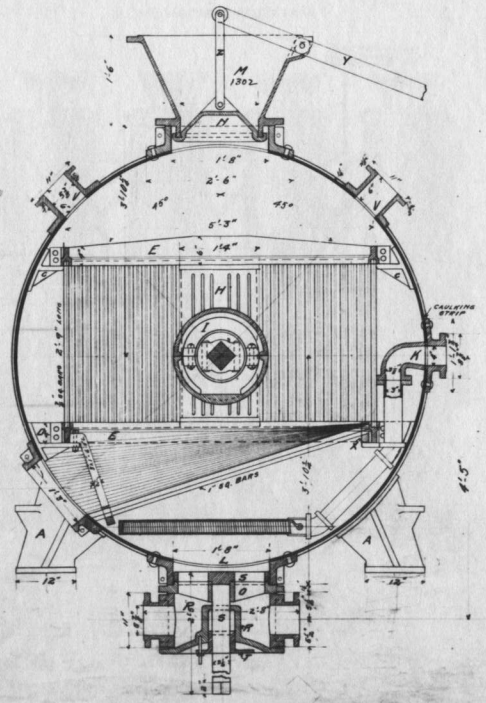
1651 - J93

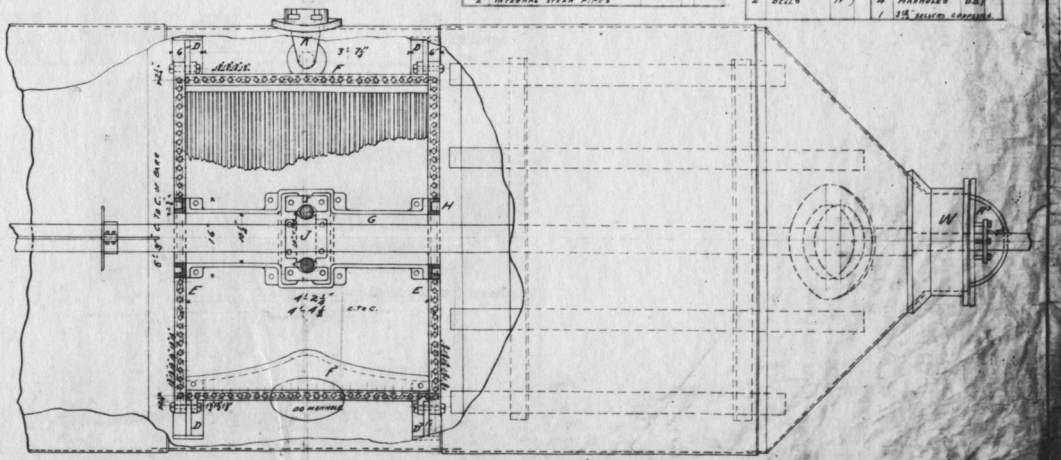

Sewer
PLASTERED WITH PORTLAND CEMENT
Fire Room Floor
Skidding Floor
6'-0"
3'-0"
1'-6" x 12" x 6"
9'-0" Diam.
Piece of Old 15 ft. Pipe
Longitudinal Section of Coastic Pot Furnace
The Sibley Process Steel Co.
B
Main Pipe
D
Fire Brick Arch
Fire Brick Foundation
Flue Base

1313 - J094









BILL OF WRT IRON

2	SHEETS 3'-10½" × 22'-1" × 12.76 LBS.			2402		
3	" × 22'-1" × 12.76 LBS.			1804		
2	CURVED SHEETS 3'-10½" × 17'-9" × 12.76 LBS.			1479		
				7594	4" SQ.	1518
12	½" × 3½" × 3" CLEAT ANGLES			714	45	616
4	ANGLES 4" × 4" × ½" × 2'-0" LONG					
1	" " 5'-8" "					
1	" " 7'-0" "			707	40	472
228	¾" SQ. BARS 2'-6" LONG			627	2.44	1600
58	1" " "			309	5.31	1814
2	BAR IRON 3'-1"-6"			18	10½	126
1	4" SQ. SHAFT 20'-0"					
1	" " 17'-6"			371	6	2006
2	INTERNAL STEAM PIPES					21008

MAKE FOR ONE CAUSTICIZER — CAST IRON

6	BRACKETS	A		2	PAINT MIXER	D
1	"	B	W	2	HANGERS	F
8	"	C		2	BEARINGS	F'
8	"	D		2	"	G'
8	BEARINGS	E		2	VALVES	G
8	"	F		2	GUARDS	T
2	BEARING SUPP	G		2	"	T'
4	CAGE PLATES	H		2	COLLARS	U
2	BALL BEAR BRT	I		4	HANGERS	V
2	" "	J		2	"	W
2	NOZZLES	K		2	BARS	X
1	"	L		2	LEVERS	Y
2	HOPPERS	M		2	LINKS	Z
2	BELLS	N		4	HANGERS	B.B.
				1	3½" SELECTA CAPPLESS	

See later drawings 1708, 1709, 1710, 1711, 1729

CAUSTICIZER FOR C.S.

THE SOLVAY PROCESS CO. SYRACUSE, N.Y.

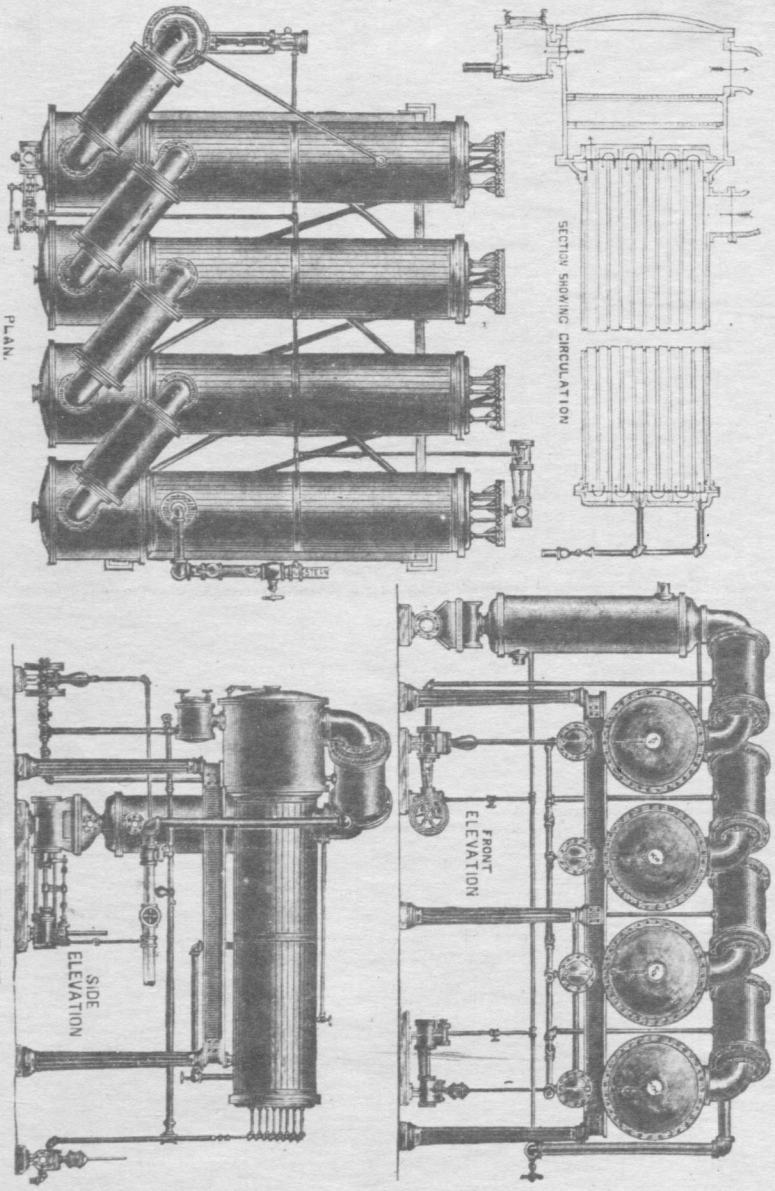
DRAWN BY ____ TRACED BY ____

BLUEPRINTED ____ CHECKED BY ____

APPROVED ____

S-1301

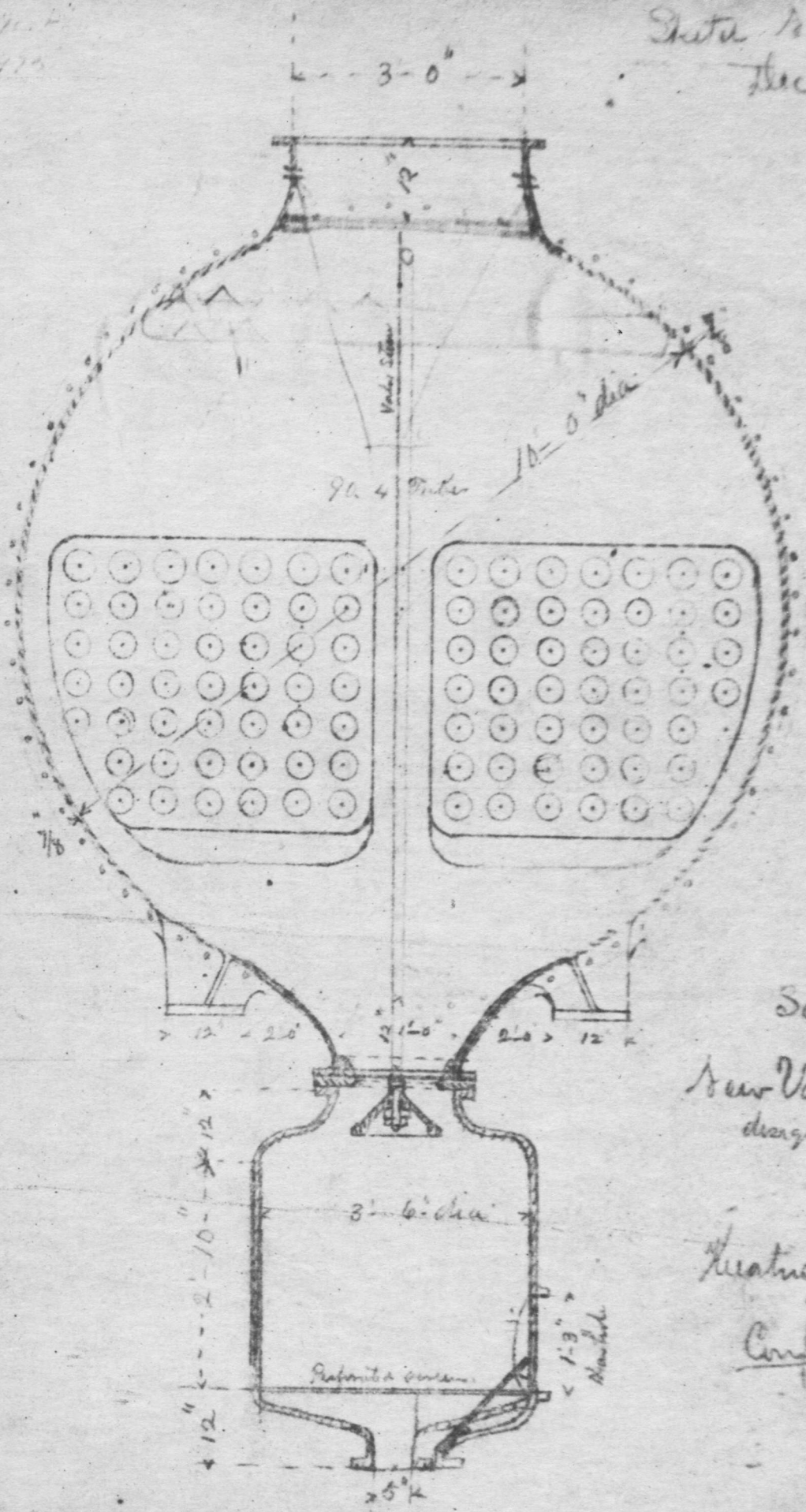
1301-A95



YARYAN EVAPORATING APPARATUS—QUADRUPLE EFFECT.

YAR YAN- p 95

Date No 145
Dec 29 1887

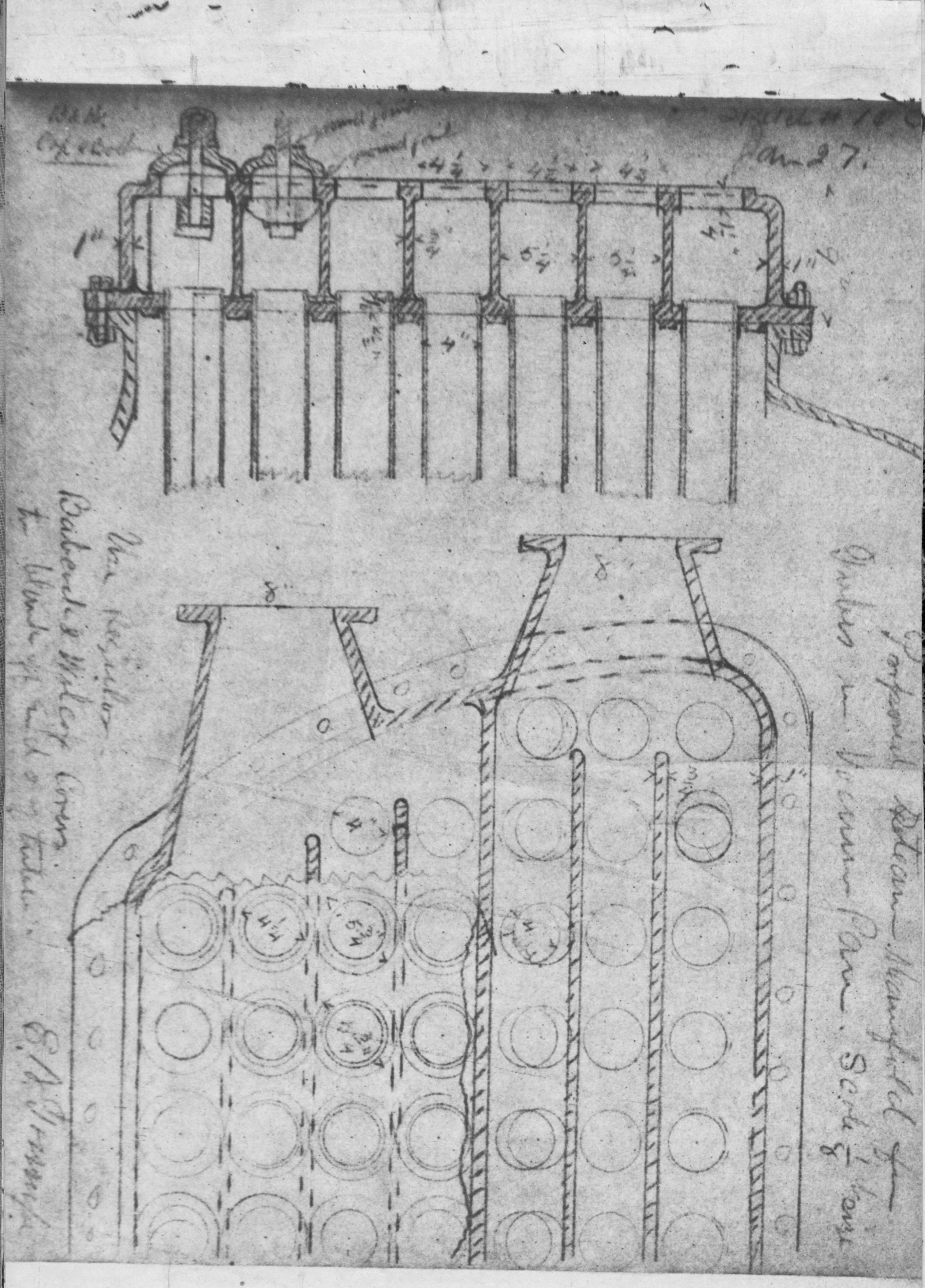


Scale $\frac{1}{2}$" = 1 ft.

New Vacuum Pan
designed July 1887.
E. D. Donnelly

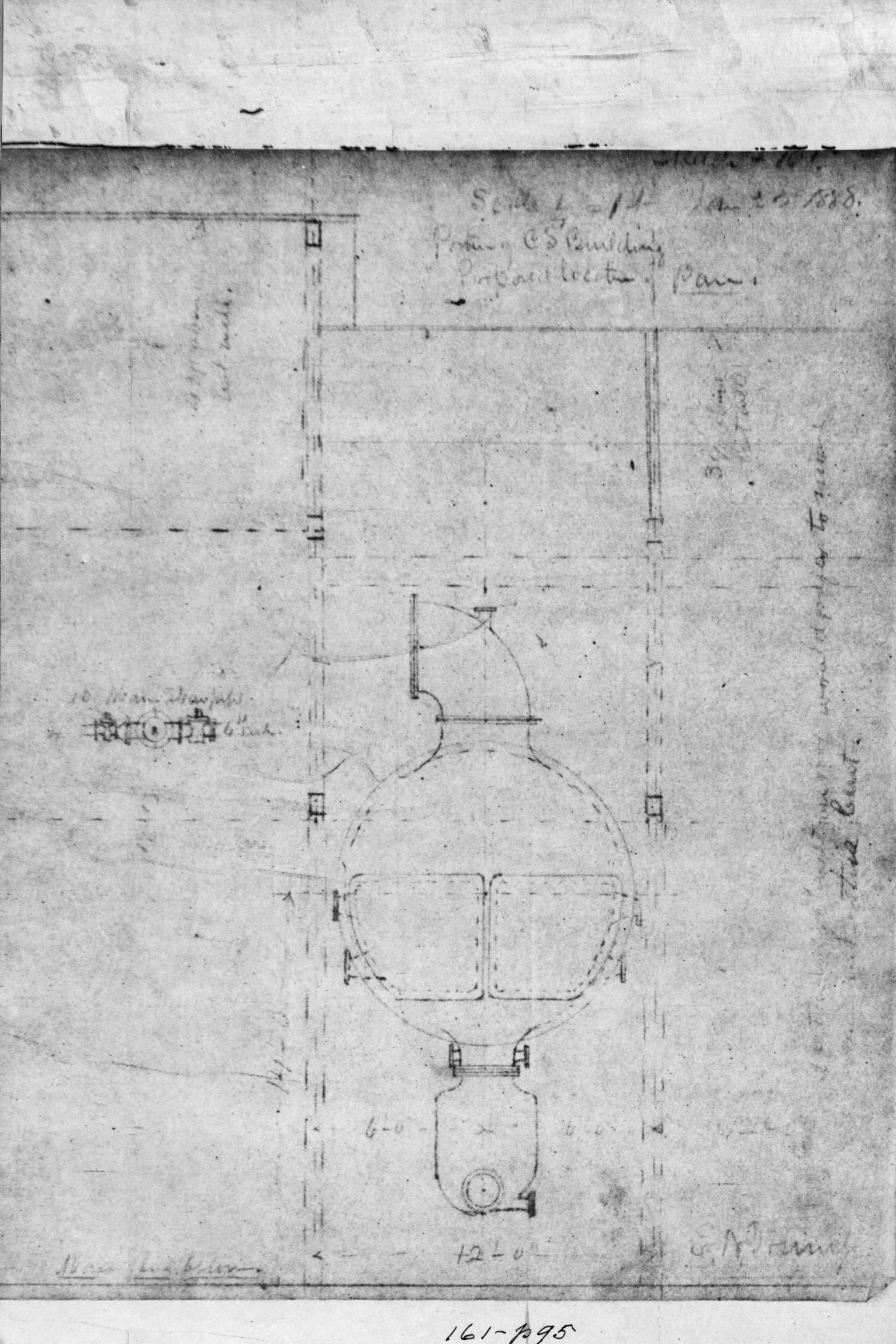
Heating Surface 98 ft²

Confectioners

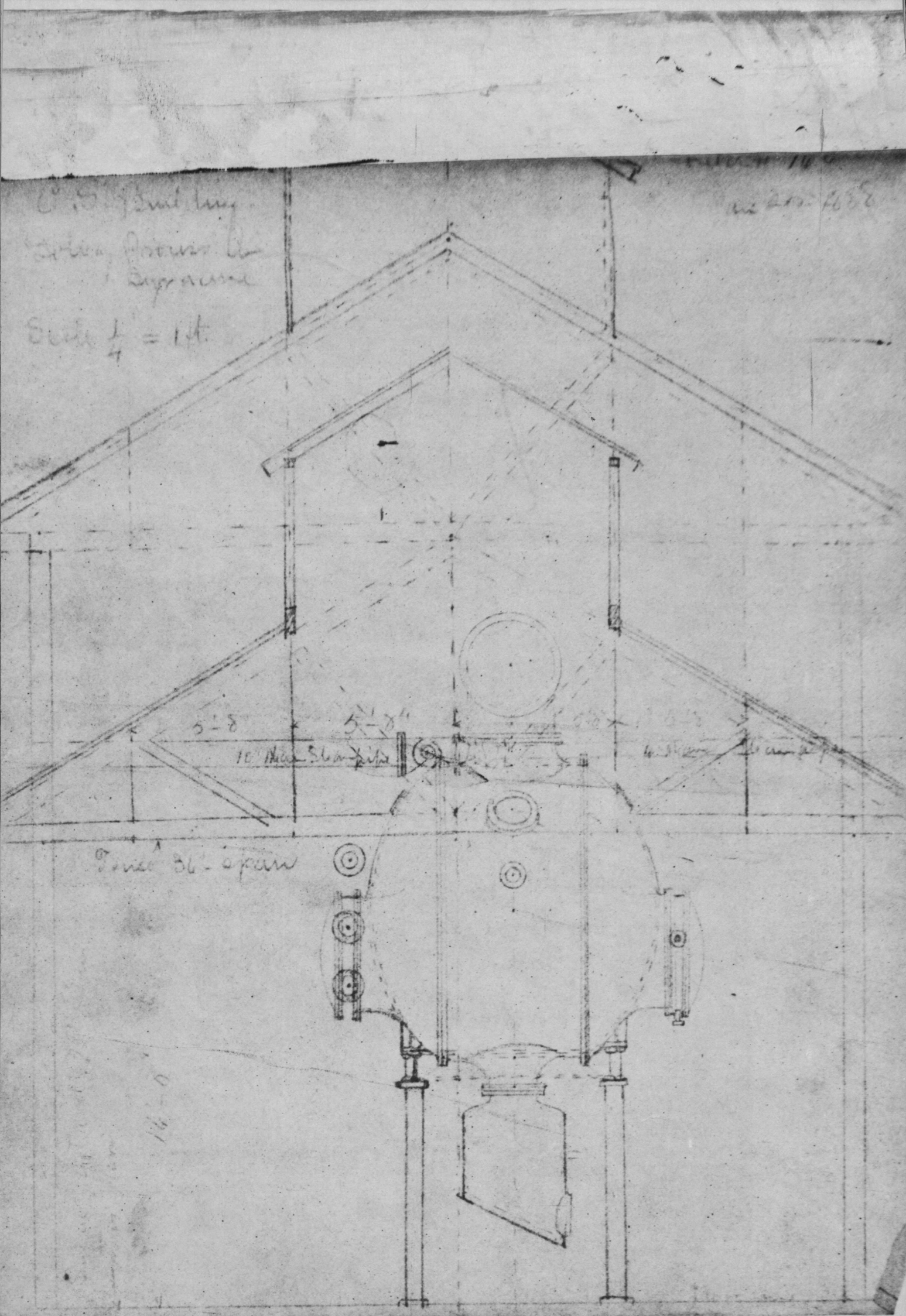

Plan 27.
Babcock & Wilcox Co.
Babcock & Wilcox Water Tube Boiler
Patent Manufactured for
Owners in Vicinity of Penn. Sta. N.Y.

Scale 1 - 1' Jan 25 1888.

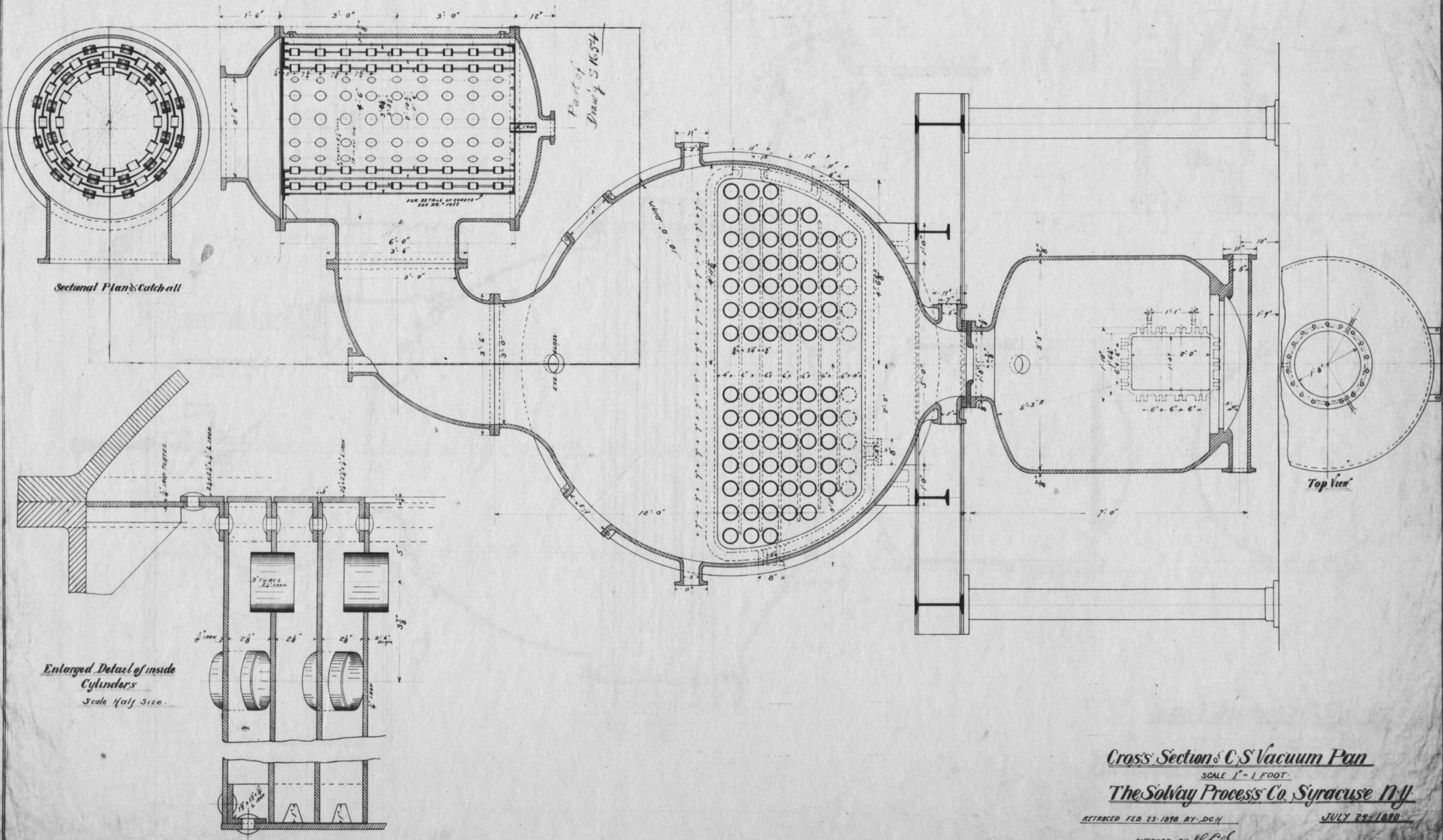
Portion U.S. Building
Proposed location of Pavement



161-295



166-P95



Cross Section of C.S Vacuum Pan

SCALE 1" = 1 FOOT.

The Solvay Process Co. Syracuse N.Y.

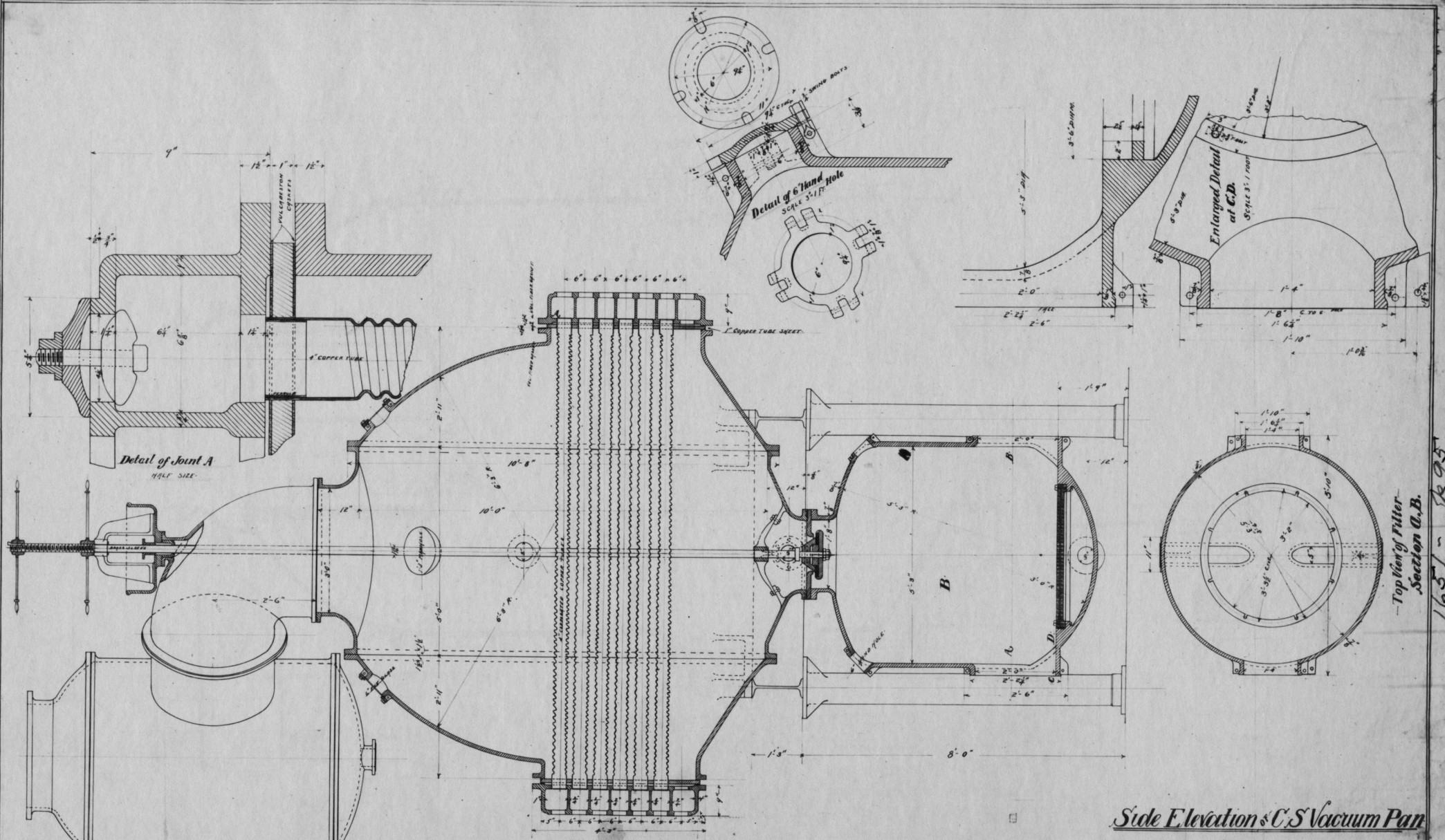
RETRACED FEB 23-1898 BY. DCH — JULY 29-1890

CHECKED BY J.G.C.S

APPROVED BY Geo C.

S 1654

1654 - 4596



Side Elevation of C.S. Vacuum Pan

SCALE 1" = 1 FOOT

The Solvay Process Co, Syracuse NY

July 22-1890

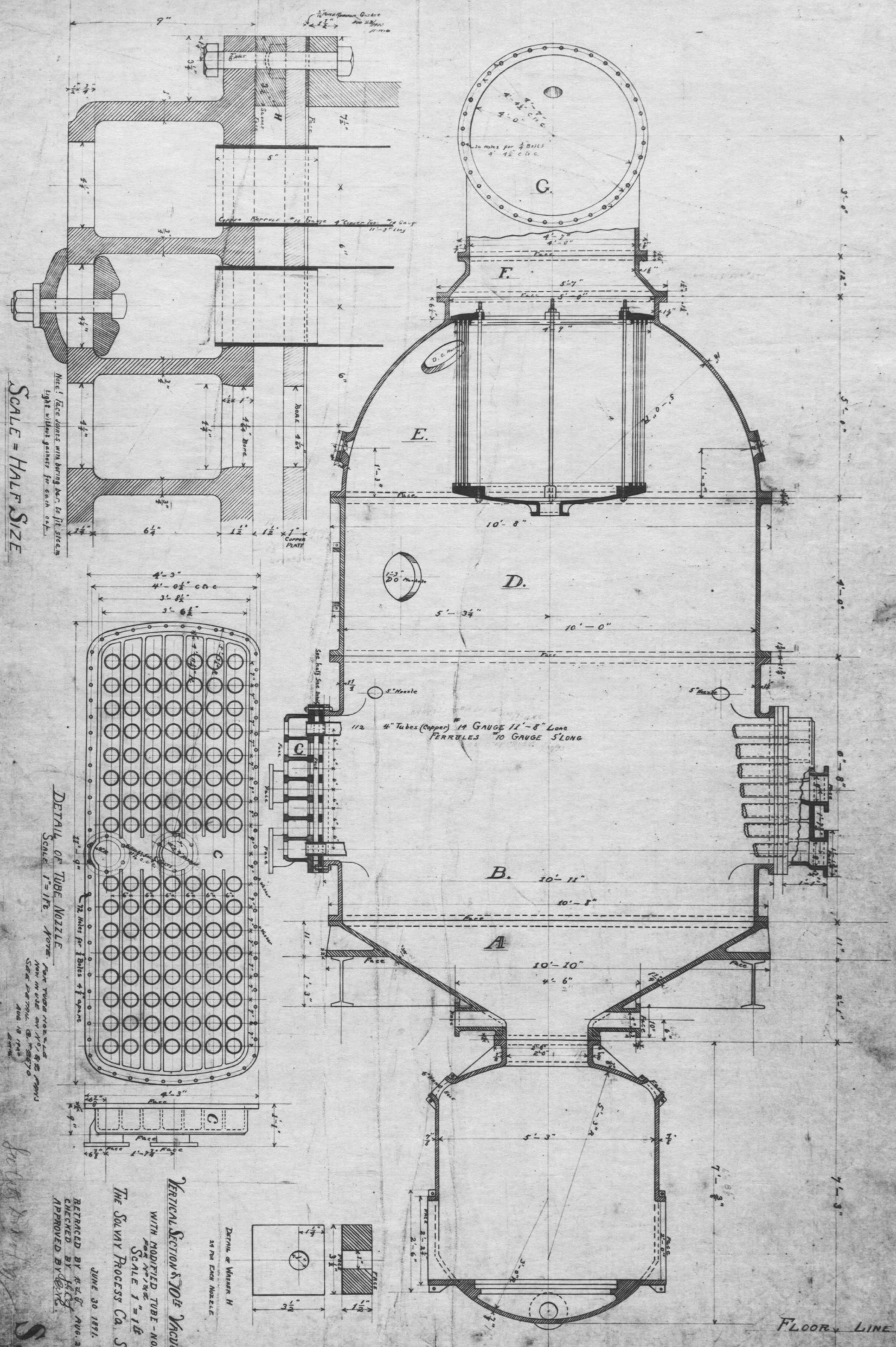
RETRACED FEB-17-1897 BY D.C.K.

CHECKED BY- J.R.C.J.

APPROVED BY Cook.

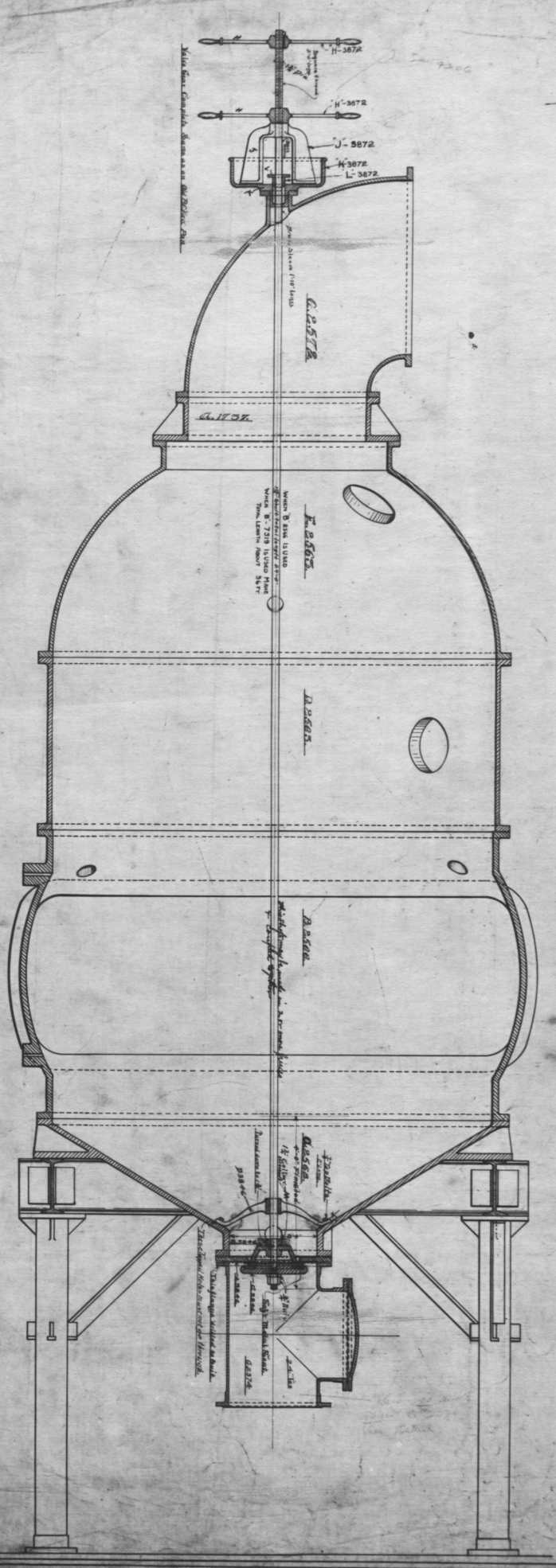
S 1651 V

1651 - 1895



S. 1780.

1780-1096



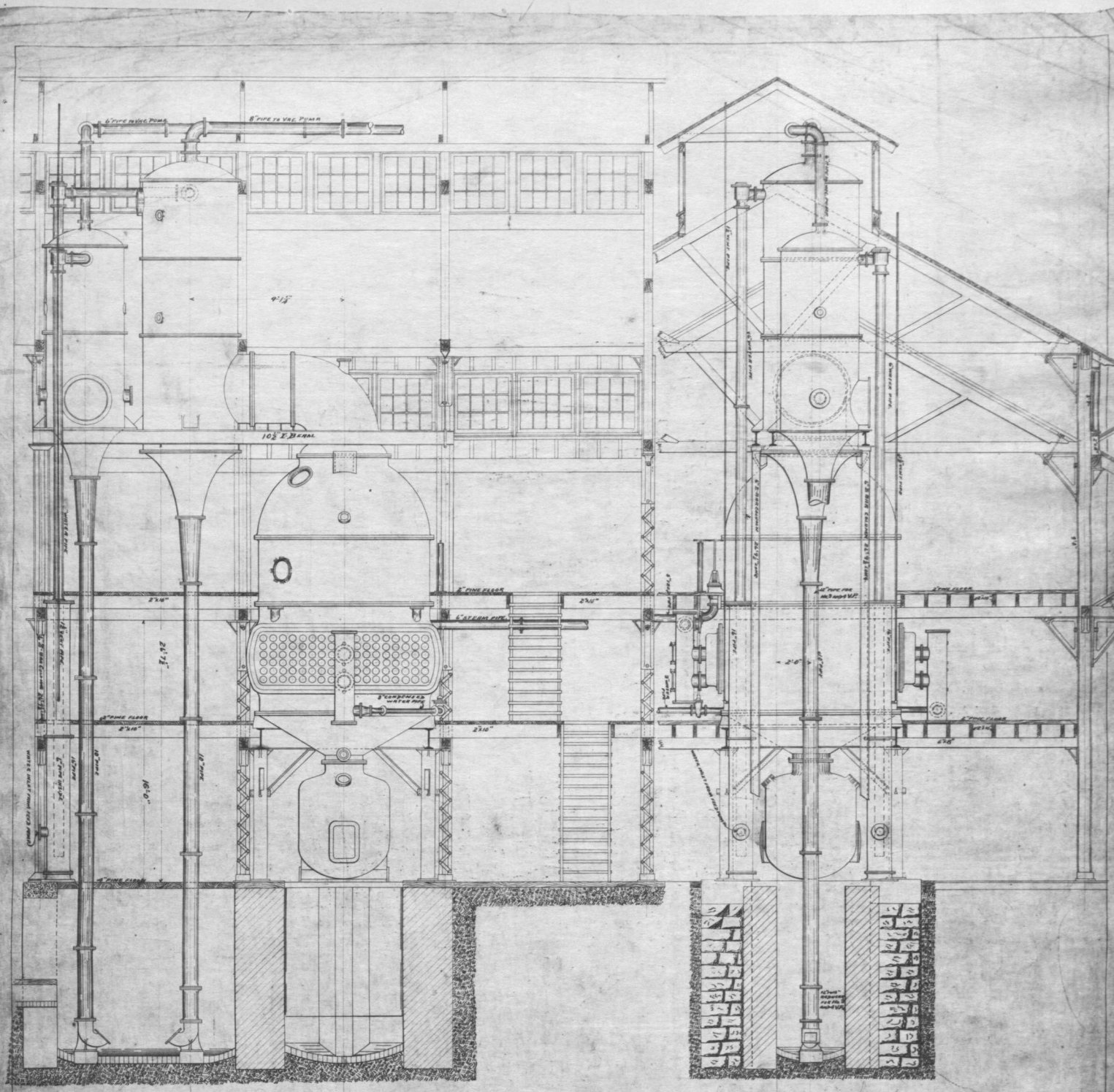
Arrangement of Bottom Valve & Gearing for Blow Off

Scale 1-1/2" = 1'-0"

The Stirling Process Co. Syracuse, N.Y.

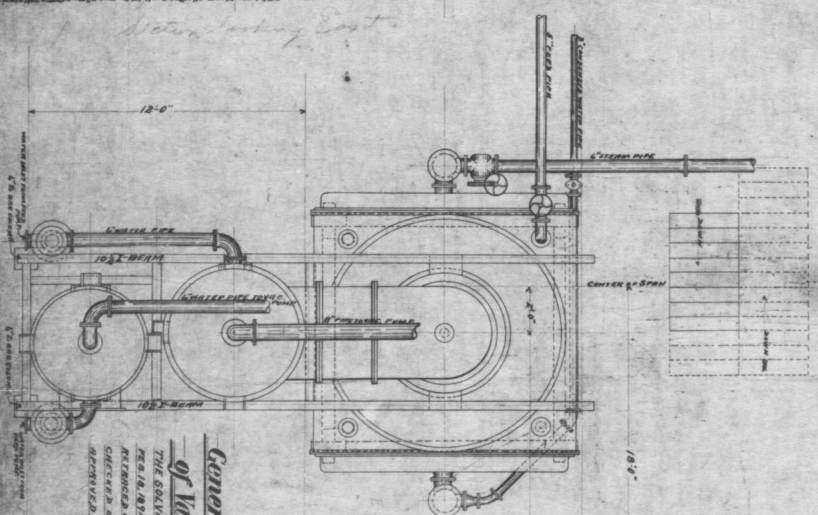
March 23rd 1896

3872-96



Section looking East

Section looking South



General Arrangement of Vacuum Pan No. 2

THE GRAVITY PROCESS OF SYRACUSE, N.Y.

FEB. 18, 1891.

DRAWN BY E.K.H.S. AND T.A.BOND.

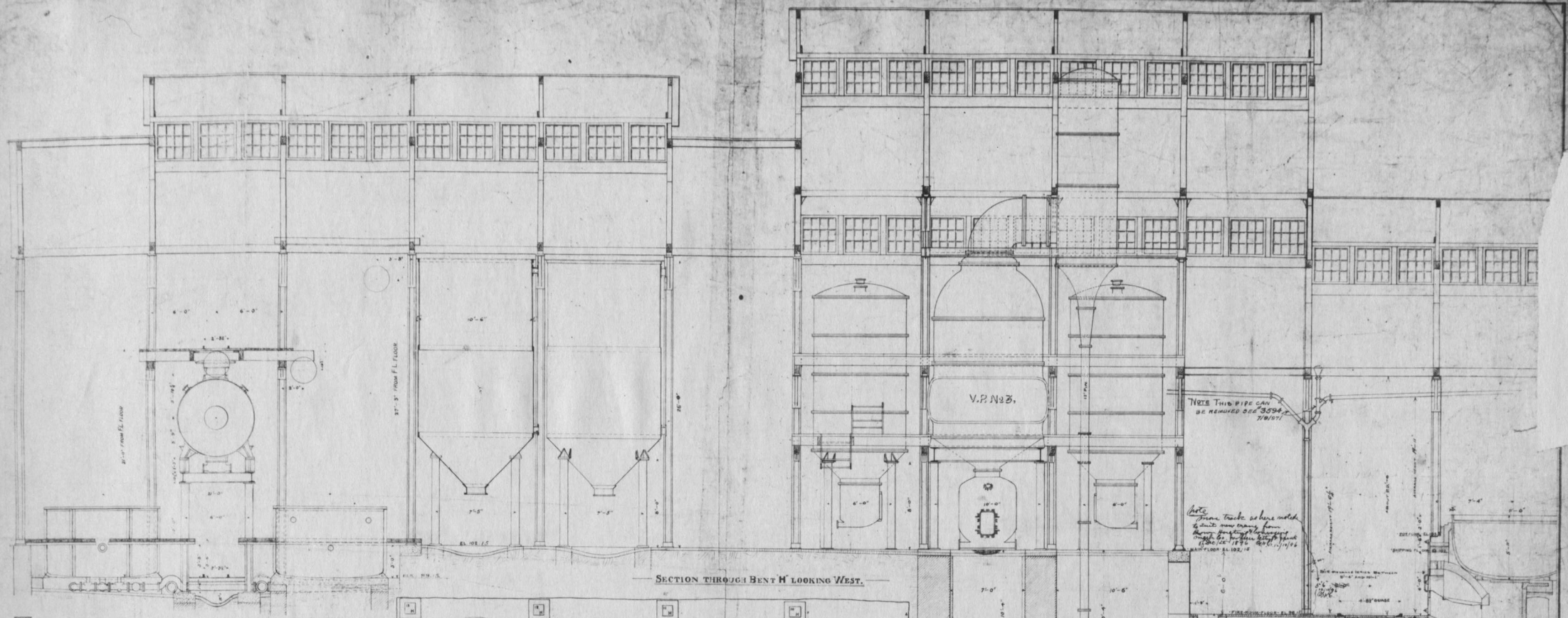
TRACED BY E.K.H.S. AND T.A.BOND.

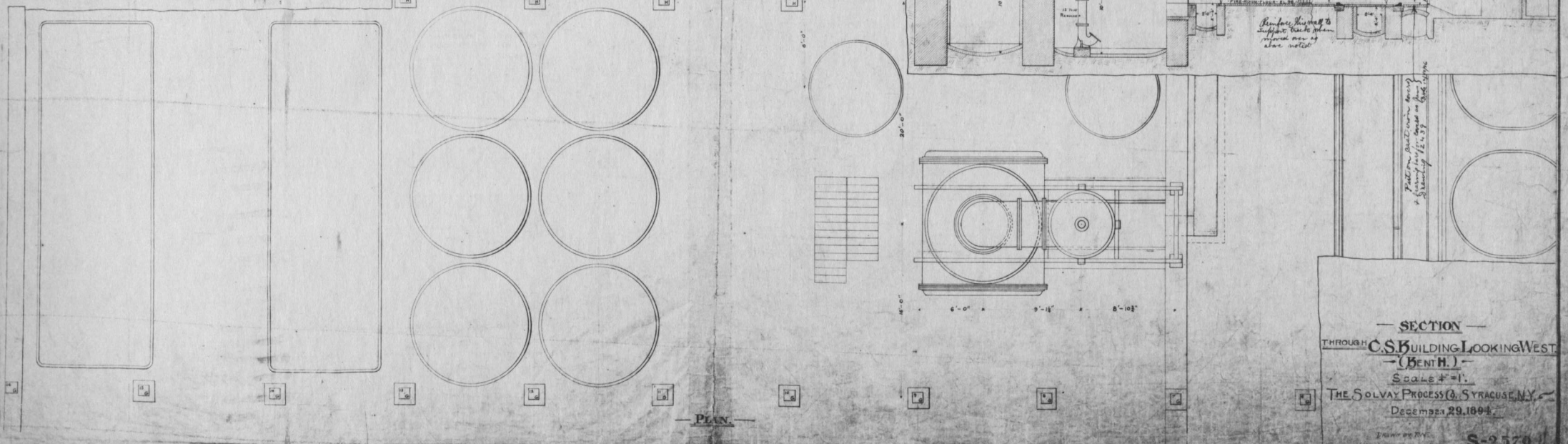
CHECKED BY

APPROVED BY

S-1725.

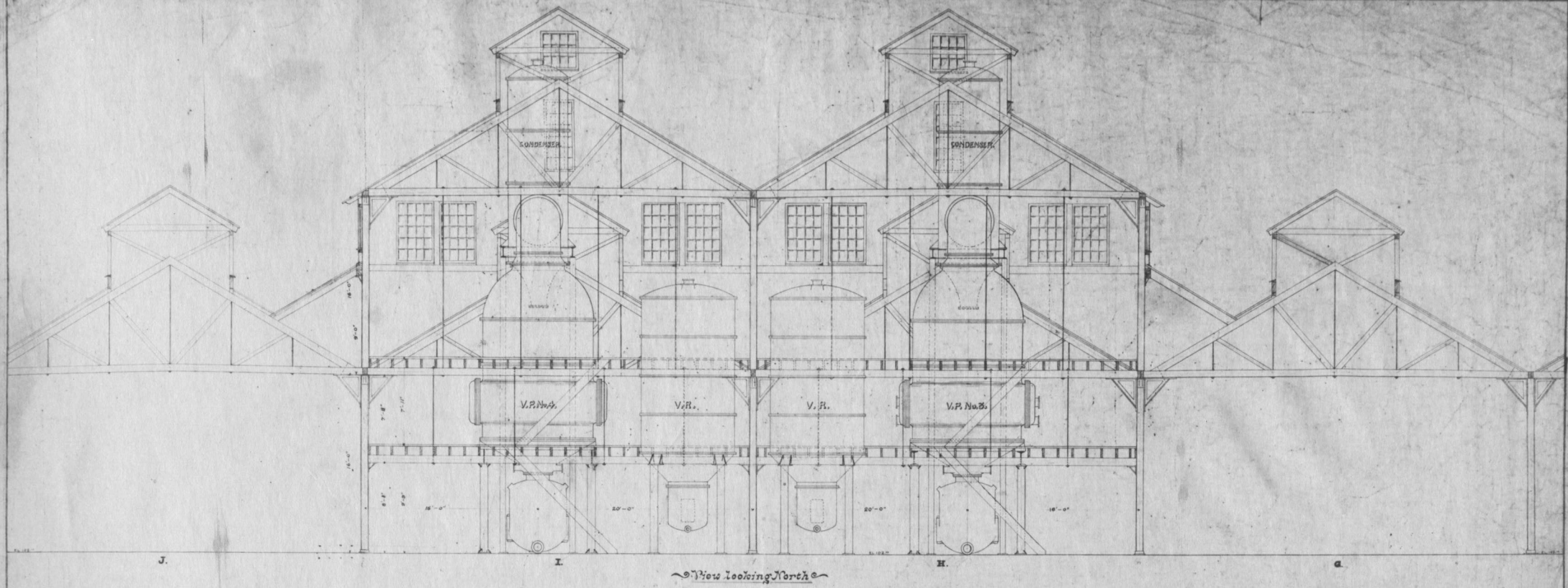
1725-P96



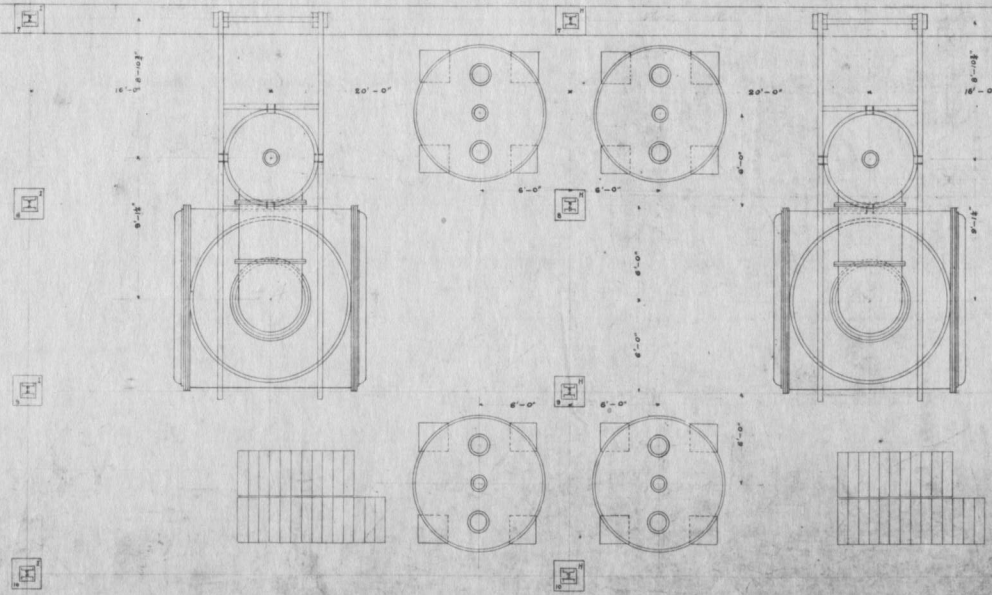


SECTION
THROUGH C.S. BUILDING LOOKING WEST.
(BENT H.)
SCALE 1/4" = 1'.
THE SOLVAY PROCESS CO. SYRACUSE, N.Y.
DECEMBER 29, 1894.
S-2579-1

2579-998



View looking North



General Arrangement of Vacuum Pans Nos 3 & 4.

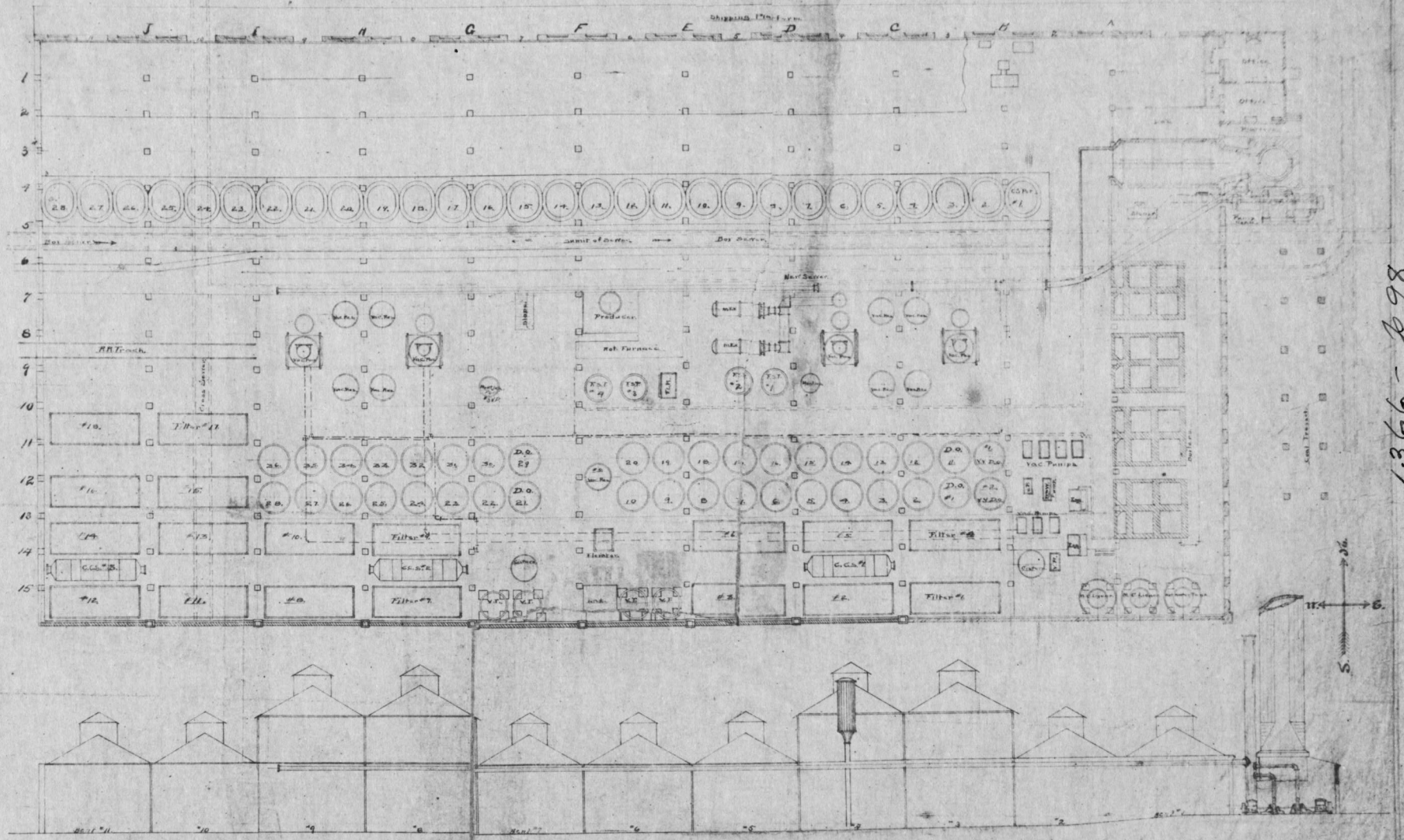
SCALE 4"=1'.

THE SOLVAY PROCESS CO. SYRACUSE, N.Y.

JANUARY 2, 1895.

S-2580.

2580 - 898



General Arrangement of C.S. Dept.

Scale, 1/16" = 1'

THE SOLVAY PROCESS CO.

March 24 - 1896 Syracuse, N.Y.

Drawn by

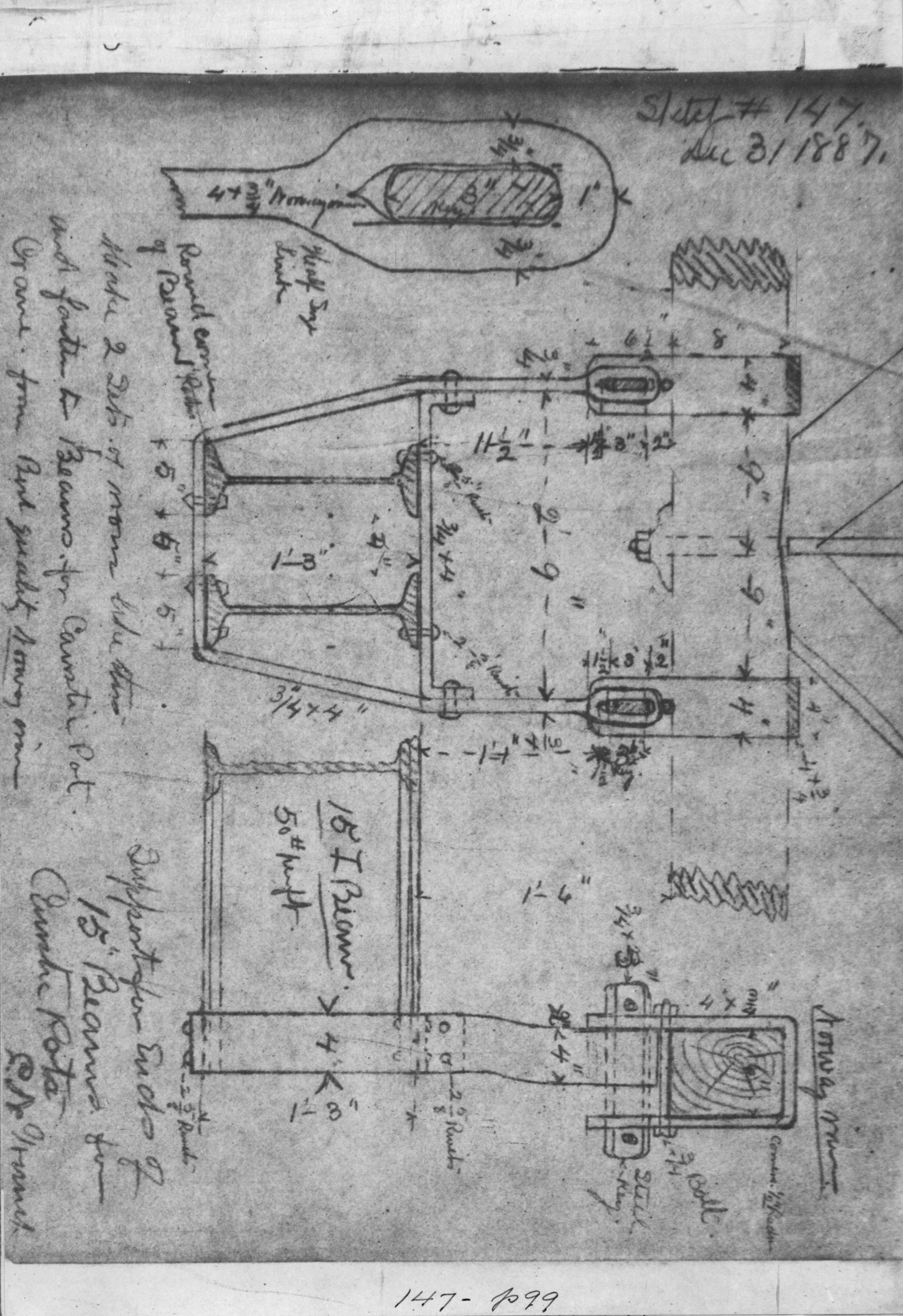
Checked "

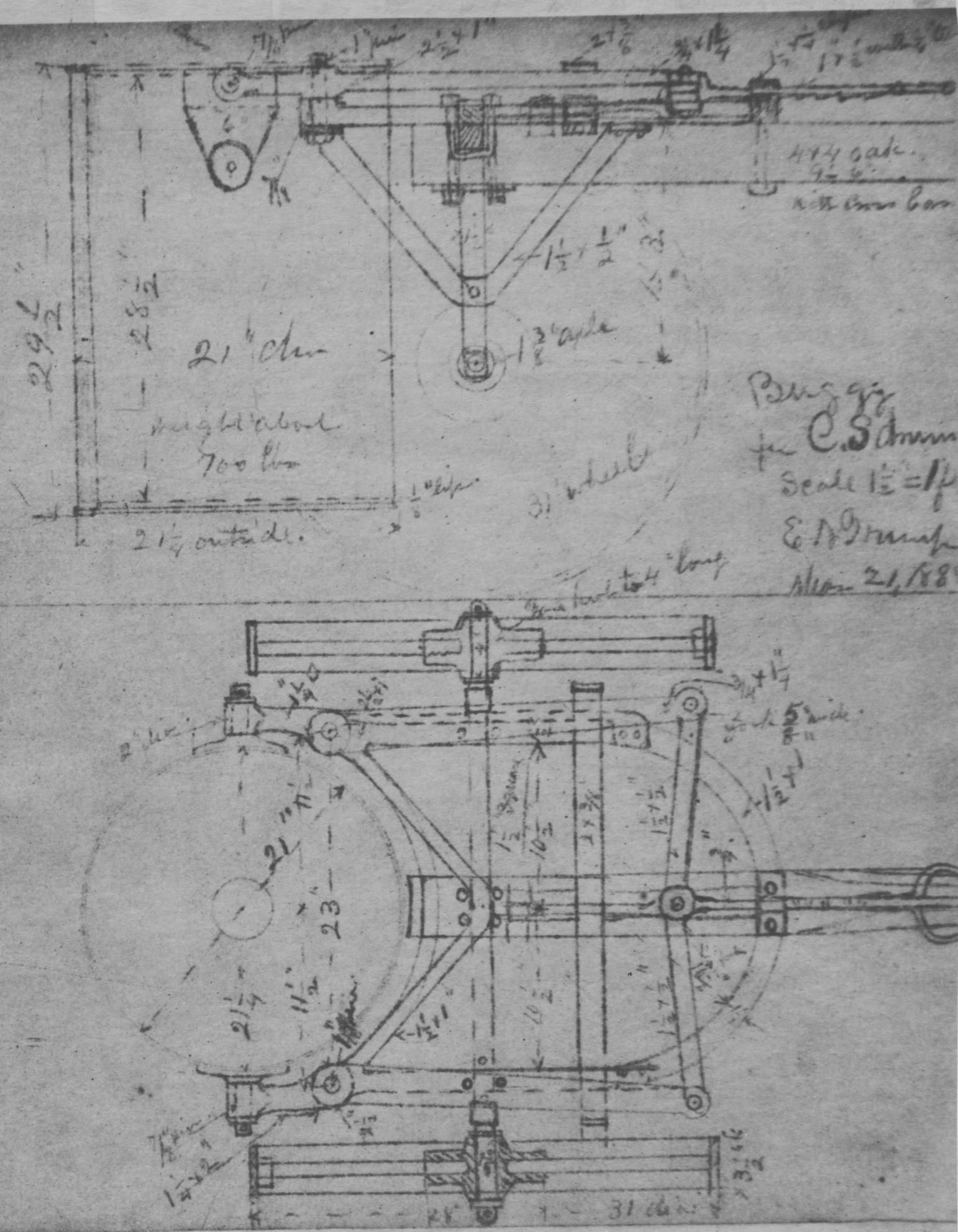
Approved "

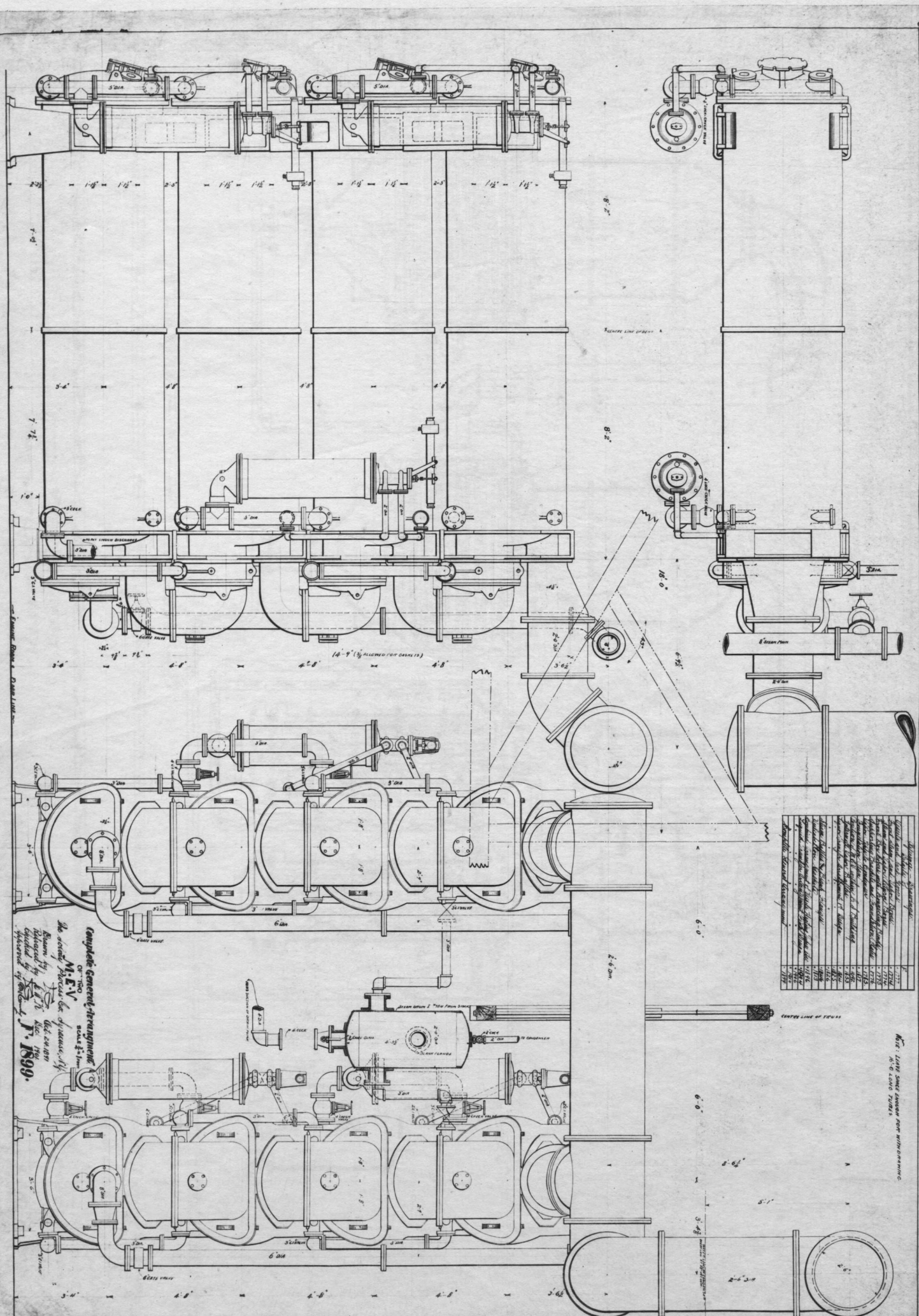
S. 1560

1379 - 88

Sketch # 147.
Dec 31 1887.



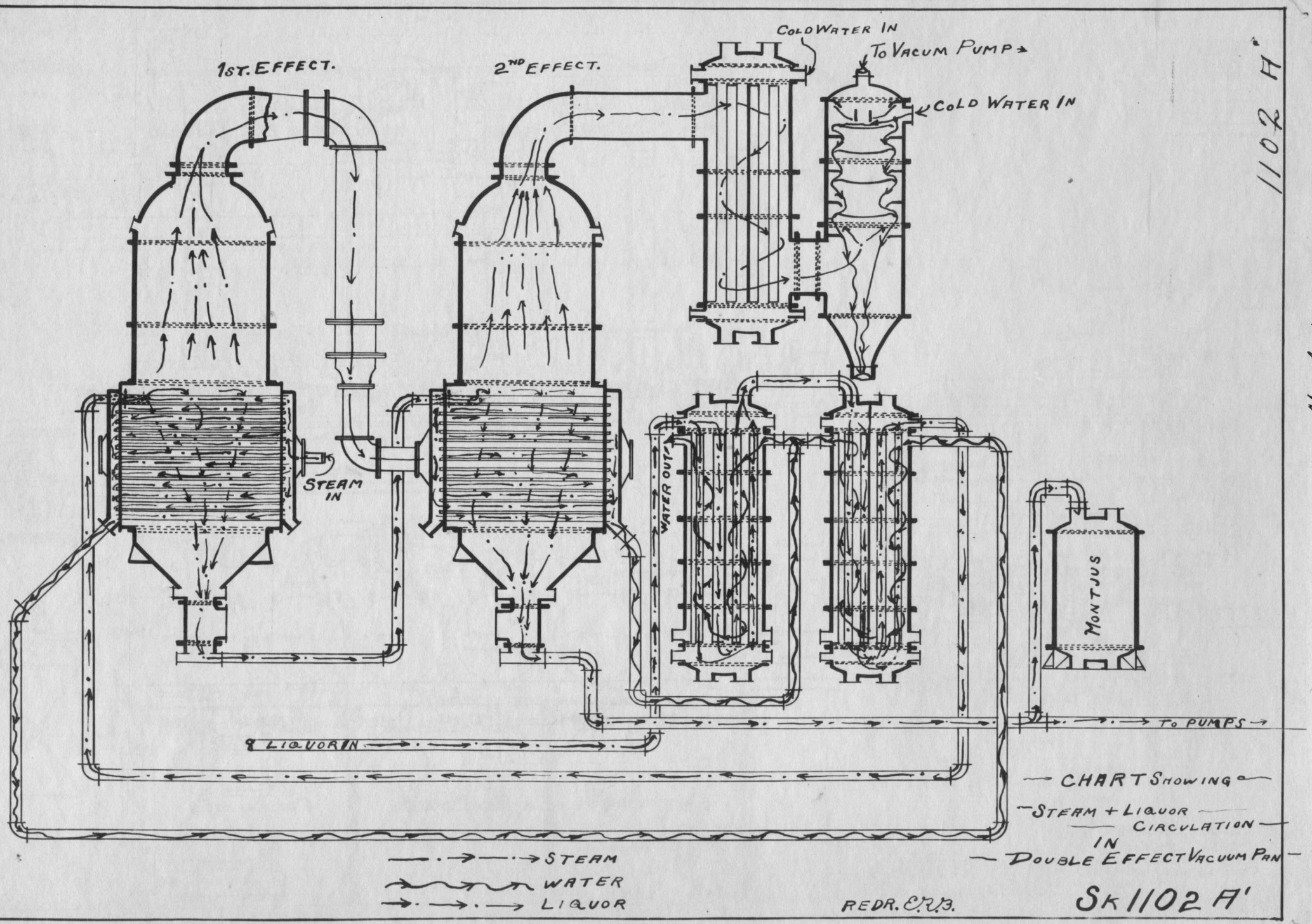

21" dia
Weight about 700 lbs
31" wheels
Buggy for C.S drum
Scale 1½" = 1ft
E.D Drum
March 21, 188
Drum Buggy - P99



Complete General Arrangement
OF TWO
M.E.V.
Re-versible Marine Gas Engines, 450 H.P.
Drawn
Designed by
Checked by
Approved by
Dec. 20th 1899.
F. 1899.

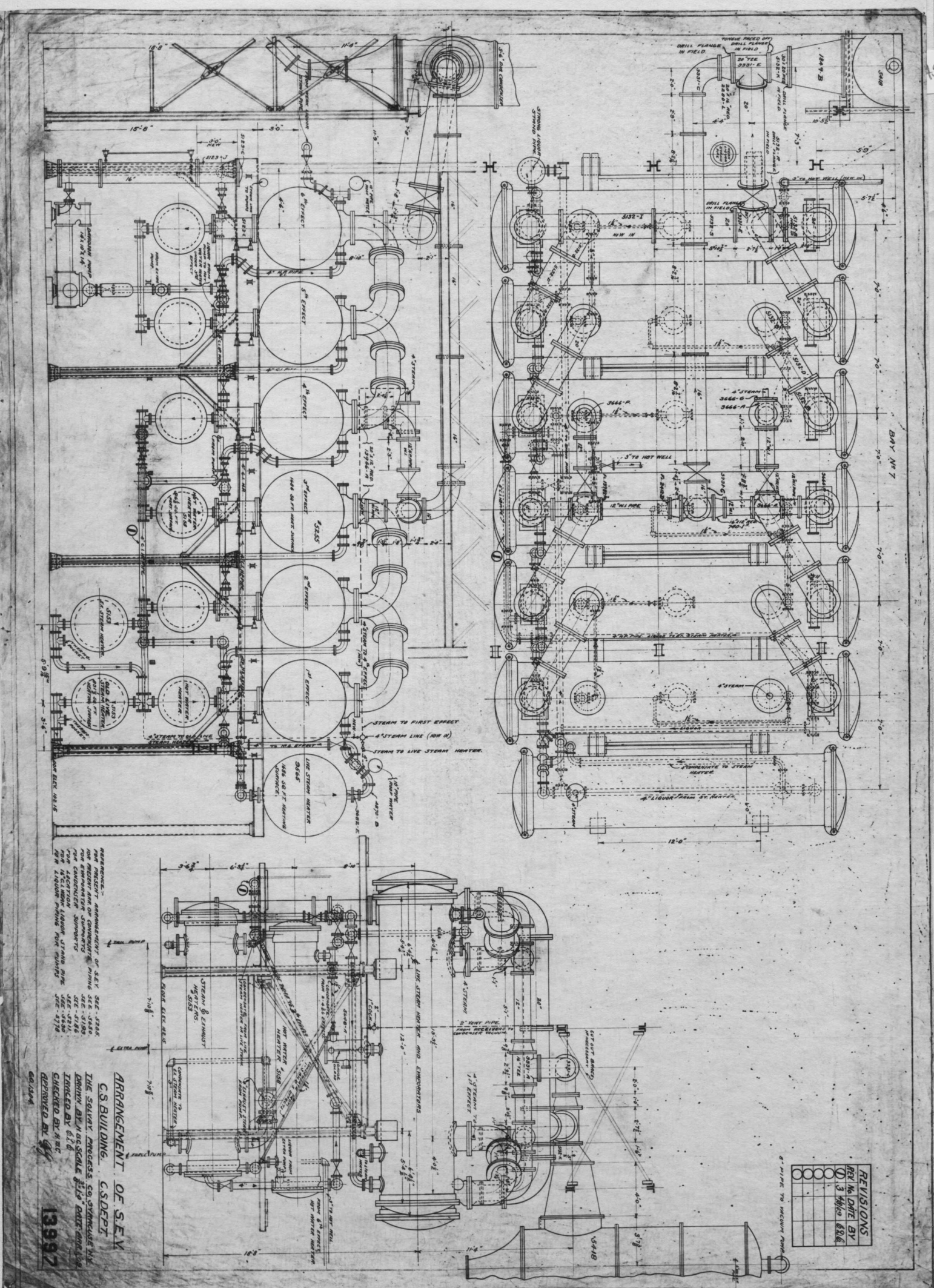
NOTE: LATER SHIPS ENGINE FOR WITH DRAWING 16'-6" LONG TUBES

1899-p101

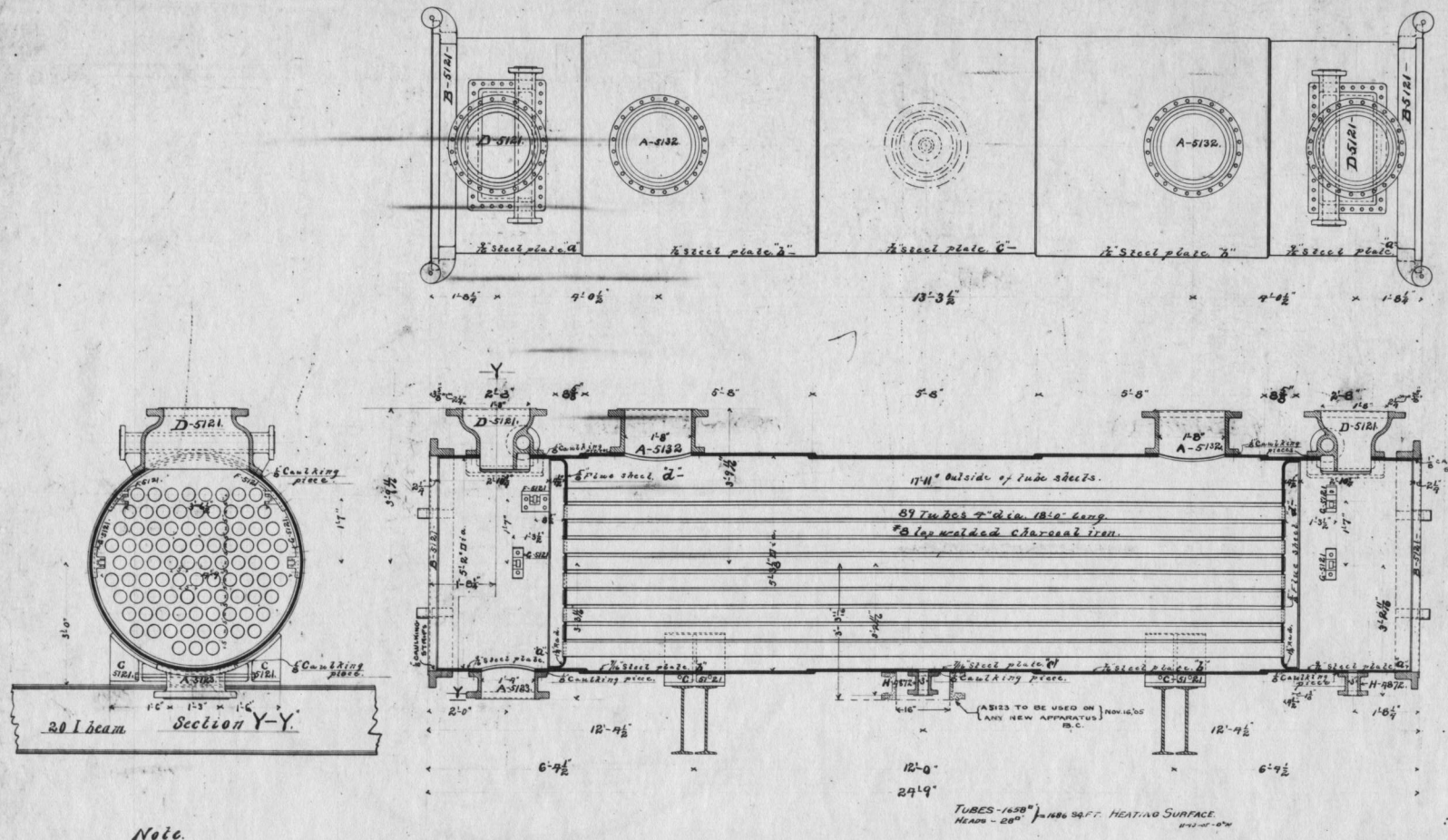


1102 A'

1102A'-P102


1st EFFECT
2nd EFFECT
3rd EFFECT
4th EFFECT
5th EFFECT
6th EFFECT
STEAM TO FIRST EFFECT
4" STEAM LINE (ROW A)
STEAM TO LIVE STEAM HEATER
LIVE STEAM HEATER
HOT WATER HEATER
BAY No 7
REVISIONS
REV No DATE BY
ARRANGEMENT OF S.E.V.
C.S. BUILDING. C.S. DEPT.
THE SOLVAY PROCESS CO. SYRACUSE N.Y.
DRAWN BY H.B.C. SCALE 1/4" DATE MAR 1938
TRACED BY G.L.K.
CHECKED BY A.B.C.
APPROVED BY
13997

13997 - p 103



Note.

All rivets to be ⅞ dia.
Circular seams to be Single riveted. 2½ lap - 2¼ pitch.
Longitudinal seams to be double riveted. 2¼ lap - 3½ pitch. 1½ back pitch.

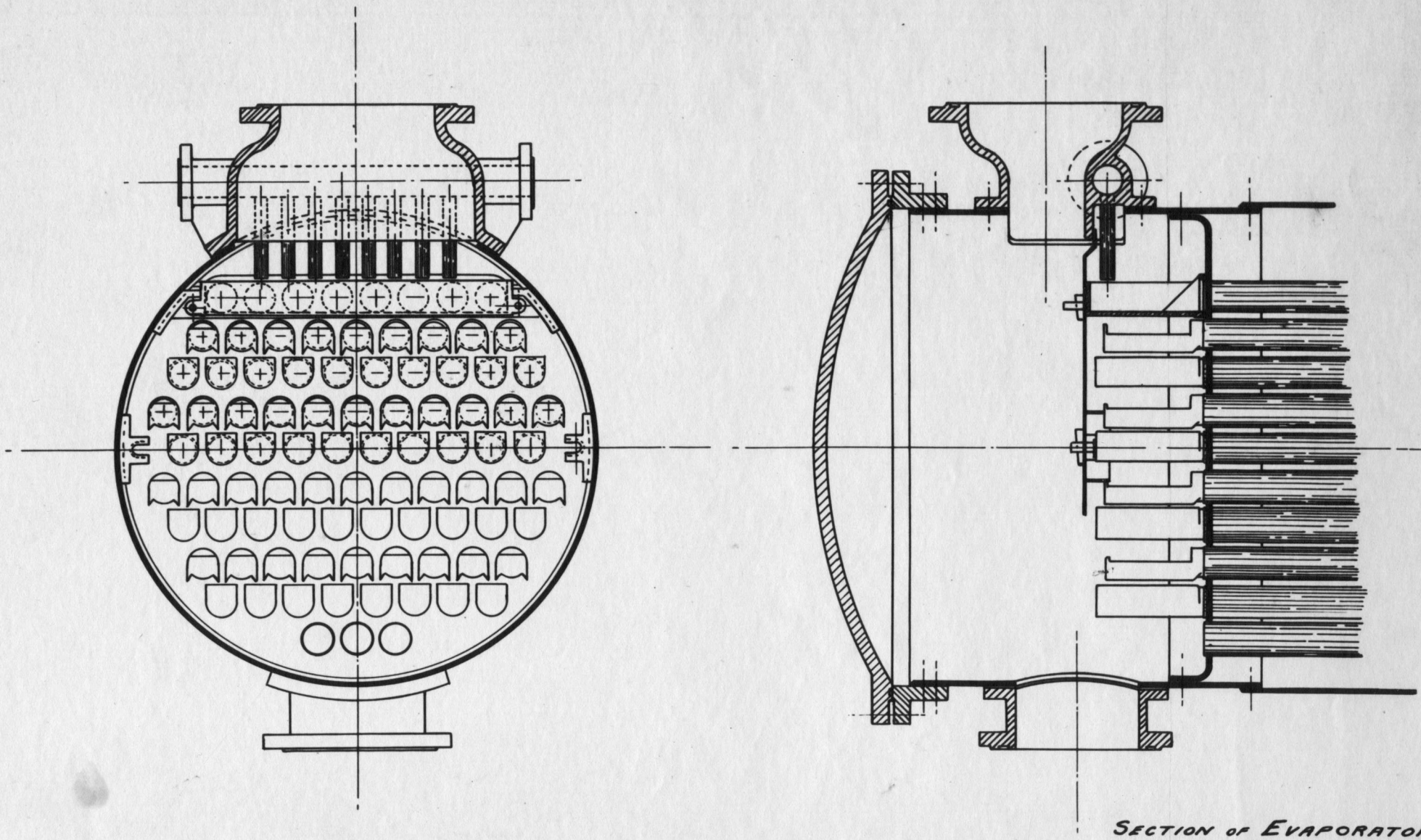
For General Arrangement "S265"
and Evaporator Complete "S265"
C.T. Details "S261"
For Spacer & Stiff. "S261"
H.P. FOR NEW SHELL SEE - - 13145.

Shell for Evaporator
S.E.V. for C.S. Plant
The Solvay Process Co.

Scale ¾" = 1ft. Syracuse N.Y. May 22nd 1906.
Drawn by JH
Checked JS
Approved Cox Cmd

F 5122

5122 - 16103



SECTION OF EVAPORATOR
FOR S.E.V. C.S. DEPT.
THE SOLVAY PROCESS CO. SYRACUSE, N.Y.
H.B.C.
SEPT. 6, 1906.

SKETCH No. 979 A'

979 A'

979A 3103

H 10011

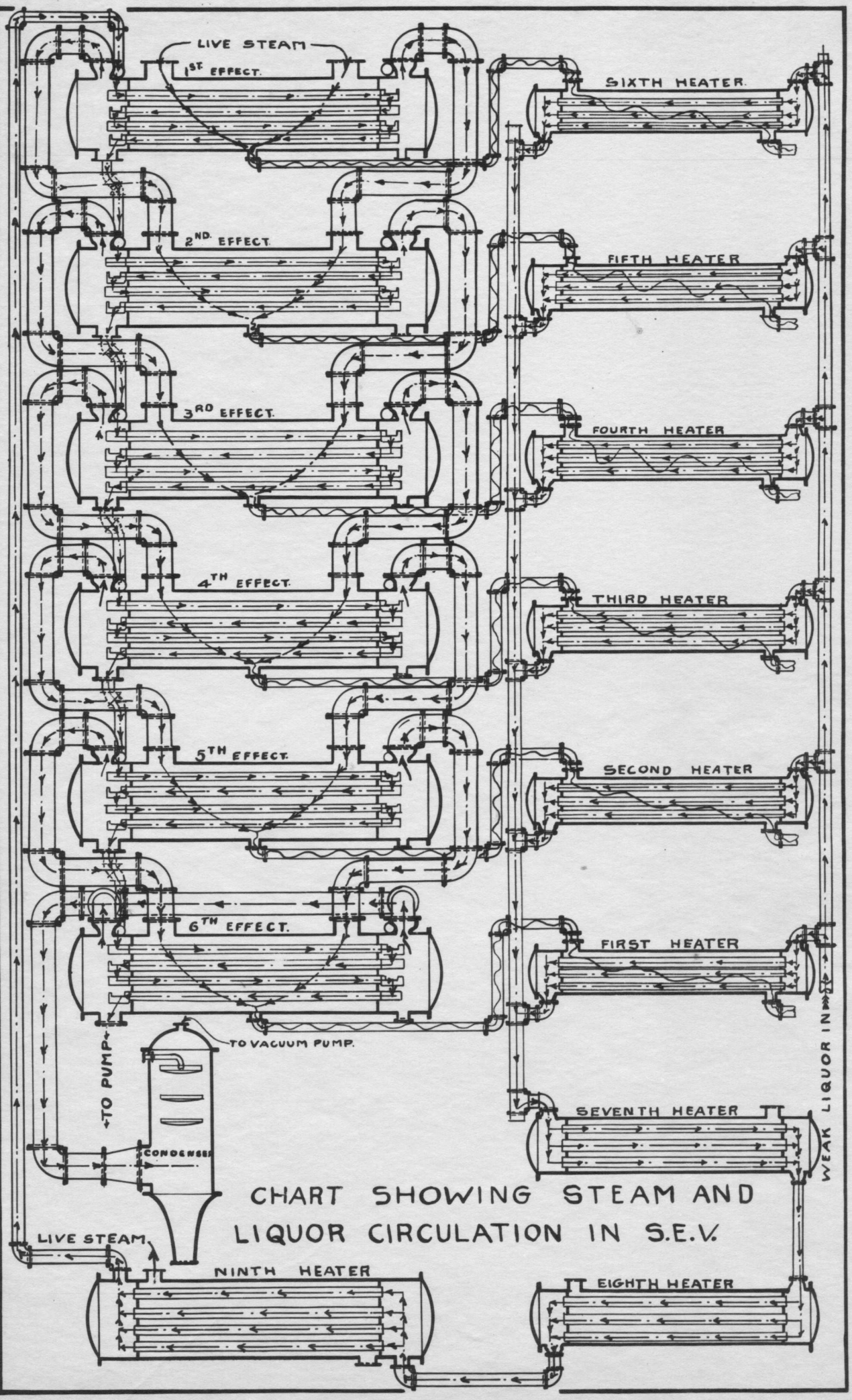
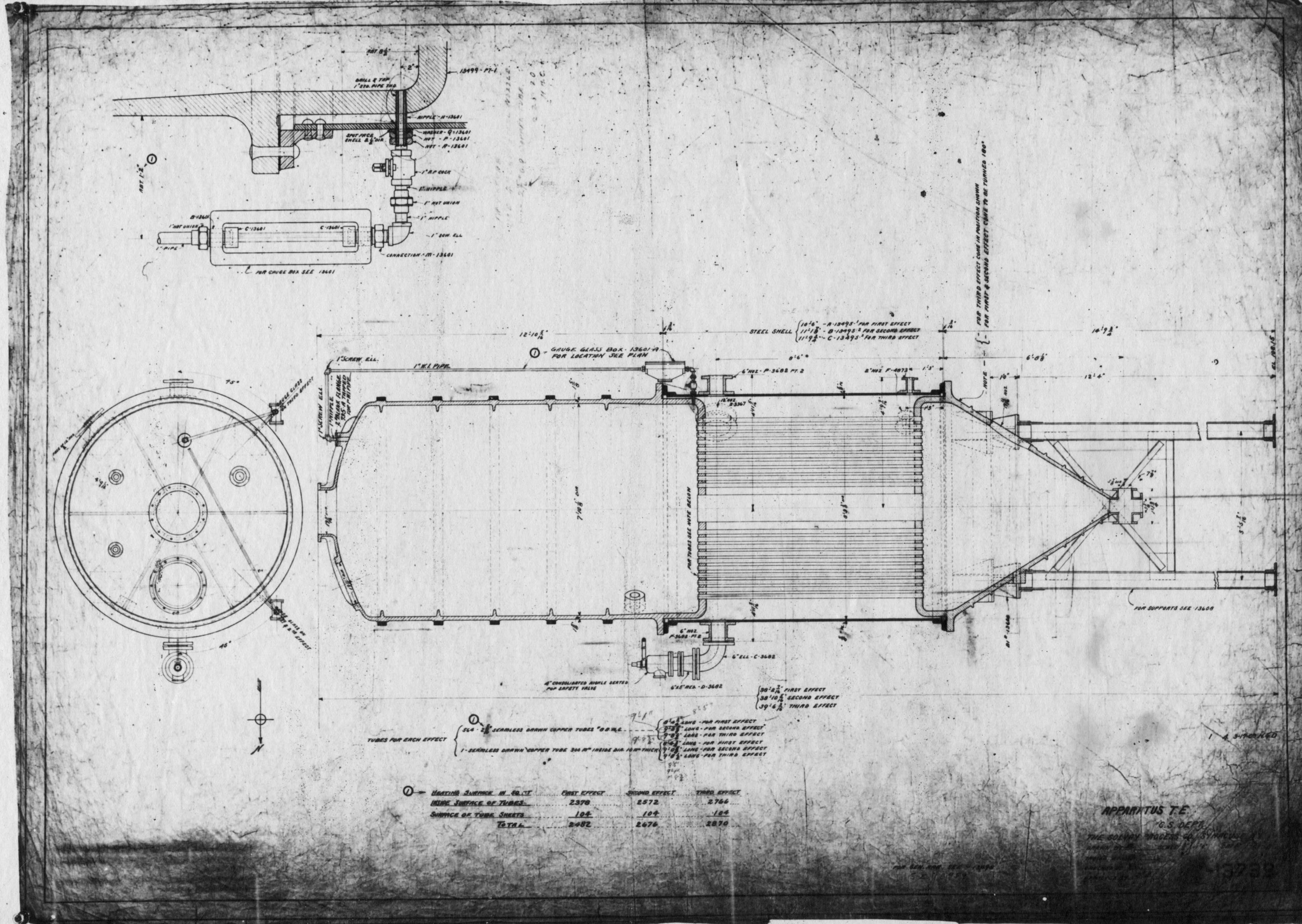


CHART SHOWING STEAM AND LIQUOR CIRCULATION IN S.E.V.

DRAWN BY J.H.F.

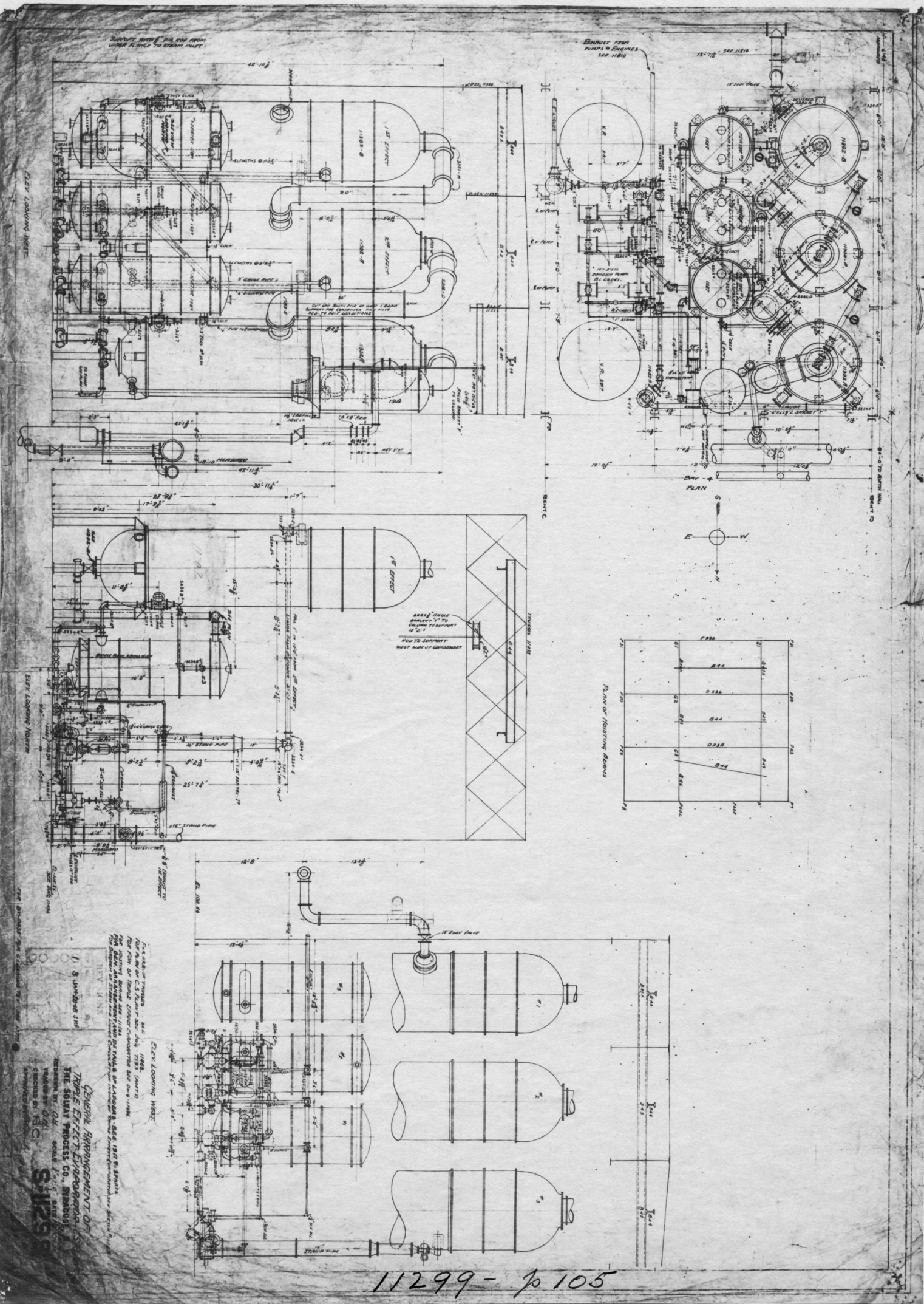
THE SOLVAY PROCESS CO. SYRACUSE, N.Y. SK. Nº. 1104-A'

1104A' - p 403

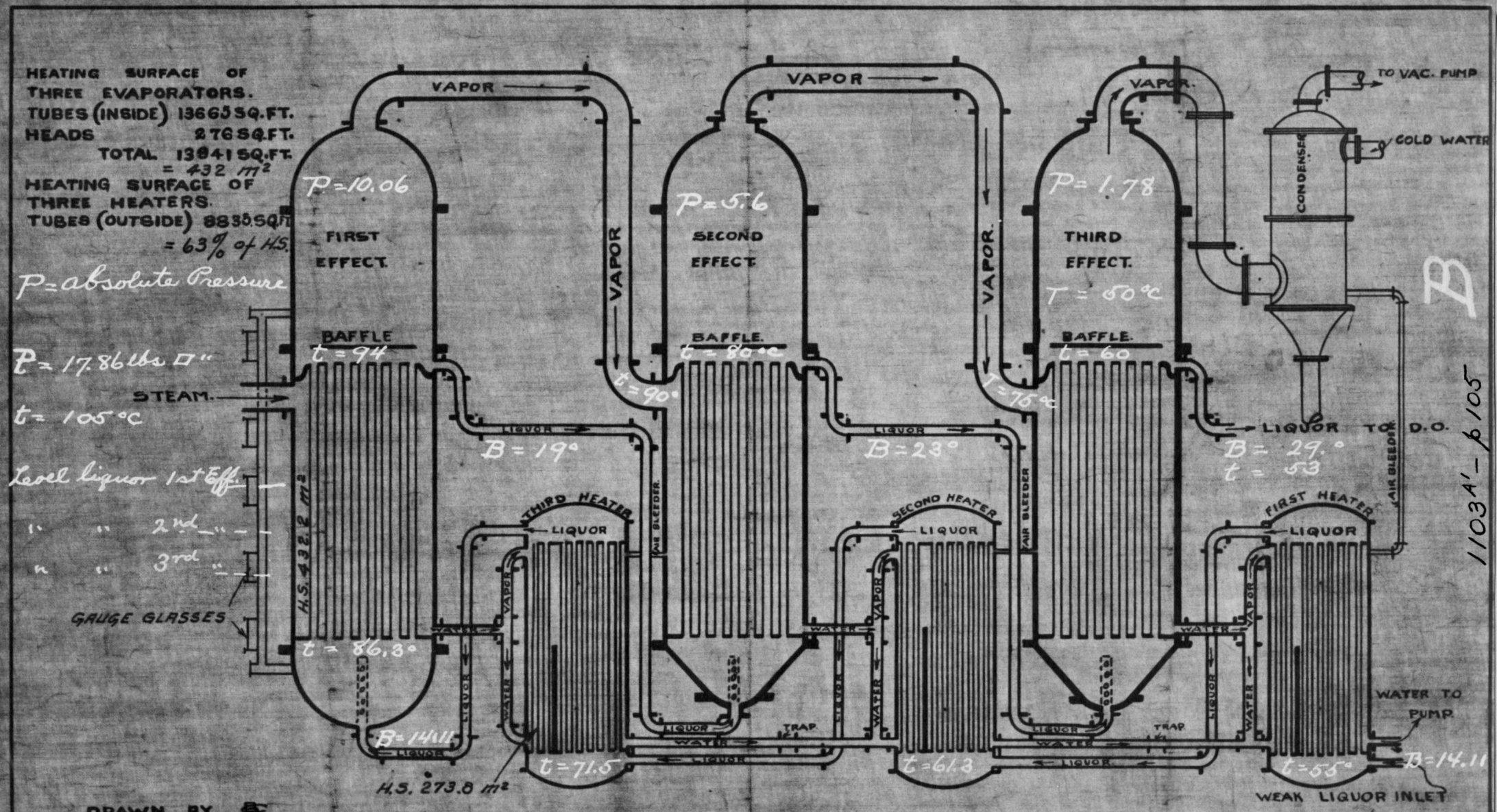


GAUGE GLASS BOX - 13601-A
FOR LOCATION SEE PLAN
STEEL SHELL
10'6" - A-13495 - FOR FIRST EFFECT
11'1 1/8" - B-13495 - FOR SECOND EFFECT
11'9 3/4" - C-13495 - FOR THIRD EFFECT
NOTE - FOR THIRD EFFECT CONE IN POSITION SHOWN
FOR FIRST & SECOND EFFECT CONE TO BE TURNED 180°
1" SCREW ELL
1" NIPPLE
1" W.I. PIPE
FOR TUBES SEE NOTE BELOW
FOR SUPPORTS SEE 13606
4" CONSOLIDATED NIPPLE SEATED POP SAFETY VALVE
6" ELL - C-3602
FOR GAUGE BOX SEE 13601
CONNECTION - M - 13601
1" RP COCK
1" NUT UNION
1" NIPPLE
NIPPLE - N - 13601
WASHER - Q - 13601
NUT - P - 13601
NUT - R - 13601
30'8 3/16" FIRST EFFECT
30'10 5/8" SECOND EFFECT
39'6 1/2" THIRD EFFECT
TUBES FOR EACH EFFECT
564 - SEAMLESS DRAWN COPPER TUBES
1 - SEAMLESS DRAWN COPPER TUBE
LONG - FOR FIRST EFFECT
LONG - FOR SECOND EFFECT
LONG - FOR THIRD EFFECT
HEATING SURFACE IN SQ. FT. FIRST EFFECT SECOND EFFECT THIRD EFFECT
INSIDE SURFACE OF TUBES 2378 2572 2766
SURFACE OF TUBE SHEETS 104 104 104
TOTAL 2482 2676 2870
APPARATUS T.E.
G.S. DEPT.
THE SOLVAY PROCESS CO.
13739

13739 - P104


ELEV. LOOKING WEST
ELEV. LOOKING NORTH
PLAN
PLAN OF ROASTING BEARS
ELEV. LOOKING WEST
GENERAL ARRANGEMENT OF
TRIPLE EFFECT EVAPORATOR
THE SOLVAY PROCESS CO., SYRACUSE, N.Y.
S-11299

11299 - p 105



DRAWN BY
TRACED BY. JF
CHECKED BY. D.G.
APPROVED BY
SUPT. A.M. Comly 3/25/08

SEE D'W'G. 11298.

CHART SHOWING STEAM AND LIQUOR CIRCULATION IN T.E.V.

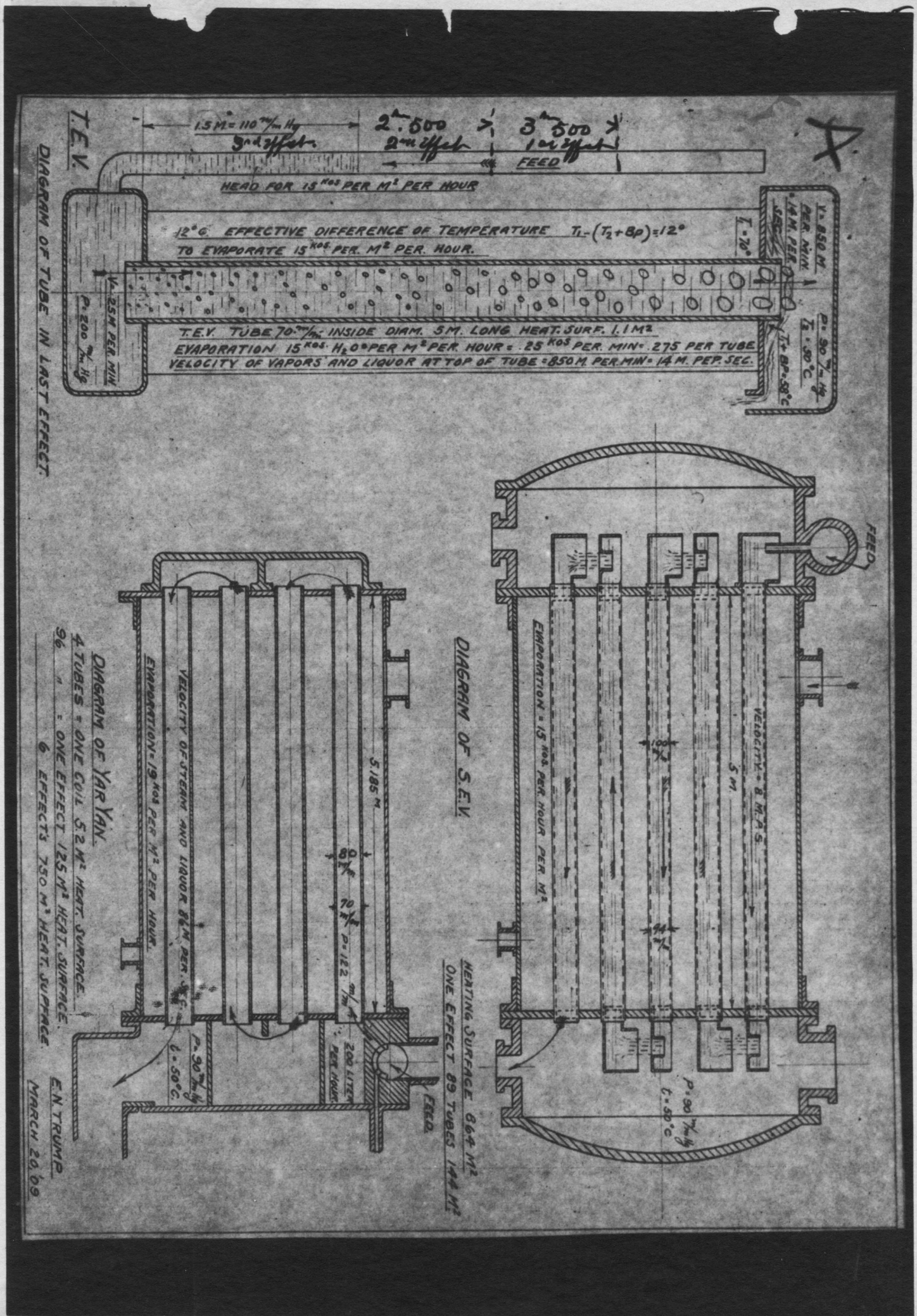
THE SOLVAY PROCESS CO, SYRACUSE N.Y.

MAR. 25 1908.

SK. 1103-A'

1103A'-B105

1103A'

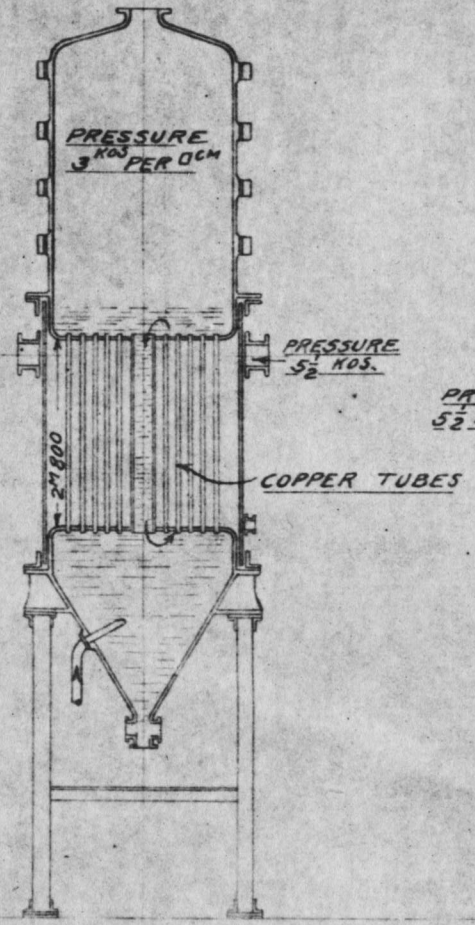

A
T.E.V.
1.5 M = 110 m/m Hg
3rd effect
2.500
2nd effect
3.500
1st effect
FEED
HEAD FOR 15 KGS PER M² PER HOUR
12° C. EFFECTIVE DIFFERENCE OF TEMPERATURE T₁-(T₂+Bp)=12°
TO EVAPORATE 15 KGS PER M² PER HOUR.
V-.850 M. PER MIN. 14 M. PER SEC.
t-70°
V-.25 M PER MIN
P-200 m/m Hg
P-90 m/m Hg
T-90°C
T+Bp-98°C
T.E.V. TUBE 70 m/m INSIDE DIAM. 5 M. LONG HEAT. SURF. 1.1 M²
EVAPORATION 15 KGS. H₂O PER M² PER HOUR = .25 KGS PER MIN = .275 PER TUBE
VELOCITY OF VAPORS AND LIQUOR AT TOP OF TUBE = 850 M. PER MIN = 14 M. PER SEC.
DIAGRAM OF TUBE IN LAST EFFECT.
DIAGRAM OF YAR YAN.
4 TUBES = ONE COIL 5.2 M² HEAT. SURFACE.
96 " = ONE EFFECT 125 M² HEAT. SURFACE.
6 EFFECTS 750 M² HEAT. SURFACE.
EVAPORATION = 19 KGS PER M² PER HOUR.
VELOCITY OF STEAM AND LIQUOR 84 M. PER SEC.
5.185 M
80
70
P-122 m/m
200 LITER PER HOUR
FEED
P-90 m/m Hg
t-50°C.
DIAGRAM OF S.E.V.
HEATING SURFACE 664 M²
ONE EFFECT 89 TUBES 144 M²
EVAPORATION = 15 KGS PER HOUR PER M².
VELOCITY = 8 M.P.S.
5 M
100
11
FEED
P-90 m/m Hg
t-50°C
E.N. TRUMP
MARCH 20, '09

A - Jo 106

C

COMPARISON OF DE & SEDE

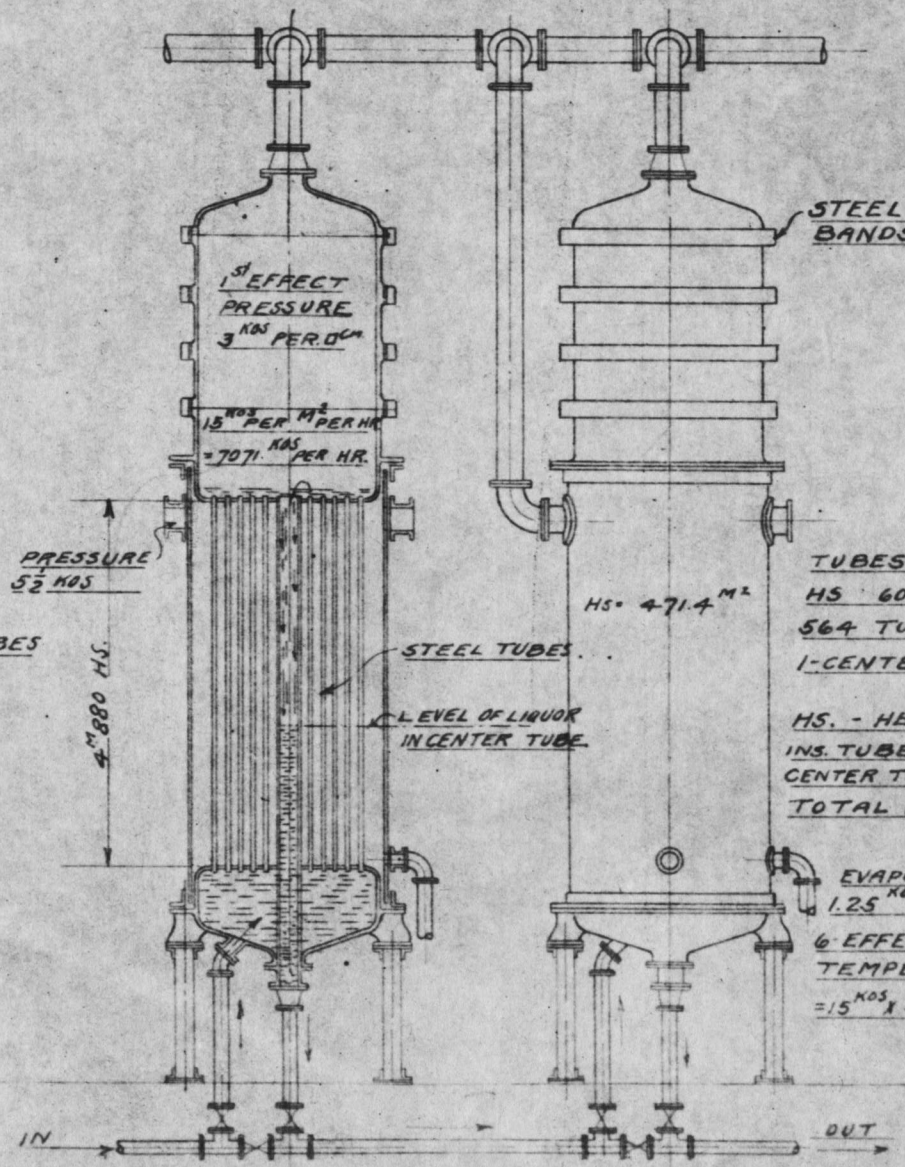
EACH EFFECT MAY BE CUT OUT FOR CLEANING



HEATING SURFACE
564 - TUBES 60 M/M DIA
2M.959 LONG
HS. 2M 800 LONG.

HS.
HEADS 10 M²
INS. TUBE 262.3
CENTER TUBE 2.7
TOTAL HS 275. M²

DE
(DOMBASLE)
LOCAL CIRCULATION



CONTINUOUS FEED
CONTINUOUS CIRCULATION
AUTOMATIC LEVEL

SEDE

TUBES 60 M/M X 16'-8"
HS 60 M/M X 4M.880
564 TUBES - 60 M/M
1-CENTER TUBE 300

HS. - HEADS 10 M²
INS. TUBES 456.8
CENTER TUBE 4.6
TOTAL HS 471.4 M²

EVAPORATION CAPACITY
1.25 KOS PER M² PER °C PER HOUR
6 EFFECTS. EFFECTIVE TEMPERATURE 120°C
=15 KOS X 471.4 M² = 7071 KOS PER HR.

PROPOSED SEXTUPLE EFFECT

MODIFIED FROM DE DOMBASLE TYPE.

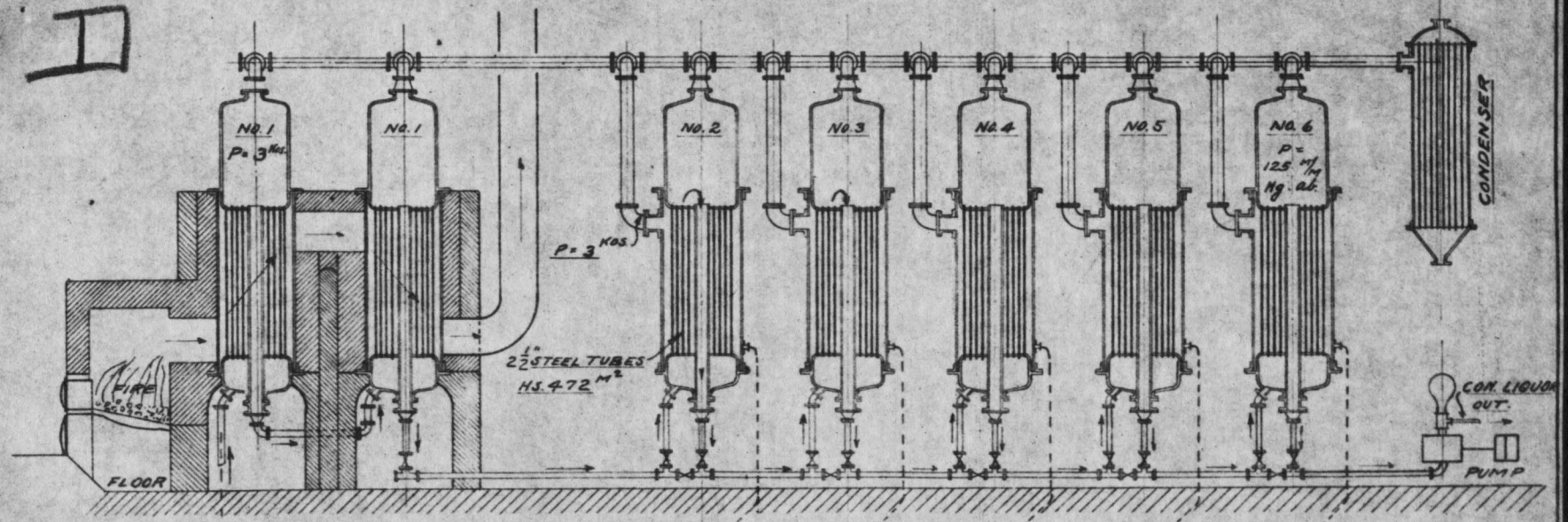
MARCH 15, 1909 E.N. TRUMP

C.O.C.

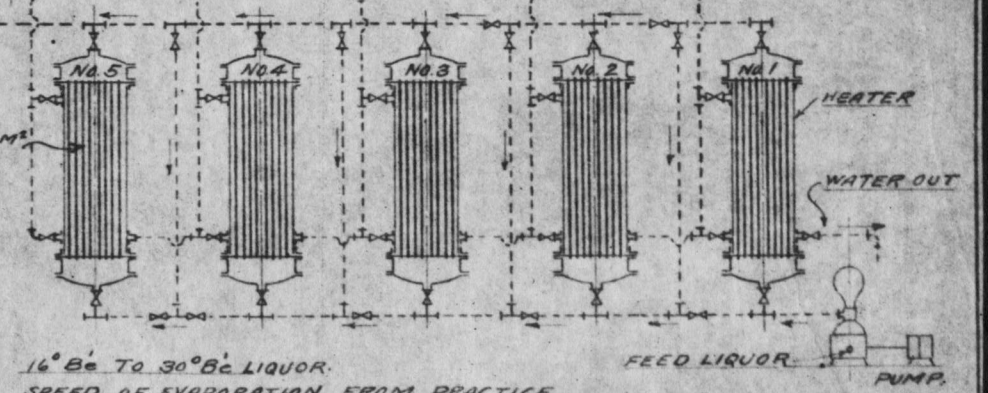
C – 1907

D

PIPING ARRANGED TO CUT OUT ANY EFFECT WITHOUT STOPPING



CONTINUOUS CIRCULATION
AUTOMATIC LEVEL.



SEDE

SEXTUPLE EFFECT. 1st EFFECT DOUBLE
WITH DIRECT FIRE OR 1st EFFECT
WITH STEAM OF 5½ KOS PRESSURE.

TEMPERATURE OF 5½ KOS	= 160° C
TEMPERATURE OF VAC	= 50° C
AVAILABLE TEMPERATURE	= 110° C
6 BOILING POINTS	38° C
EFFECTIVE DIFFERENCE 6-EFFECTS	} 72° C
EFFECTIVE DIFFERENCE 1-EFFECT	} 12° C

DIRECT FIRE
EVAPORATION ABT 7.5 KOS PER M² PER HOUR

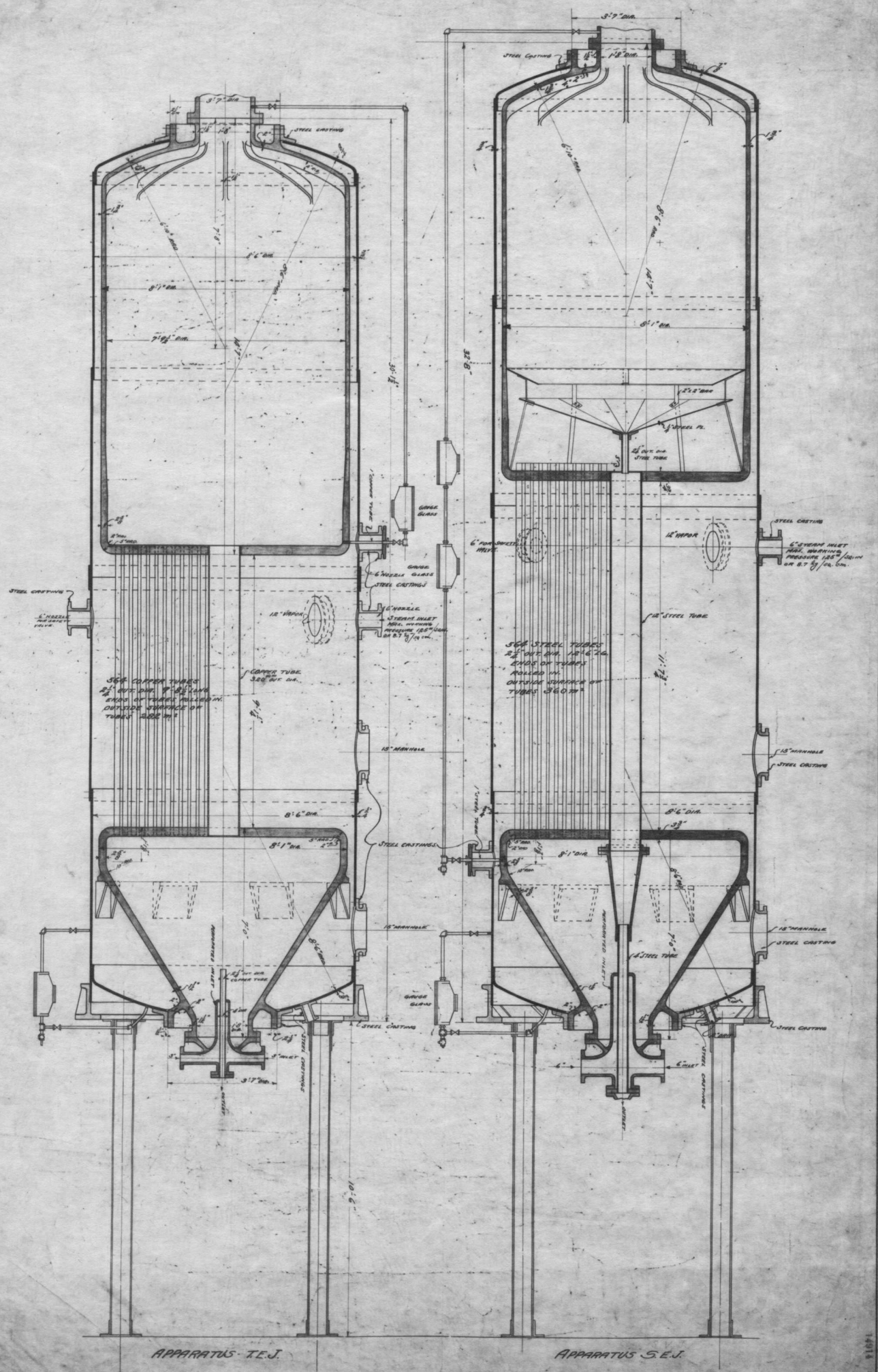
16° Bé TO 30° Bé LIQUOR.
SPEED OF EVAPORATION FROM PRACTICE
1.25 KOS PER °C PER M² PER HOUR
15 KOS PER M² PER HOUR FOR 12° DIFFERENCE EFFECTIVE.
7071 KOS PER HOUR EACH EFFECT = 42426 KOS PER HOUR.
1018224 KOS PER 24 HOURS @ 5327 KOS PER TON CAUSTIC = 191 TONS OF 70%

SUGGESTION FOR SEXTUPLE EFFECT

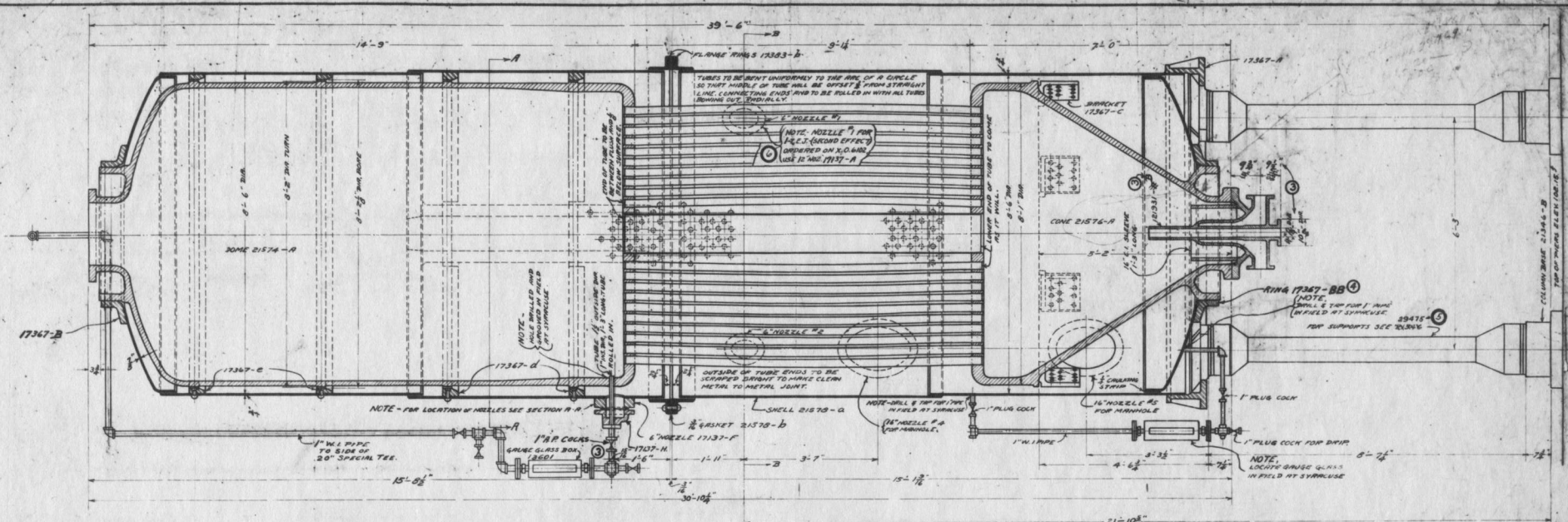
SUGGESTER E.N TRUMP MAR 15, 1909

D-1107

15923



15923 - p 107



② HEATING SURFACE IN SQ. FT.

INSIDE SURFACE OF TUBES	2692
TUBE SHEETS	69
CONE (INSIDE)	108
DOME (INSIDE)	337
TOTAL	3196

FOR FOUNDATION SEE 21920.

ALL PRINTS DATED BEFORE LATEST REVISION ARE CANCELLED AND RECALLED.

REVISIONS			
REV.	NO.	DATE	BY
1	1	12.7.18	EGP
2	1	3/17/14	D.S.D.
3	5	3-4-20	H.B.C.
4	1	3-17-20	H.B.C.
5	6	4-28-20	H.B.C.
6	2	8-9-20	H.B.C.
7			

APPARATUS T.E.J.
C.S. BLD'G - C.S. DEPT.
THE SOLVAY PROCESS CO. SYRACUSE, N.Y.

DRAWN BY E.T. SCALE 1/4" = 1'-0" BLUE PRINT NO. 21584
TRACED BY GPR DESIGNED FOR 50 LBS. P.
CHECKED BY H.B.C.
APPROVED BY

21584

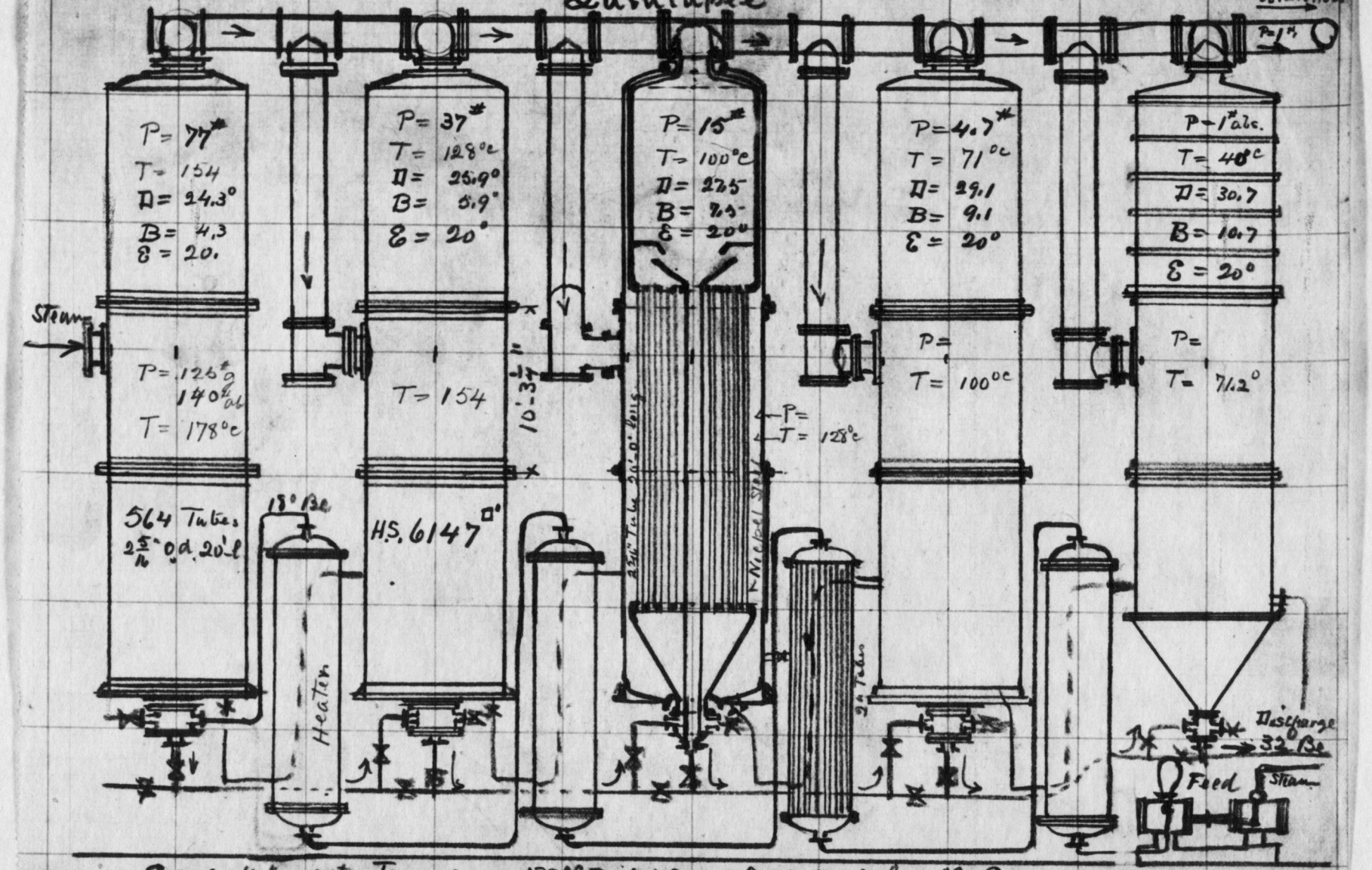
21584-d-107

P = absolute Pressure #□"
T = Temperature °C
Δ = Temp difference
B = Boiling point
E = effective temp.

TEV

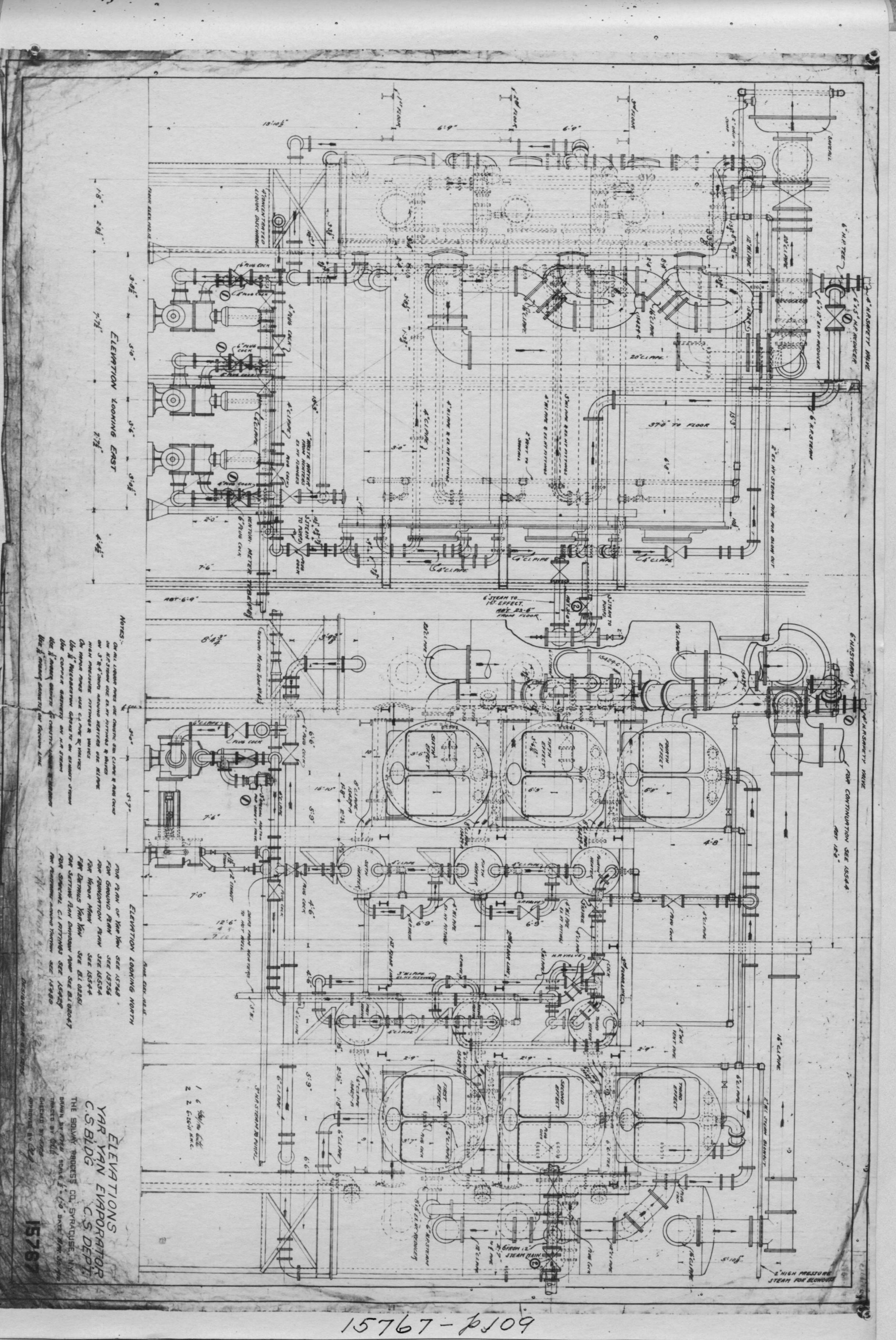
Using old T.E.J. with 20' steel tubes and 10'-8½" addition to Jacket.
for caustic liquor from 18° Be to 32° Be Live Steam 125# gauge.

Quintuple

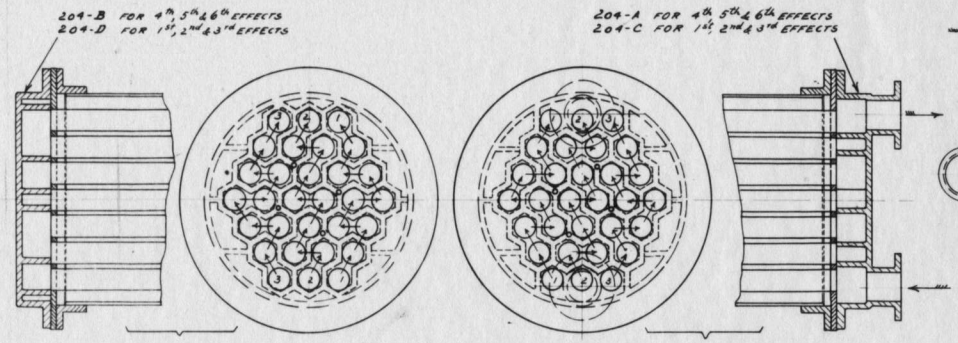


Scale 1/8" = 1 ft. Temp. Range 138°C Boiling Points 38° Effective $\frac{100°}{5} = 20°C$ Edward N Trump Aug 15. 22

T.E.V. - p108


ELEVATION LOOKING EAST
ELEVATION LOOKING NORTH
ELEVATIONS
YAR YAN EVAPORATOR
C.S. BLDG
C.S. DEPT.
THE SOLVAY PROCESS CO., SYRACUSE, N.Y.
15767

15767-6509



FRONT END OF HEATER

BACK END OF HEATER

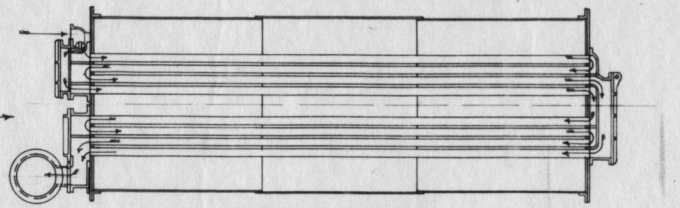


DIAGRAM of EVAPORATOR

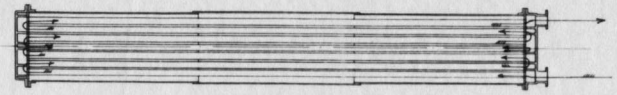
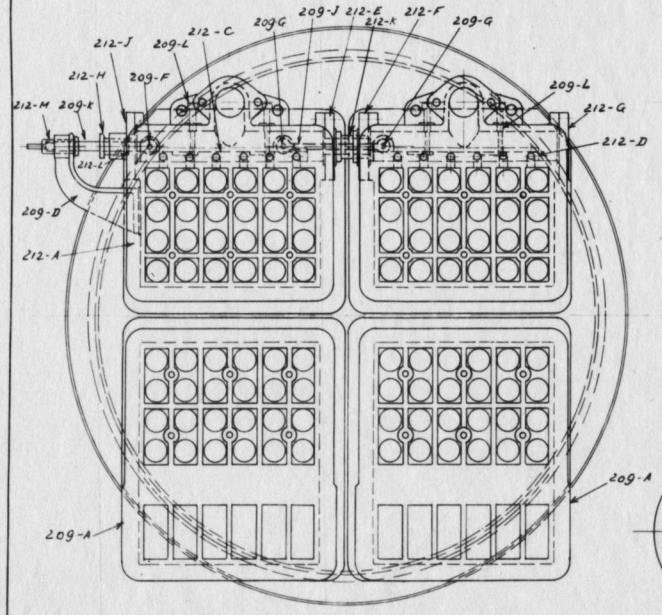
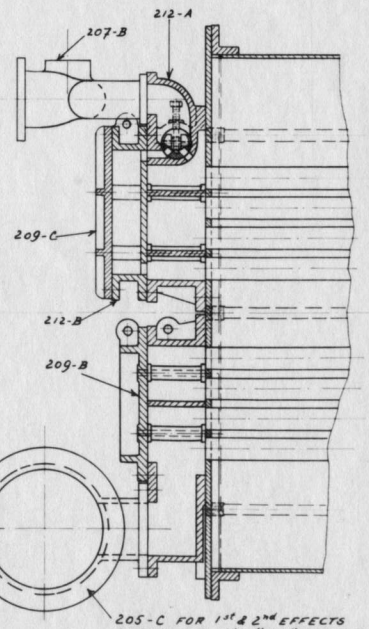


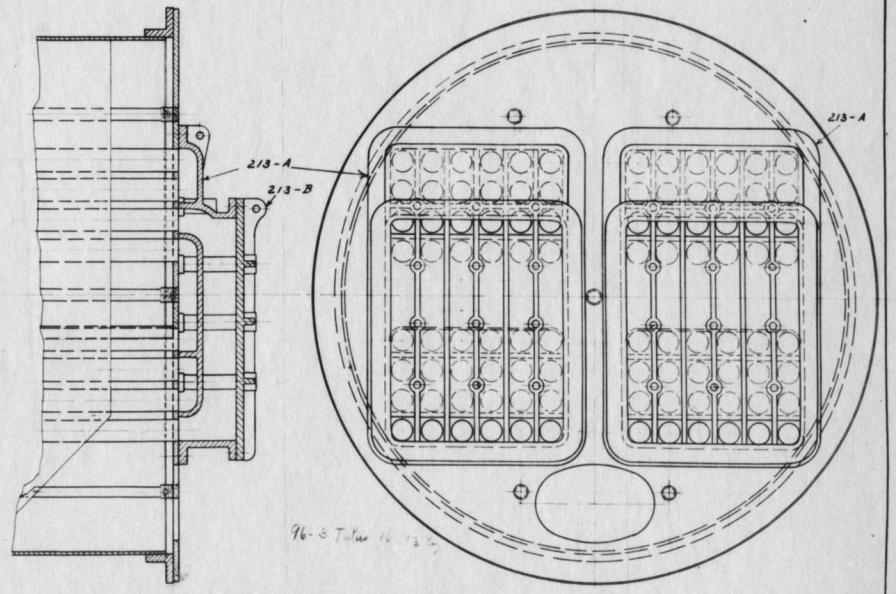
DIAGRAM of HEATER





205-C FOR 1st & 2nd EFFECTS
205-A FOR 3rd 4th & 5th EFFECTS
205-B FOR 6th EFFECT

FRONT END OF EVAPORATOR



BACK END OF EVAPORATOR

NOTE:
NUMBERS AND PIECE MARKS REFER TO DRAWINGS OF, THE KILBY MFG. Co., CLEVELAND, O. B. or I "02251.

DESIGNED FOR G.O. 1278

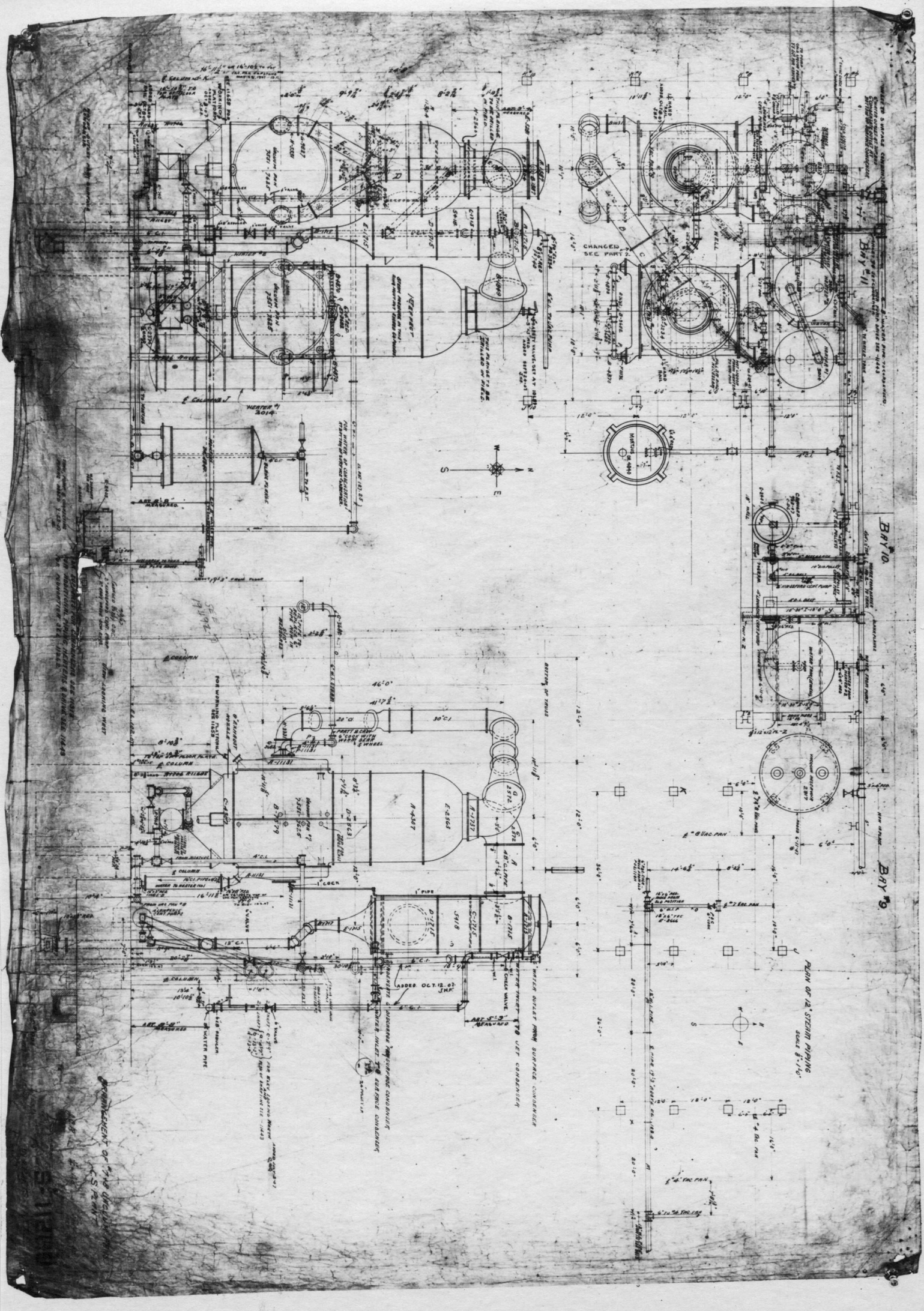
DIAGRAM of YARYAN EVAPORATORS AND HEATERS
C.S. BLDG. C.S. DEPT.
THE SOLVAY PROCESS CO., SYRACUSE, N.Y.
DRAWN BY E.P. SCALE 1½" = 1'-0" DATE 4.7.11
TRACED BY E.P. 1" = 1'-0"
CHECKED BY E.P.
APPROVED BY Kilby Jr.

17708

DRAWING No 17708

No 17708

17708-8-109


BAY 11
BAY 10
BAY 9
CHANGED SEC. PART 2
PLAN OF 12" STEAM PIPING
SCALE 1/4"=1'-0"
WATER OUTLET FROM SURFACE CONDENSER
TO VERT. CONDENSER
WATER INLET TO AIR EJECTOR CONDENSER
WATER INLET TO AIR EJECTOR CONDENSER
ADDED OCT. 12, 03 JHP
ARR'T B-18" MEASURED
ARR'T B-18" MEASURED
HEATER #1 3014
HEATER #2 3011
HEATER #3 3012
HEATER #4 3013
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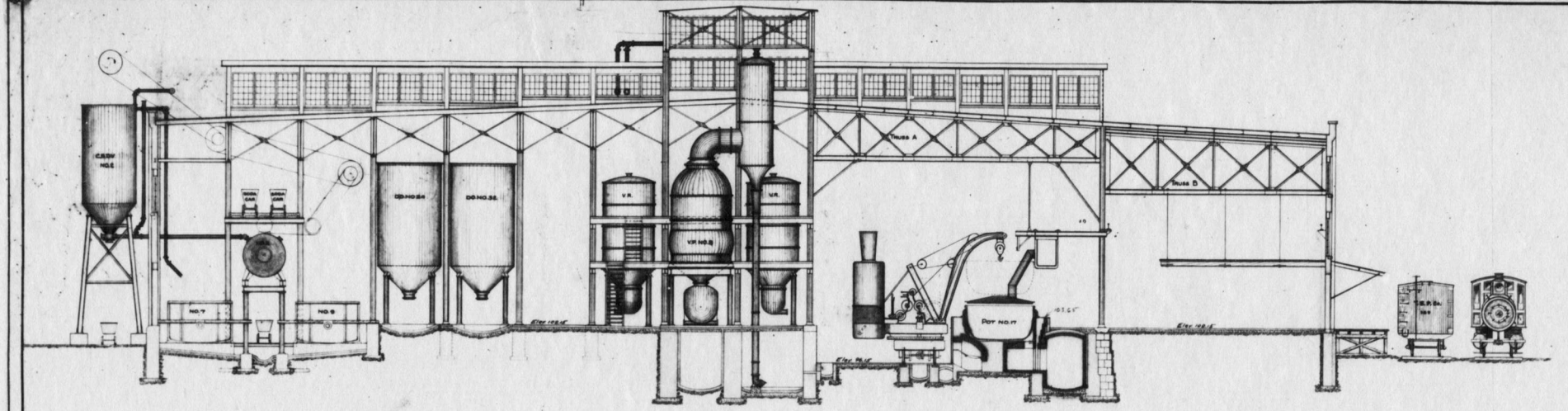
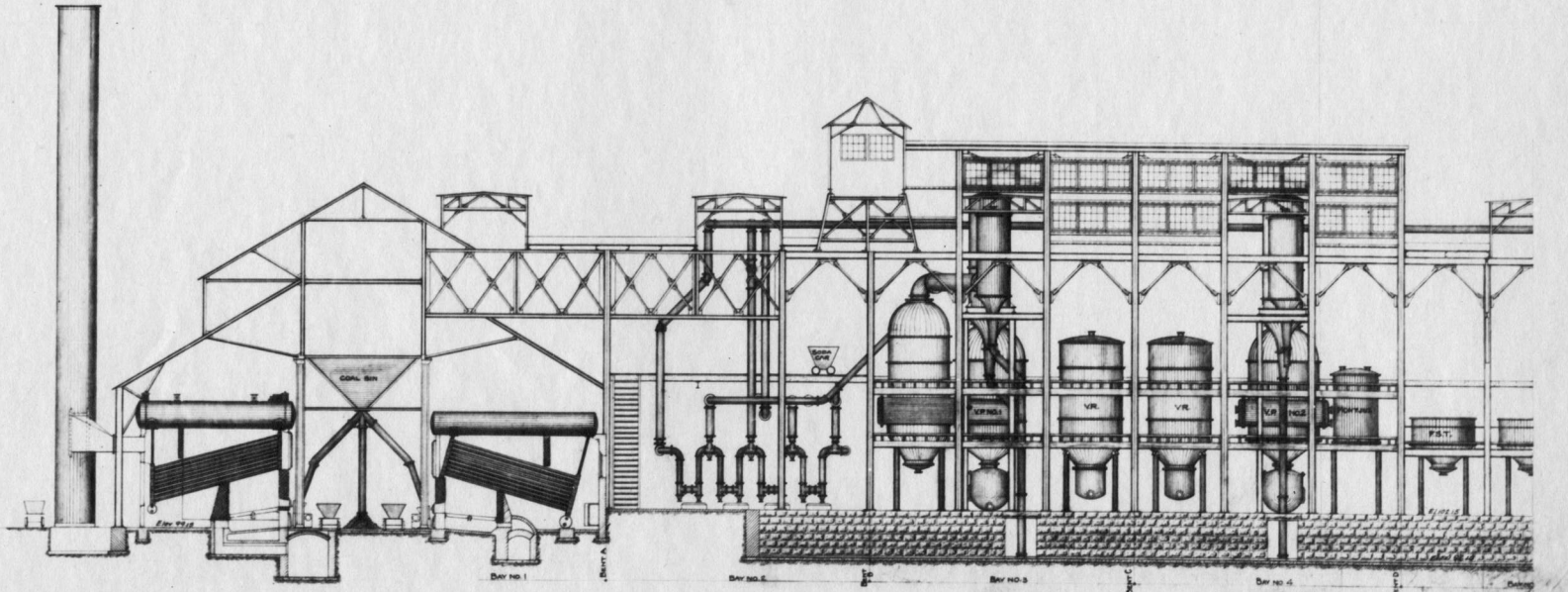
11269-P110



SECTION THROUGH BAY 2
LOOKING WEST

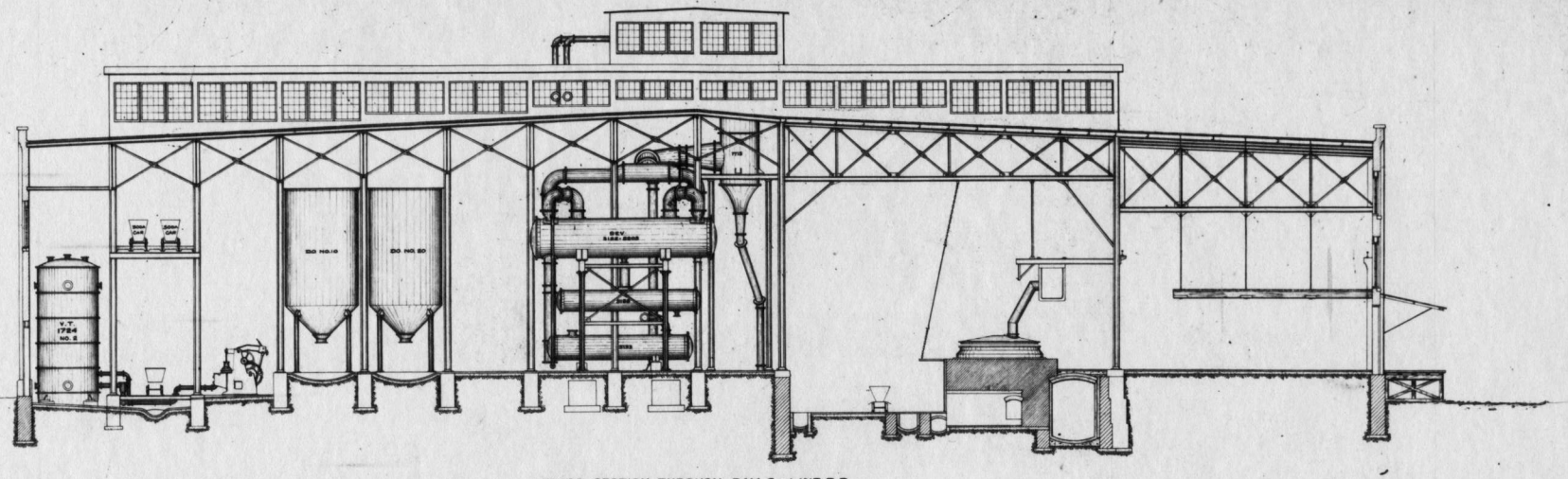


IN 2 PARTS— PART 1

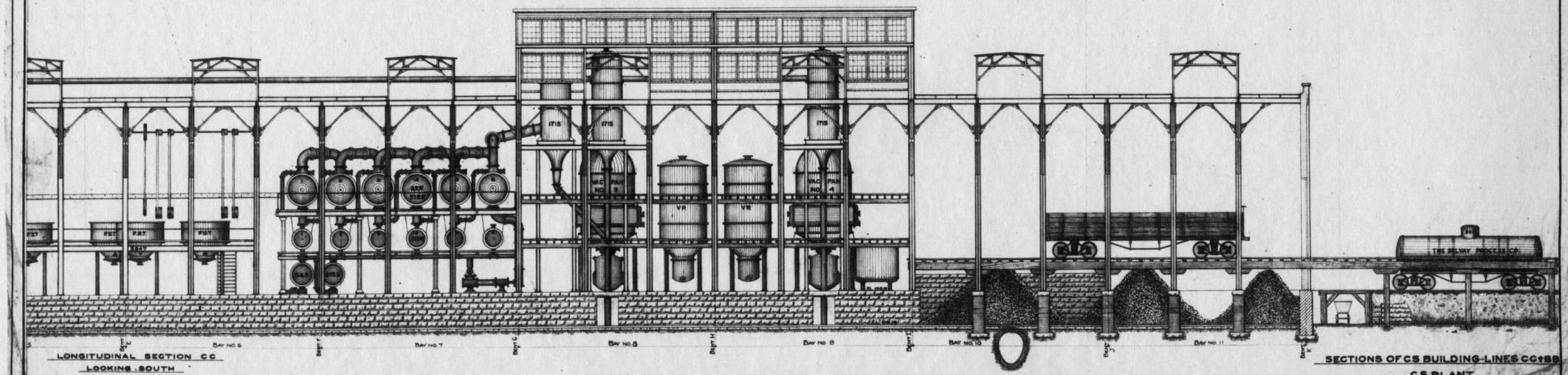
SECTIONS OF CS BUILDING-LINES CC+BB
CS PLANT
THE SOLVAY PROCESS CO. SYRACUSE, N.Y.
DRAWN BY GT SCALE 1/8"=1'-0" DATE 1/1926
TRACED BY [illegible]
CHECKED BY [illegible]
APPROVED BY [illegible]

S7394

7394-1111



CROSS SECTION THROUGH BAY 6 - LINE B B
LOOKING WEST



LONGITUDINAL SECTION C C
LOOKING SOUTH

IN 2 PARTS – PART 2

SECTIONS OF CS BUILDING-LINES CC & BB
CS PLANT
THE SOLVAY PROCESS CO. SYRACUSE N.Y.
DRAWN BY GX SCALE 1/2"=1' DATE 8/20/09
TRACED BY [illegible]
CHECKED BY [illegible]
APPROVED BY [illegible]

S 7394

73942 - 9111

SECTIONS OF C.S. BUILDING - LINE DD AND EE

C.S. PLANT

THE SOLVAY PROCESS CO. SYRACUSE N.Y.

DRAWN BY GV SCALE 1/16" DATE Dec. 1920

TRACED BY [illegible]

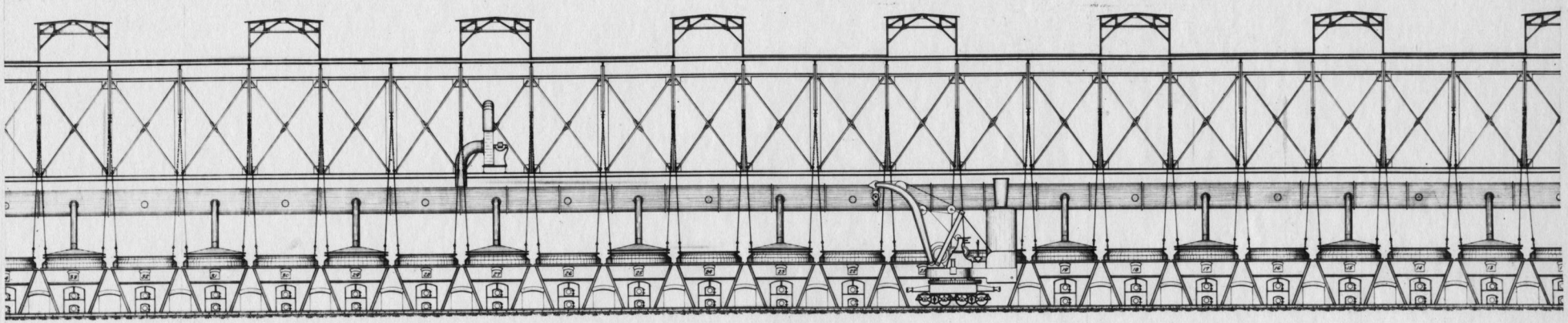
CHECKED BY [illegible]

APPROVED BY [illegible]

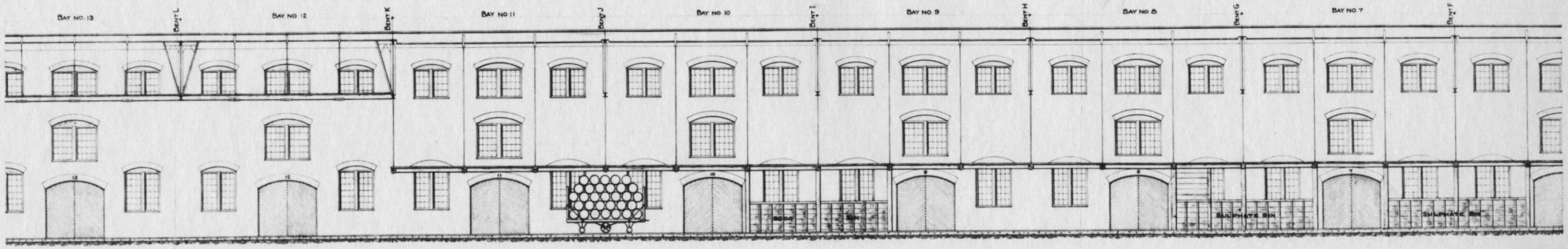
S 7393

In Three Parts - Part I

7393' - p. 111



LONGITUDINAL SECTION EE
LOOKING NORTH



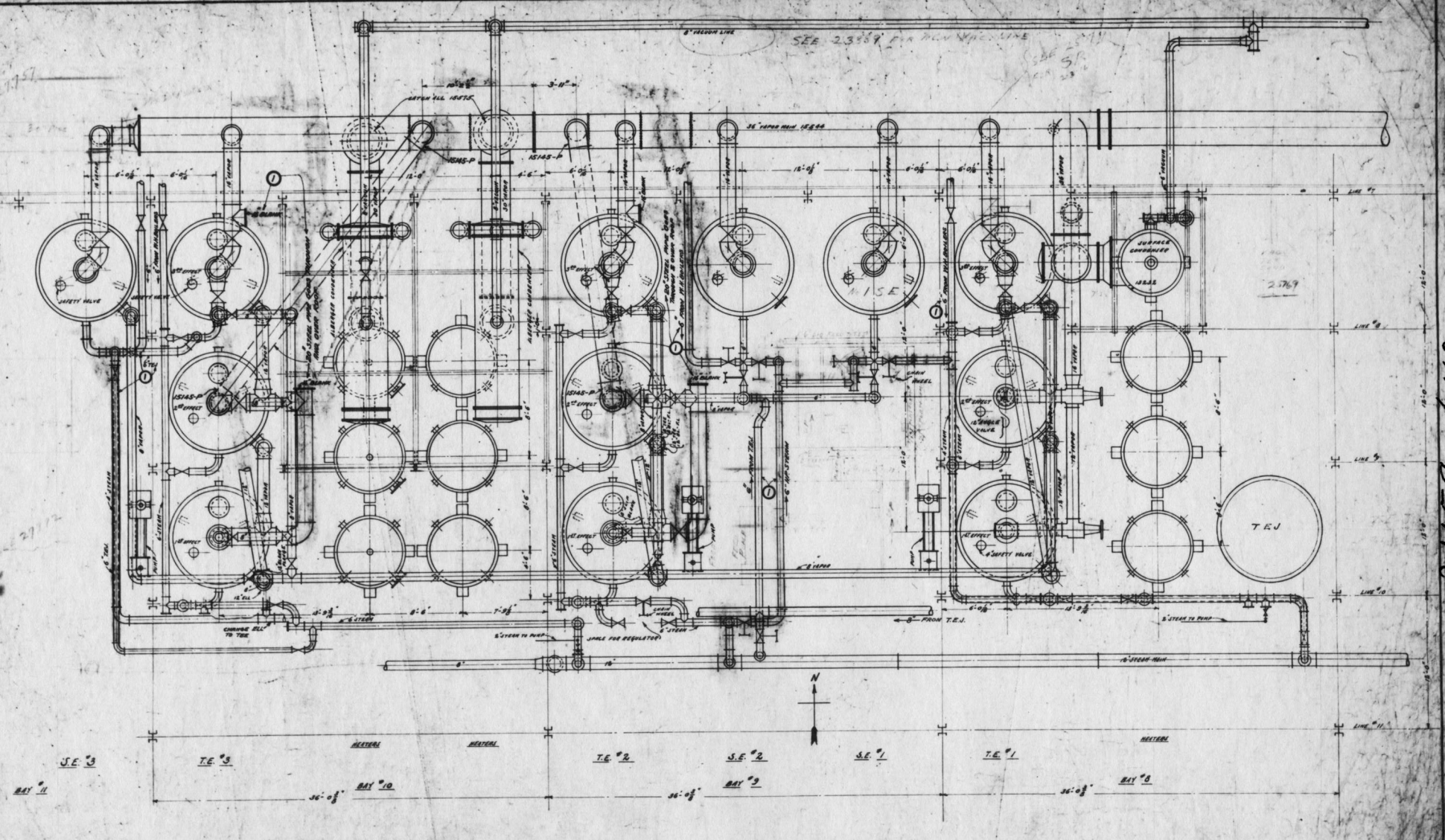
LONGITUDINAL SECTION DD
LOOKING NORTH

IN THREE PARTS - PART 2

SECTIONS OF C.S. BUILDING - LINE DD AND EE
C.S. PLANT
THE SOLVAY PROCESS CO. SYRACUSE N. Y.
DRAWN BY GV SCALE 1/8"-1'-0" DATE Dec 30/1908
TRACED BY H.C.P.
CHECKED BY [illegible]
APPROVED BY [illegible]

S 7393

7393 - B 111



For changes - in exhaust piping from T.E. & S.E. to Vapor Main see 27628 #5 9/7/17

FOR WASTE HEAT BOILER PIPING SEE 23802
" T.E.J. PIPING SEE 23031 & 23732

FOR ELEVATIONS SEE 21149.

ALL PRINTS DATED BEFORE LATEST REVISION ARE CANCELLED AND RECALLED.

REVISIONS			
REV.	NO.	DATE	BY
	5	7-27-15	C.W.F.

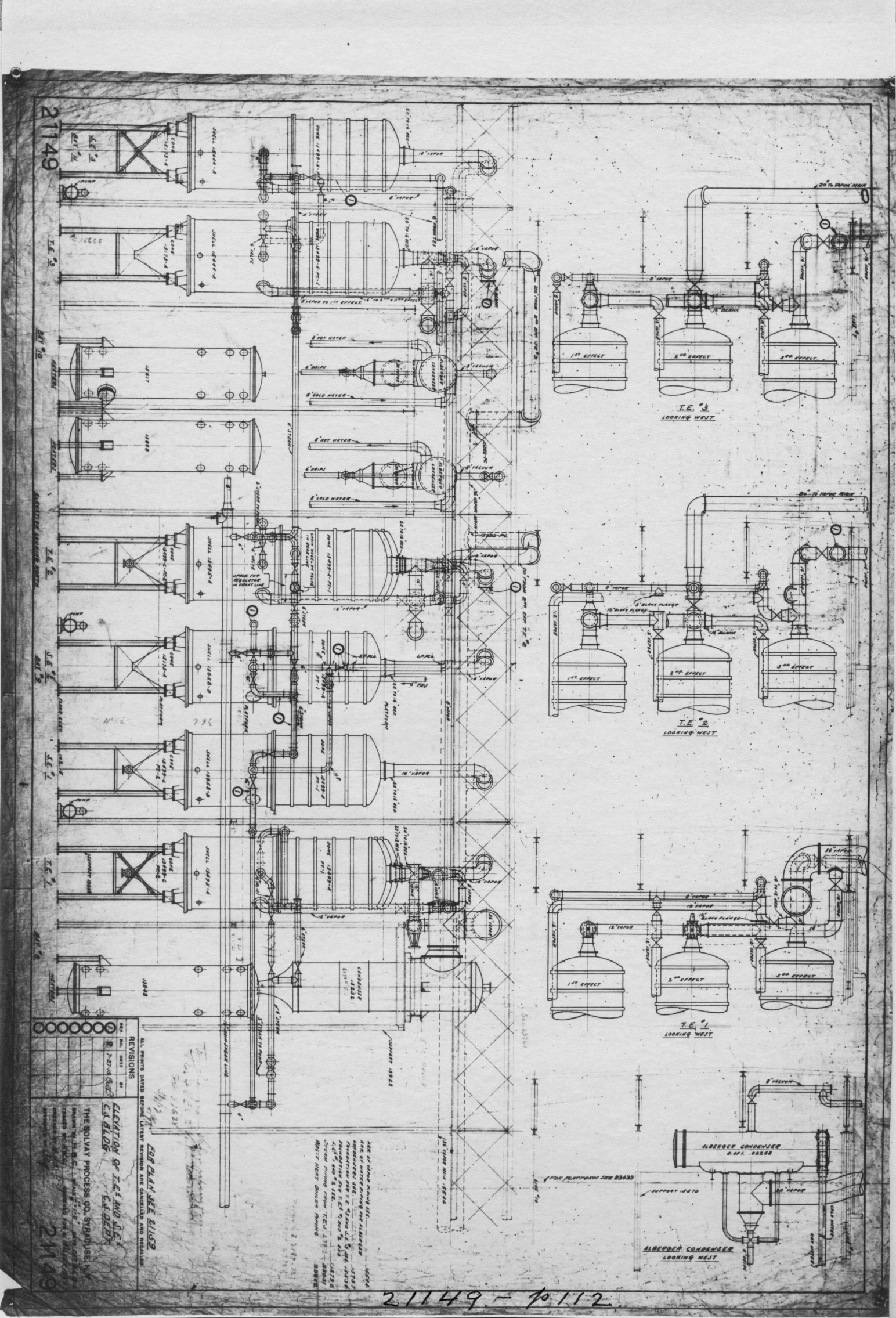
PLAN OF T.E.'s AND S.E.'s
C.S. BLDG. C.S. DEPT.

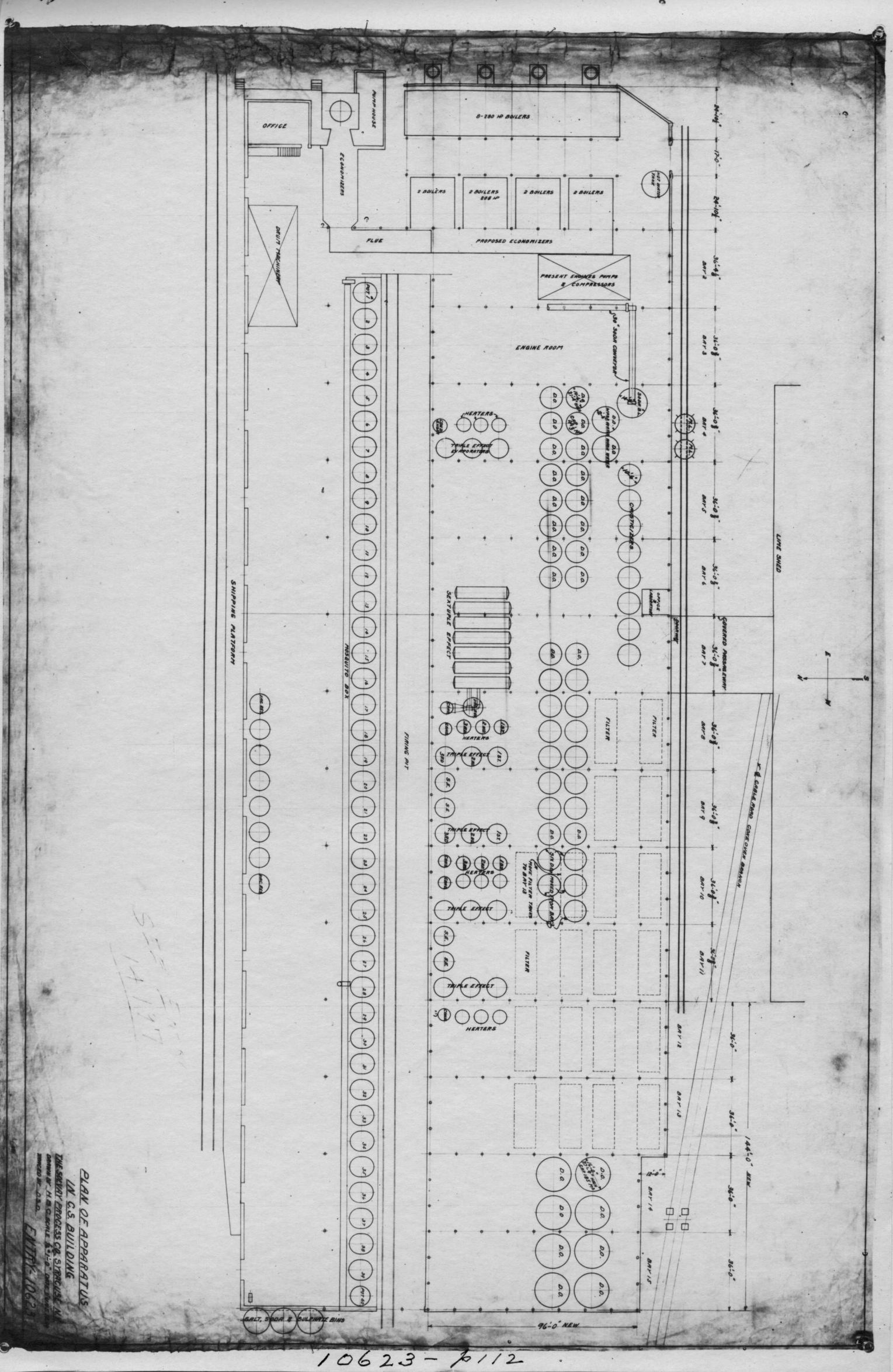
THE SOLVAY PROCESS CO. SYRACUSE, N.Y.

DRAWN BY H.B.C. SCALE 1/8" = 1'-0"
TRACED BY E.E.K. DESIGNED FOR
CHECKED BY E.D.D.
APPROVED BY

21159-p1/2

21159

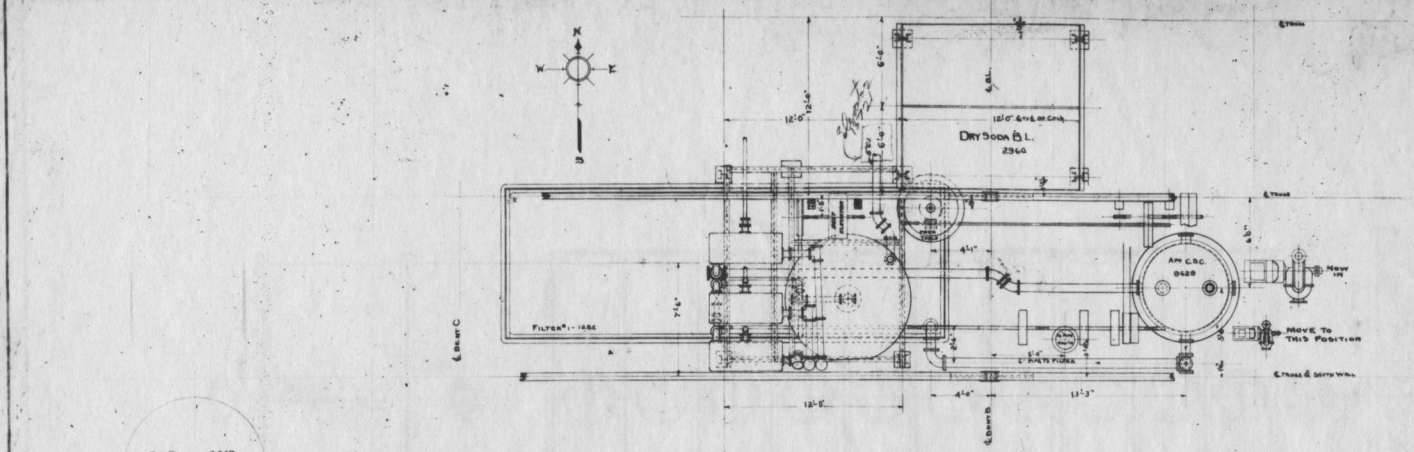

T.E. "3"
LOOKING WEST
T.E. "2"
LOOKING WEST
T.E. "1"
LOOKING WEST
ALBERGER CONDENSER
LOOKING WEST
ELEVATION OF T.E.'s 1 AND 2 E.S. BLDG.
THE SOLVAY PROCESS CO. SYRACUSE, N.Y.
REVISIONS
ALL PRINTS DATED BEFORE LATEST REVISION ARE CANCELLED AND RECALLED
FOR PLAN SEE 21152
21149
21149 - p112.

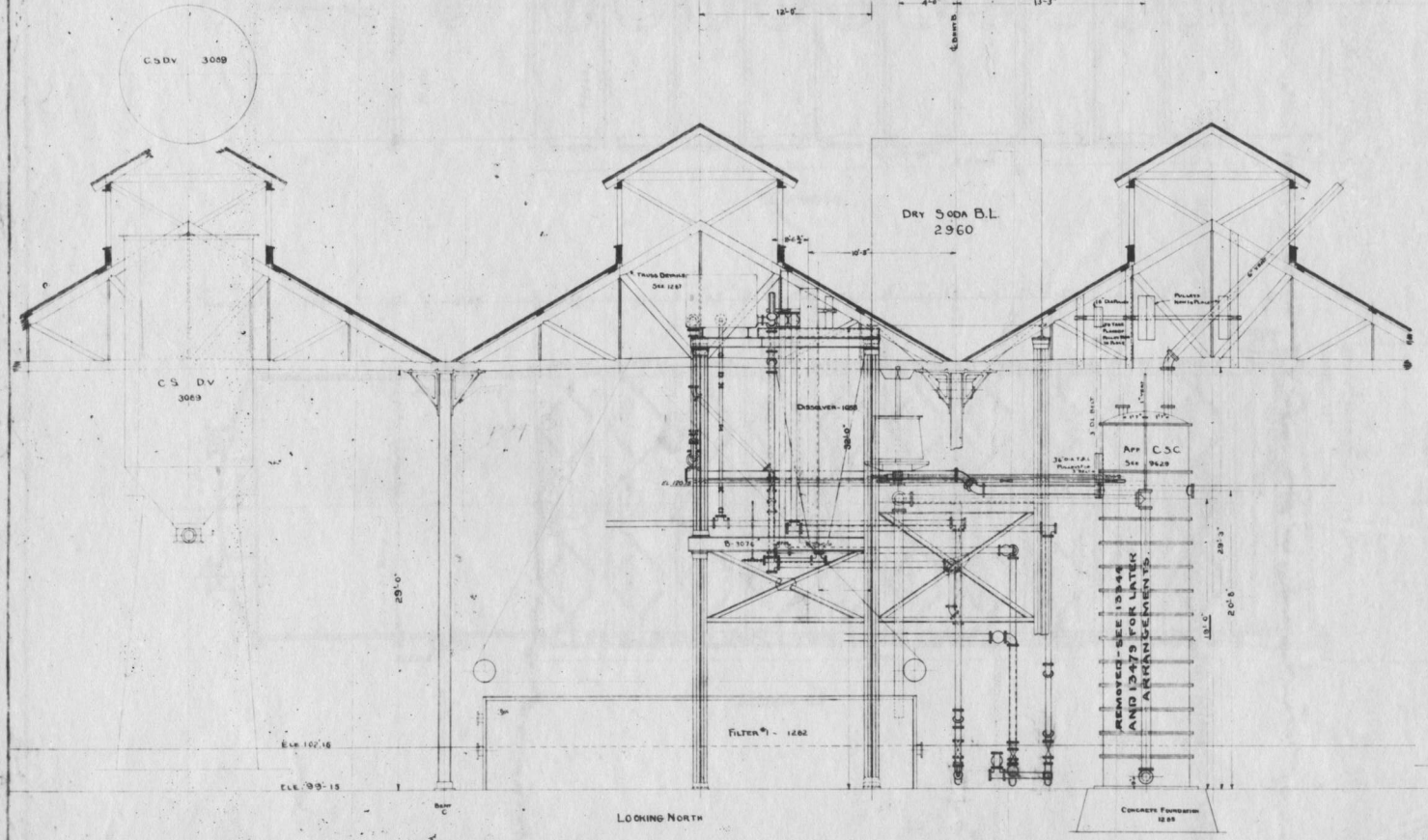


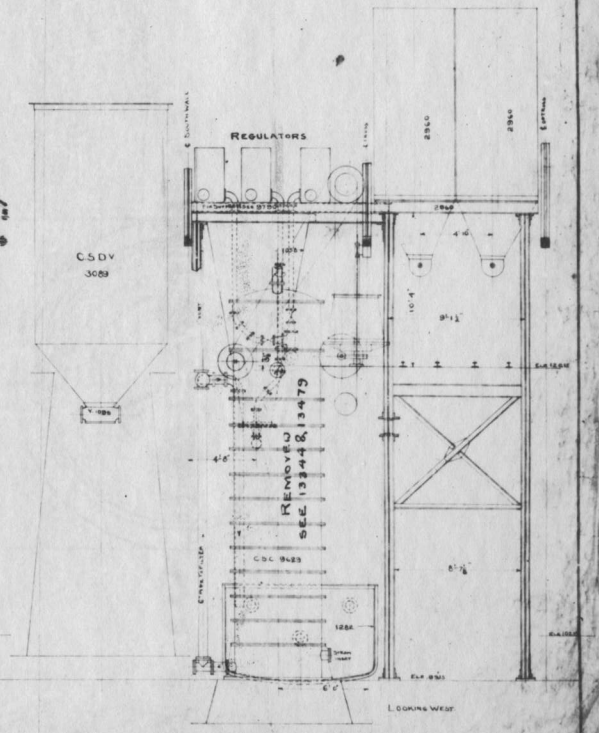
PLAN OF APPARATUS
IN C.S. BUILDING
THE SOCIETY EPROCESS CO. SYRACUSE, N.Y.
DRAWN BY H.B. CLAFLIN & CO. CHEMISTS
TRACED BY J.S.D.

ENTRY 10623

10623-P112







LOCATION & APPARATUS C.S.C. - C.S. DV.

THE SOLVAY PROCESS CO. SYRACUSE, N.Y.

DRAWN BY D.A.K.T.A. SCALE 1/4" DATE

TRACED BY M.T.A.

CHECKED BY

APPROVED

8-8768

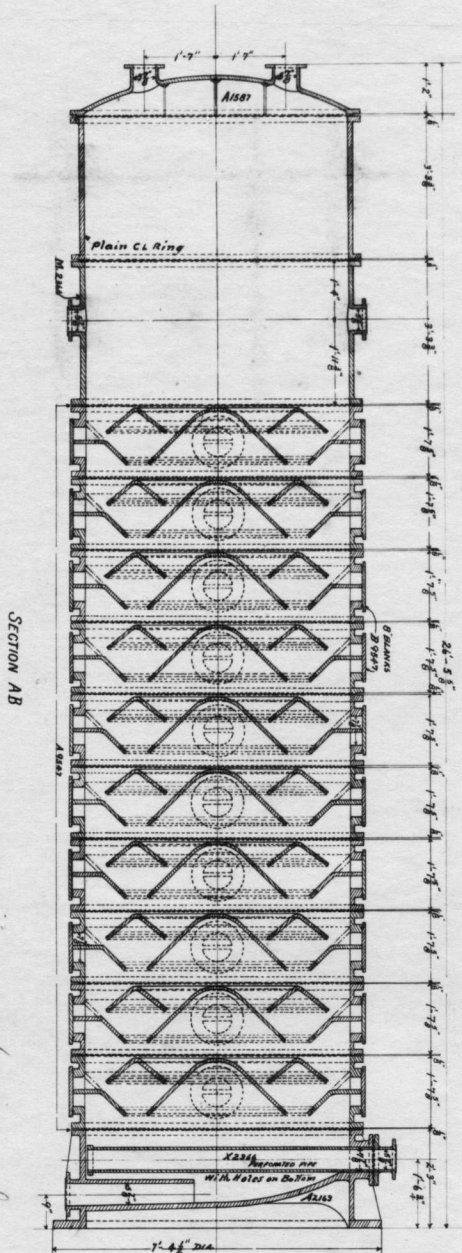
FOR NEW ERR. OF DISSOLVERS SEE 13349.

FOR DETAIL OF SUPPORTS SEE 8790

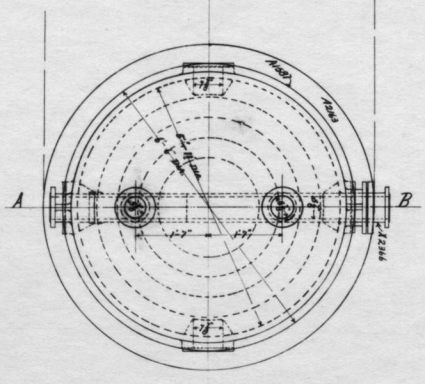
FOR LOCATION OF BL. SEE 2961 & 3076

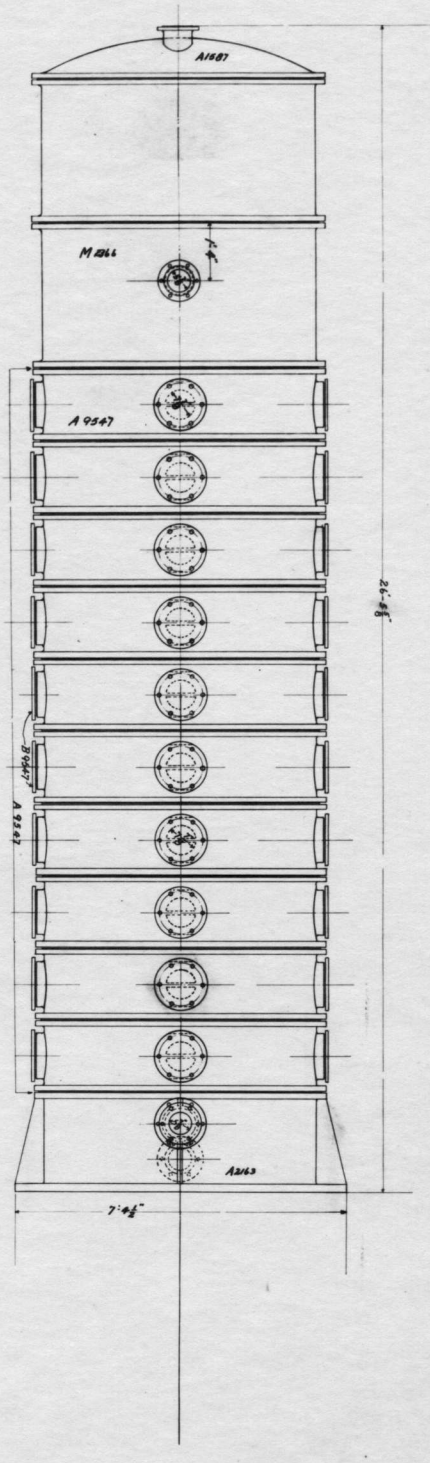
" " " CE AIR PIPE - 13438

8-8768 of 112



SECTION AB





ELEVATION

Plan Rear Removed from C S 8x4x

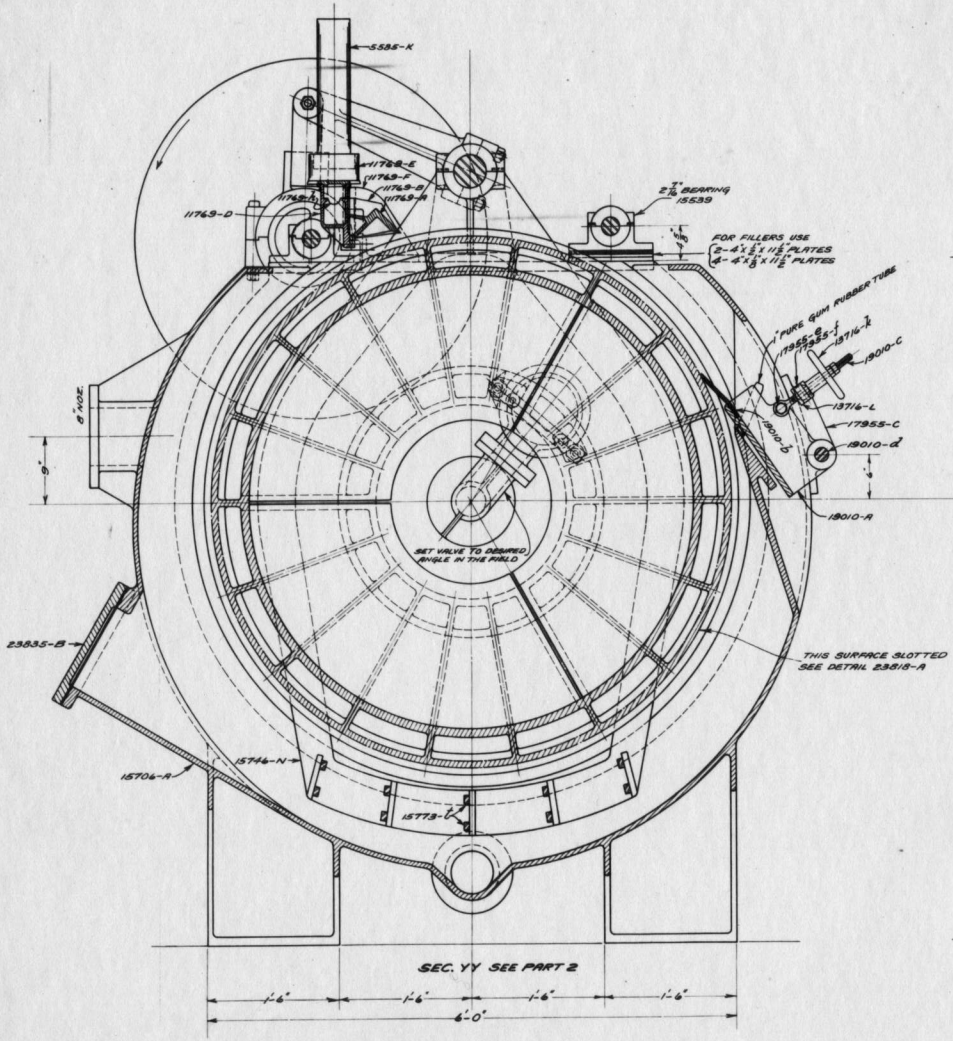
ENSEMBLE OF APPARATUS C.S.C. C.S. PLANT
THE SOLVAY PROCESS CO. SYRACUSE, N.Y.
DRAWN BY M.J.R SCALE 1/4"=1'-0" DATE JUNE 6 1930
TRACED BY M.J.R
CHECKED BY
APPROVED BY

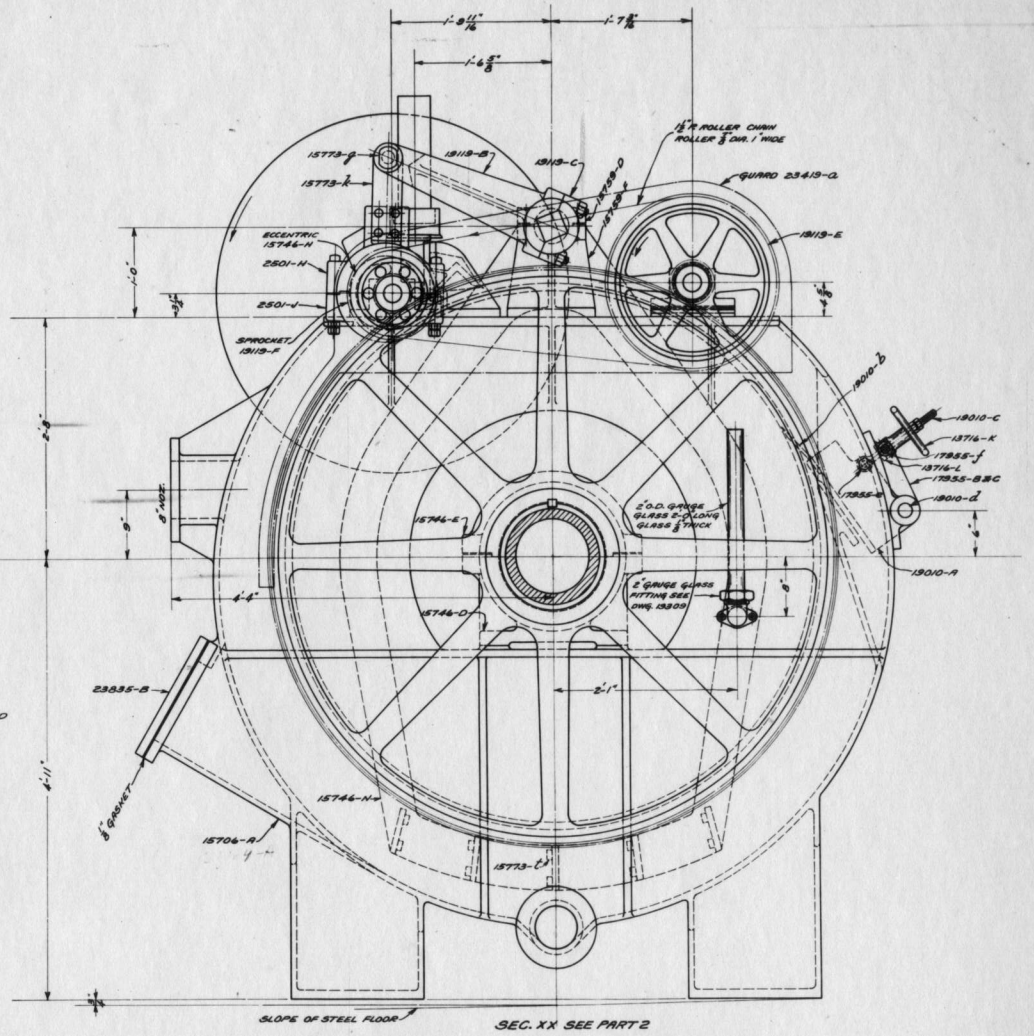
FOR LOCATION SEE S-7768

S-9629

2-YO-4 P31

9629-p112





(B) REDRAWN & RETRACED MAKING DRAWING IN TWO PARTS. THIS DWG. SUPERSEDES PREVIOUS DWG. OF SAME NUMBER.

18 COMPRESSION GREASE CUPS TO BE ARRANGED TO SUIT CONDITIONS IN THE FIELD

ALL PRINTS DATED BEFORE LATEST REVISION ARE CANCELLED AND RECALLED.

REVISIONS			
REV.	No.	DATE	BY
(B)	1	5-14-18	B.V.H H.G.O.

ARR. OF C.S.-F.L.R.
1ST FILTRATION
C.S. BLDG. C.S. DEPT.
THE SOLVAY PROCESS CO., SYRACUSE, N.Y.
DRAWN BY H.G.O. SCALE 1/2"-1'-0" DATE 5-14-18
TRACED BY B.V.H. DESIGNED FOR G.O.
CHECKED BY H.G.O.
APPROVED BY
15716
IN TWO PARTS - PT. I

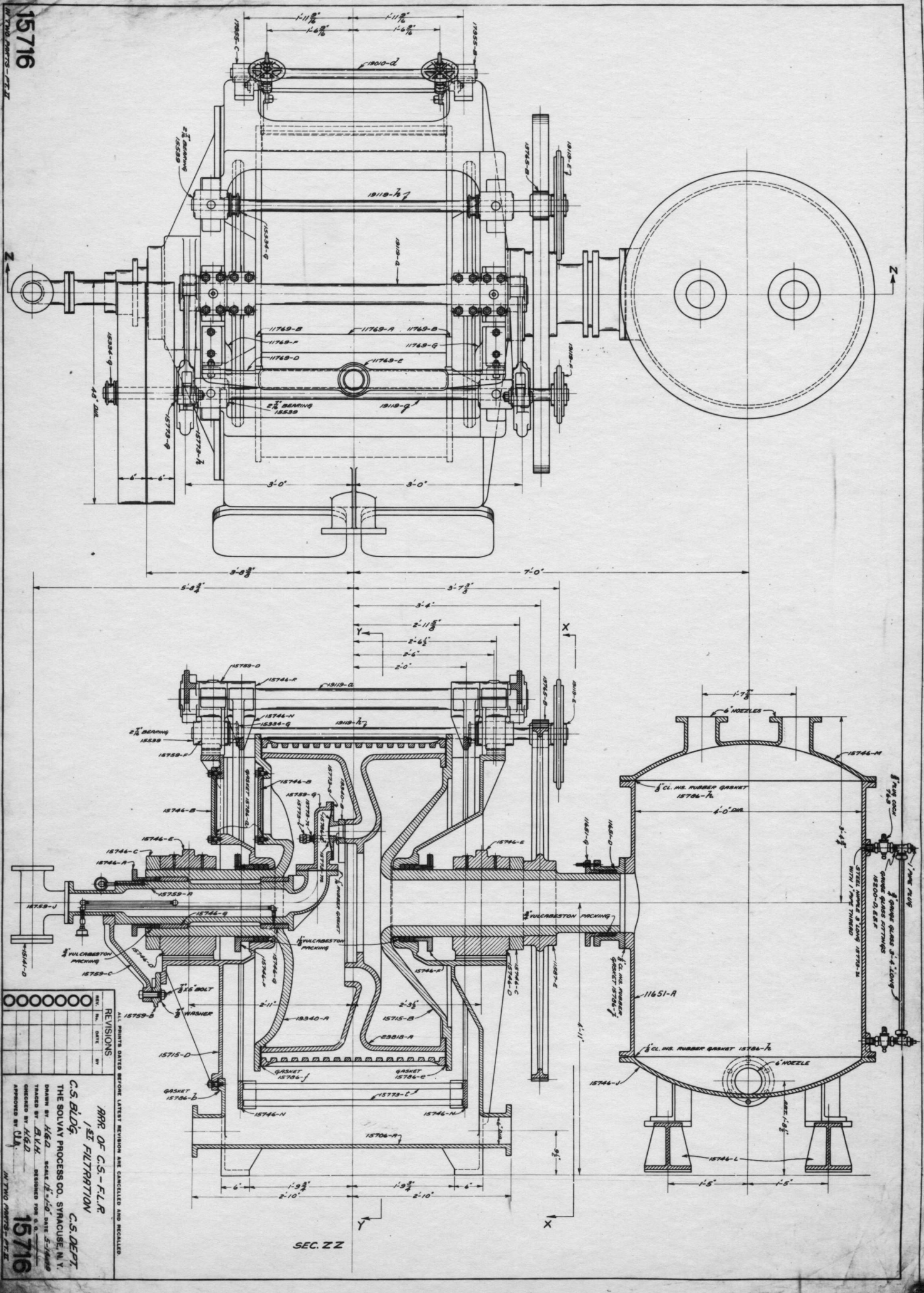
15716

IN TWO PARTS - PT. I

15716-B 112

15716

IN TWO PARTS - PT. II



REVISIONS

REV. No.	DATE	BY

ALL PRINTS DATED BEFORE LATEST REVISION ARE CANCELLED AND RECALLED

ARR. OF C.S. - F.L.R.
1ST. FILTRATION
C.S. BLDG.

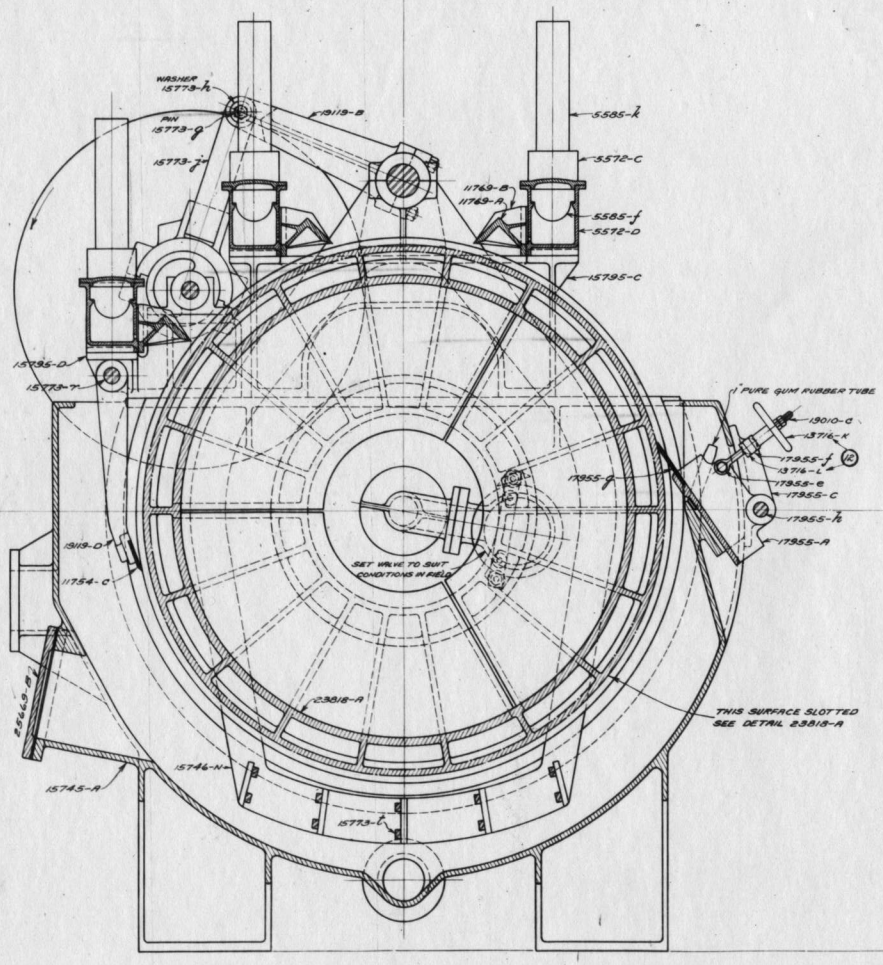
C.S. DEPT.
THE SOLVAY PROCESS CO. SYRACUSE, N.Y.

DRAWN BY: M&D SCALE: 1/2"=1'-0" DATE: 5-1-1940
TRACED BY: M&D DESIGNED FOR C.O.
CHECKED BY: B.V.H.
APPROVED BY: C.A.

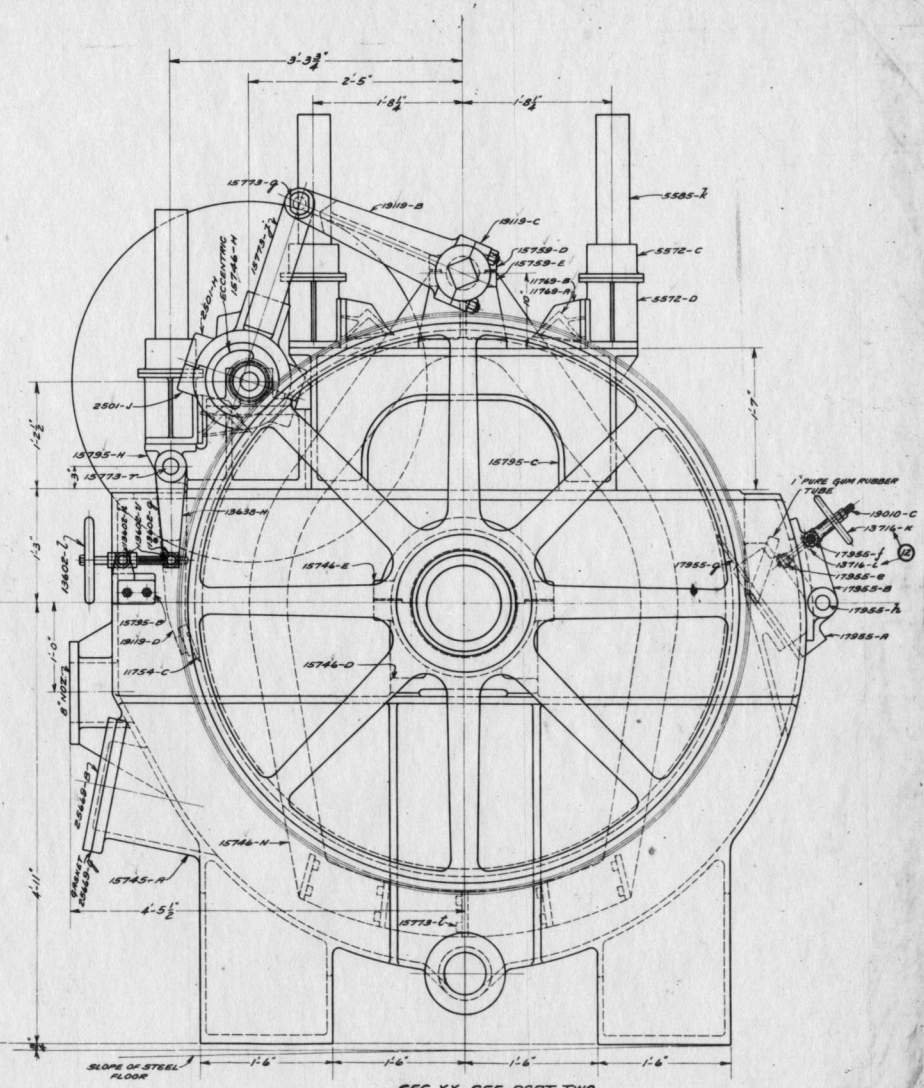
15716

IN TWO PARTS - PT. II

15716 - p112



SEC. YY SEE PART TWO



SEC. XX SEE PART TWO

(11) REDRAWN & RETRACED MAKING DWG. IN TWO PARTS. THIS DWG. SUPERSEDES PREVIOUS DWG. OF SAME NUMBER.

15 COMPRESSION GREASE CUPS TO BE ARRANGED TO SUIT CONDITIONS IN THE FIELD

ALL PRINTS DATED BEFORE LATEST REVISION ARE CANCELLED AND RECALLED.

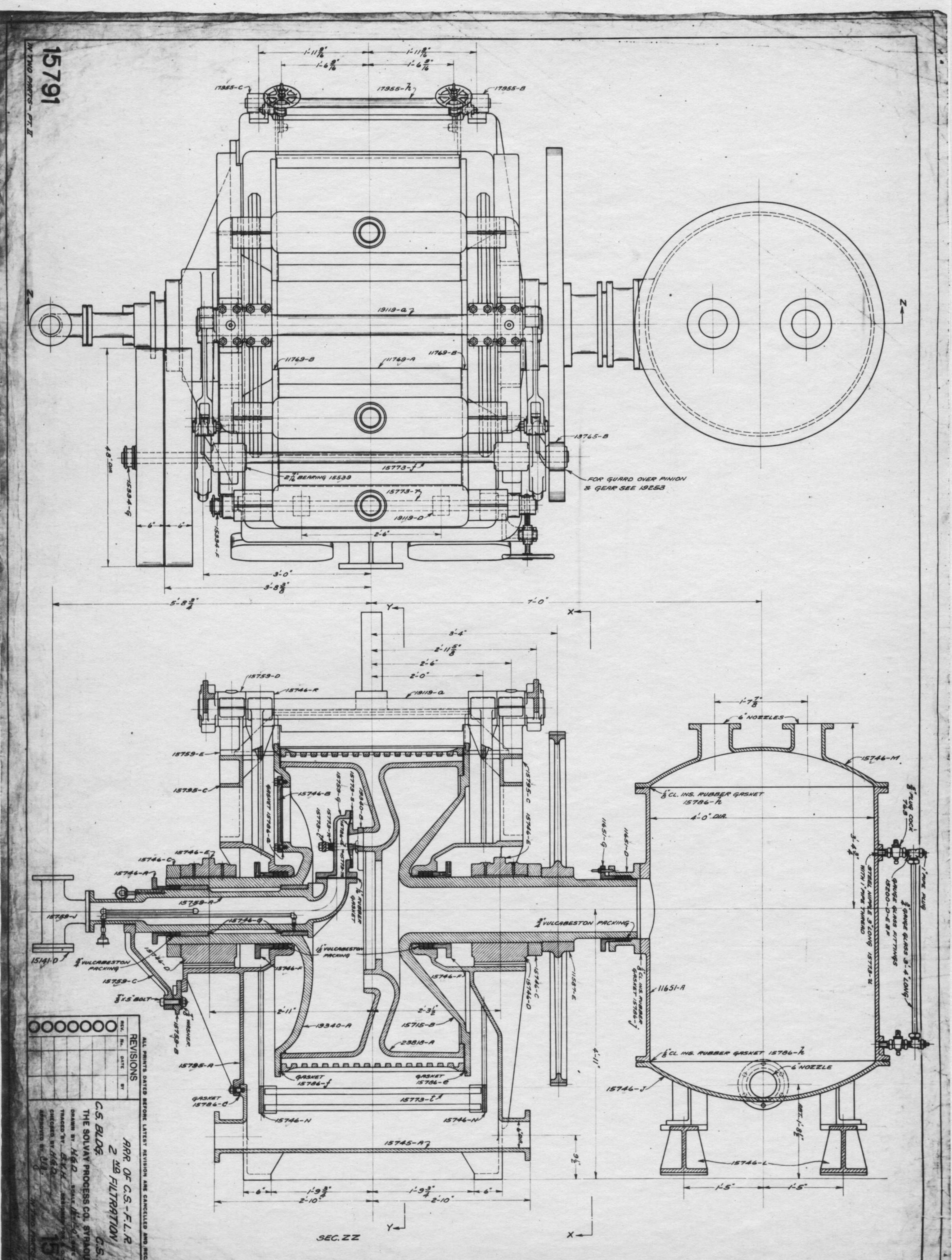
REVISIONS			
REV.	No.	DATE	BY
(11)	1	5-14-18	B.V.H. H.G.D.
(12)	2	3-11-20	B.V.H. H.G.D.

ARR. OF C.S.-F.L.R.
2ND FILTRATION
C.S. BLDG. C.S. DEPT.
THE SOLVAY PROCESS CO. SYRACUSE, N.Y.
DRAWN BY H.G.D. SCALE 1"-1'-0" DATE 5-14-18
TRACED BY B.V.H. DESIGNED FOR W.O.
CHECKED BY H.G.D.
APPROVED BY C.L.A.
15791
IN TWO PARTS-PT. II

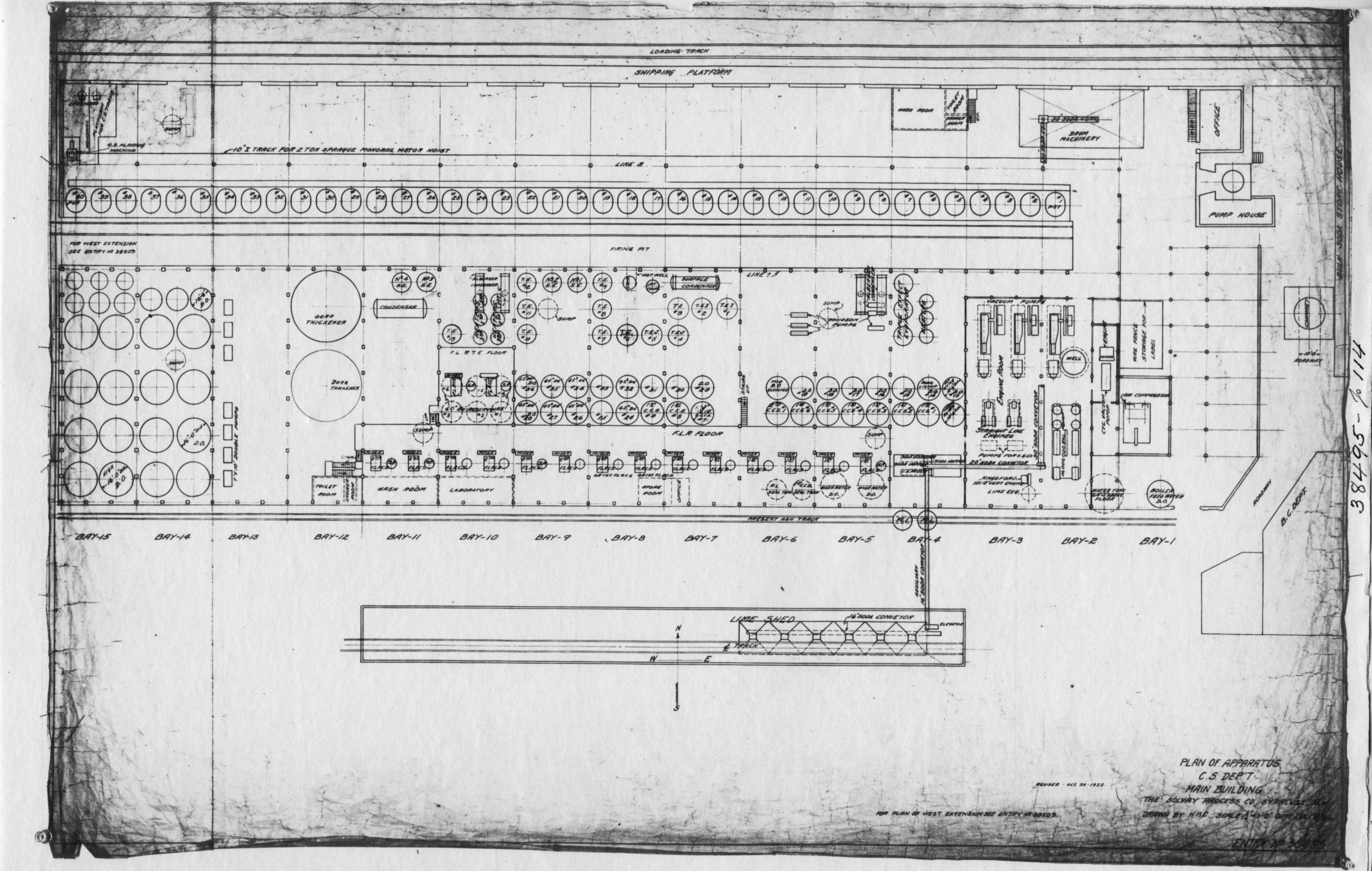
15791

IN TWO PARTS-PT. I

15791-15792


15791
IN TWO PARTS - PT. II
FOR GUARD OVER PINION & GEAR SEE 19253
2 1/16" BEARING 15539
6" NOZZLES
1/8" CL. INS. RUBBER GASKET 15786-H
4'-0" DIA.
3/8" VULCABESTON PACKING
1 1/2" VULCABESTON PACKING
GAUGE GLASS FITTINGS
6" NOZZLE
SEC. ZZ
REVISIONS
ALL PRINTS DATED BEFORE LATEST REVISION ARE CANCELLED AND RECALLED
ARR. OF C.S.-F.L.R.
2 ND FILTRATION
C.S. BLDG.
C.S. DEPT.
THE SOLVAY PROCESS CO. SYRACUSE, N.Y.
15791

15791² - № 112


LOADING TRACK
SHIPPING PLATFORM
10" I TRACK FOR 2 TON SPRAGUE MONORAIL MOTOR HOIST
LINE 8
LINE 7
FIRING PIT
FOR WEST EXTENSION SEE ENTRY No 38503
MAIN BUILDING
MEN'S ROOM
TOILET ROOM
DRUM MACHINERY
OFFICE
PUMP HOUSE
C.S. PLANING MACHINE
DORR THICKENER
DORR THICKENER
CONDENSER
SURFACE CONDENSER
HOT WELL
BAROMETRIC CONDENSER
BRIGGS PUMPS
TANK FOR HOT WATER
VACUUM PUMPS
ENGINE ROOM
WELL
NINE FENCE STORAGE FOR LABEL
AIR COMPRESSOR
CYC. HAMMER MILL
F.L.R.T.E. FLOOR
F.L.R. FLOOR
STRAIGHT LINE ENGINES
PUMPS FOR S.E.D.
KINGSFORD 100 H.P. VERT. ENGINE
LIME EGG
WATER TANK ON BOILER FLOOR
BOILER FEED WATER P.O.
TOILET ROOM
WASH ROOM
LABORATORY
STORE ROOM
OFFICE
OFFICE FLR.
SEAL TANK
SEAL TANK
WATER P.O.
WATER P.O.
PRESENT A&N TRACK
BAY-15
BAY-14
BAY-13
BAY-12
BAY-11
BAY-10
BAY-9
BAY-8
BAY-7
BAY-6
BAY-5
BAY-4
BAY-3
BAY-2
BAY-1
LIME SHED
16'-0" CONVEYOR
ELEVATOR
TRACK
N
W
E
S
B.C. DEPT.
ROADWAY
N.Y.C. ROADWAY
PLAN OF APPARATUS
C.S. DEP'T.
MAIN BUILDING
THE SOLVAY PROCESS CO. SYRACUSE N.Y.
DRAWN BY H.P.C. SCALE 1"=50' DATE JULY 1922
REVISED - DEC. 30. 1922
FOR PLAN OF WEST EXTENSION SEE ENTRY No 38503
ENTRY No 38495
38495-B 114