THE SUGAR MILL

AT

ALVARADO, CALIFORNIA

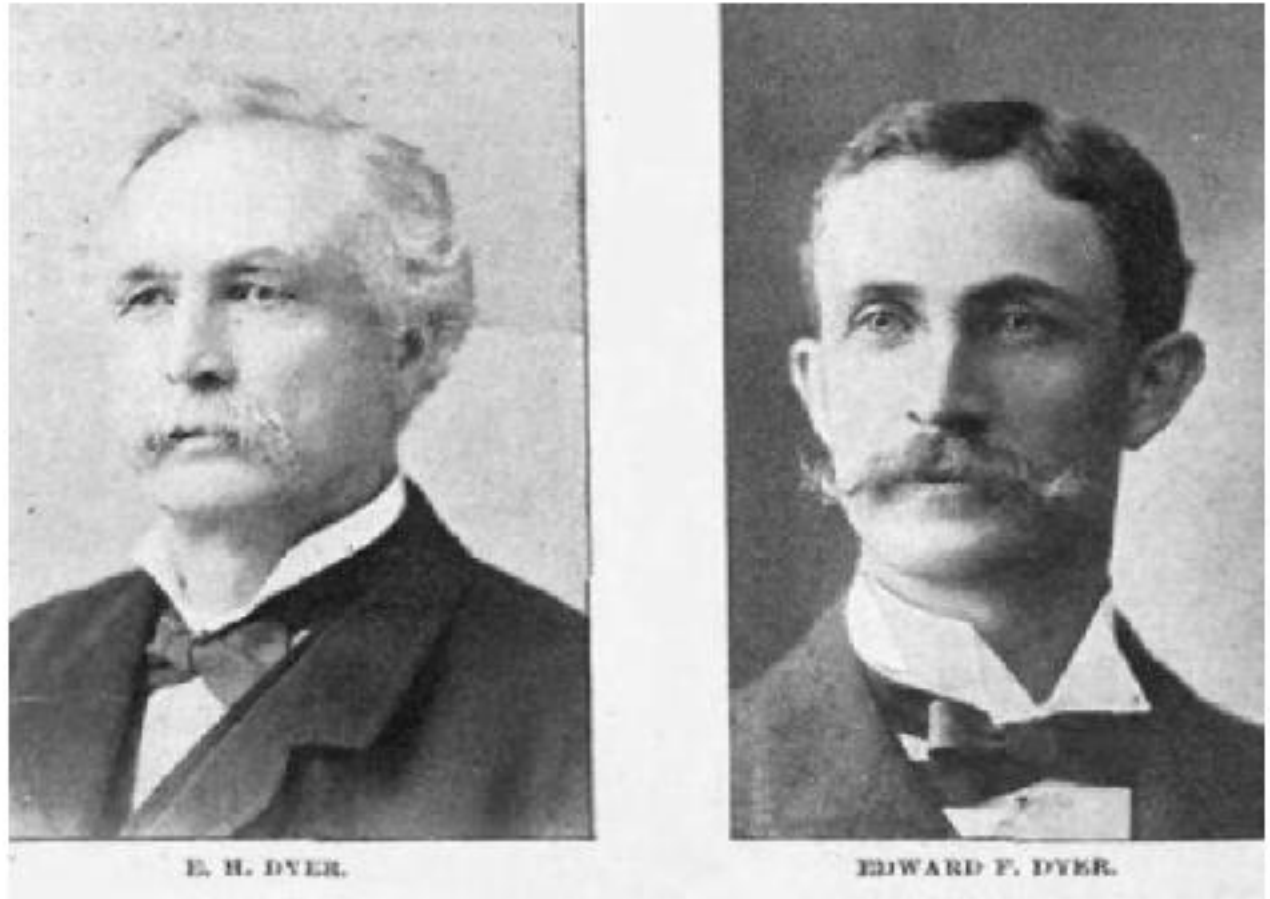
ODE TO THE SUGAR MILL

FROM *THE OAKLAND TRIBUNE*, PUBLISHED DECEMBER 5, 1928

Half hidden in the leafy shadow
Where whispering willows hover near
Still stands the mill at Alvarado
Grinding on from year to year

From year to year in track well beaten
In modesty it serves mankind
Its only purpose is to sweeten
Its only mission is to grind

Grinding refers to the slicing of beets, the first step in the processing of extracting sugar from beets. The beets are sliced by knives into "cosettes," narrow slices of beets which make the extraction of sugar more complete.



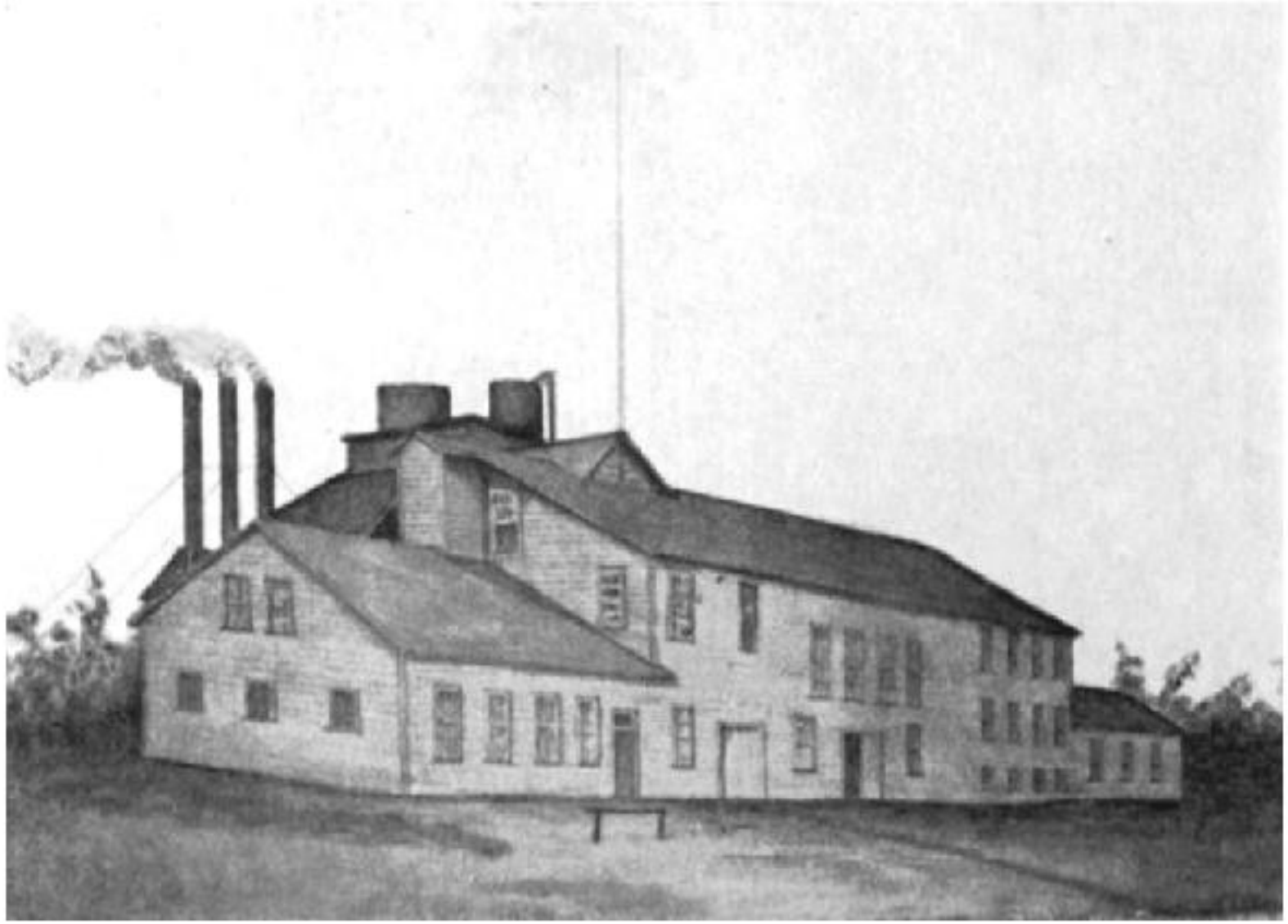
E. H. DYER.

EDWARD F. DYER.

E.H. (Ebenezer Herrick) Dyer: Built the first commercially successful beet sugar factory in the U.S. He was known as the "Father" of the U.S. beet sugar industry. Later in life he would design and build sugar factories in the U.S. E.H. Dyer would make his headquarters in his home in Alvarado next to the beet factory he helped found.

E.F. (Edward F.) Dyer: Son of E.H. Dyer who collaborated with his father in the building of sugar factories. Edward would later locate a subsidiary company, E.H. Dyer & Co., in Cleveland, Ohio with his cousin H.P. Dyer. With the operations in Alvarado and Cleveland Ohio they would build turn-key sugar factories in the U.S.

THE ALVARADO SUGAR MILL HISTORY FROM 1869 TO 1968.



The California Beet Sugar Company
Built by E.H. Dyer & Co., 1870 in Alvarado California
First barrel of sugar produced was on November 17, 1870

In 1869 Ebenezer Dyer led a consortium of investors in establishing a beet sugar mill in Alvarado, California. Construction began in May 1870, led by Benjamin F. Ingalls, the father-in-law of Ebenezer Dyer. The first barrel of sugar was produced on November 17, 1870, and put in a polished walnut barrel fitted with resplendent brass hoops and sent off to President Grant in Wash. D.C.

The principals of the company were Dyer and two German sugar makers from Fon Du Lac, WI., Bonesteel & Otto, who had run a small, but relatively successful plant in Wisconsin. They quit Fond Du Lac and brought their equipment west to Alvarado. The investment capital in plant and equipment was $250,000, and the return for the first year was almost $18,000. The plant had proved to be a money maker in its first year.

This caused newspapers to herald the beet sugar industry, of which, all that had tried to make money from beet sugar in the U.S. previously had failed. Almost all sugar had to be imported into the U.S. from the more tropical areas of the globe or from Europe where beet sugar had been a success for almost one hundred years.

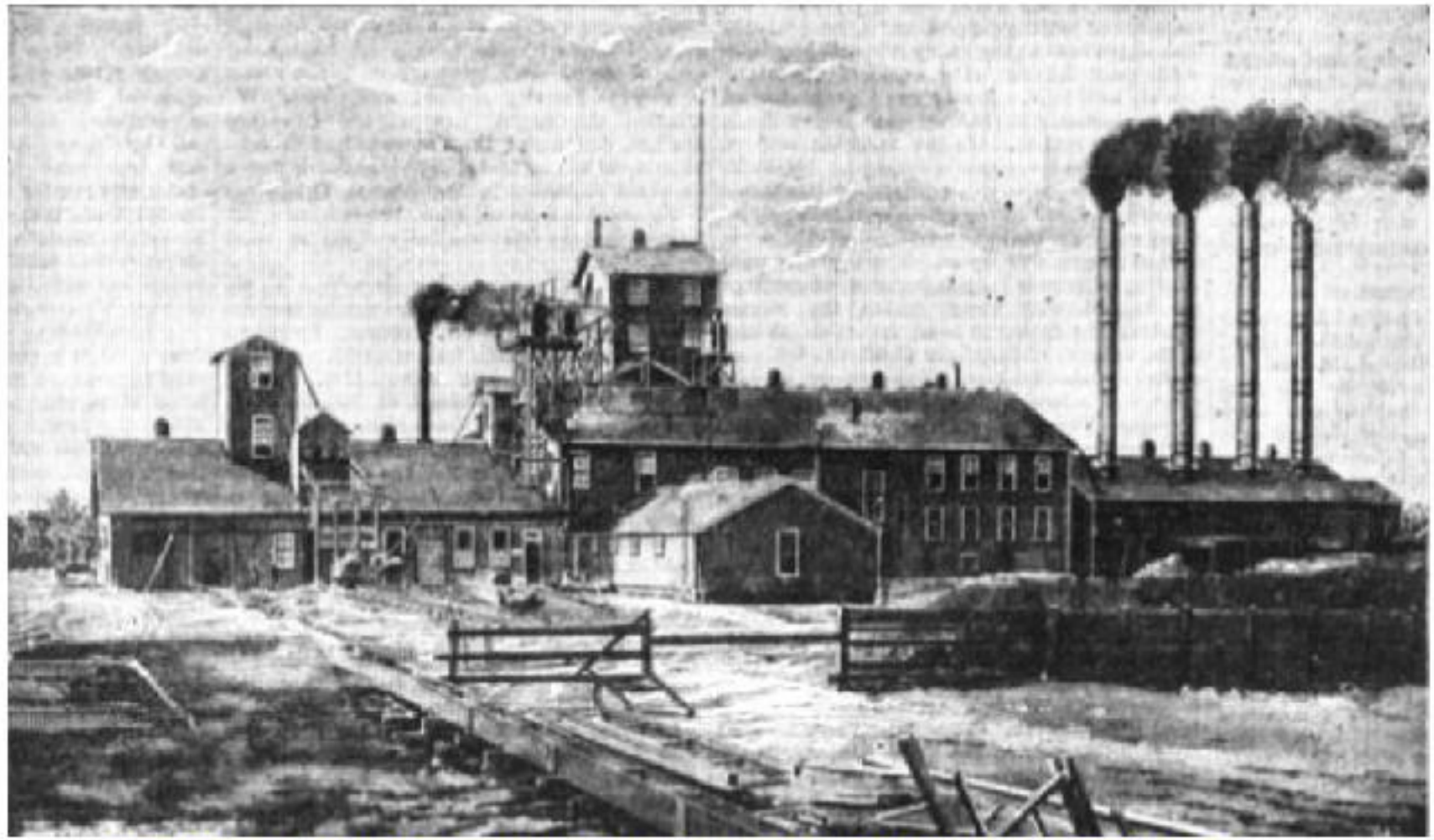
The next two years the company was tight lipped about profits and after the fourth year (1873), rumors were about that there was tough times in the Alvarado mill.

Then in 1874 the mill announced that they would close the plant and move the equipment to Soquel (near Santa Cruz). Bonesteel and Otto took their equipment and headed to Soquel. E.H. Dyer then bought the building that had housed the plant and it laid empty awaiting a new effort by Dyer to bring new life to the enterprise.

During its four year run the mill processed 50 tons of beets a day that produced 4,000 tons of pure sugar daily. Failure of the mill was eventually laid at the feet of the Germans, Bonesteel & Otto and their mismanagement of the operation. As for the their new operation in Soquel, it too would end in failure in 1879, and the equipment was abandoned.

The repeated failures of the beet sugar industry in the U.S. made capitalists hesitant to invest and it was not until 1879 that Mr. Dyer was able to enlist the investment needed to expand the original building and bring in new equipment to process beets.

In 1879 Mr. Dyer succeeded in forming the Standard Sugar Company in Alvarado where the original plant had been located.



The Standard Sugar Company, built by E.H. Dyer in 1879 at Alvarado, Calif.

If you look carefully at the left wing of the building you can see a portion of the old mill that was added on to create the new mill.

In 1879 Mr. Dyer, along with his investors, refitted and reopened the old mill at Alvarado. For equipment they purchased the workings of an old competitor mill in Sacramento that had gone under. The company contracted for 1,100 acres of beets to fill the need of the 50 tons of beets a day that the mill would process.

In November 1879 it was reported that the beets being delivered to the Alvarado mill were yielding 14% of sugar, thus making 7 tons of pure product daily. The venture not only processed the beets, but it also refined the product into pure sugar. When the results of the 1879 season were released it was estimated that the 1,100 acres of beets produced about 12,500 tons of beets, of which 680 tons of pure sugar were produced at a 5.44% yield of sugar.

For the year 1882 the company again had 1,100 acres of beets and they were processing 50 tons a day. The product processed during this year was 11,229 tons, which produced 695.5 tons of pure sugar, a yield per ton of 6.2%. The net profit for the year was just short $45,000 for a return of 18% on invested capital. This was in a year where a boiler explosion leveled the boiler room, and led to the death a fireman who was tending the boilers.

Newspapers throughout the country were singing the praises of the Alvarado sugar mill, and were heralding a new manufacturing enterprise that would offer sugar at lower process and freedom from the grip of foreign sugar barons. Alvarado had pioneered the first commercially successful beet sugar mill in the U.S. Ebenezer H. Dyer had turned failure into success!

On January 30, 1887 a devastating explosion again occurred in the boiler room at the Alvarado mill. The boiler room and adjacent building were all demolished and one employee died as a result of injuries. The mill lay in ruins.

In June 1887 it was announced that E.H. Dyer had bought out the remnants of the old Alvarado Sugar Mill and would rebuild a new mill from the ground up. The old mill, although successful, had been a patchwork of two buildings and various equipment pieced together to form the sugar making process. The mill would be more scientifically constructed than the old. Improved European and American machinery would be used. In June 1887 Claus Spreckels would announce the construction of his giant beet sugar mill in Watsonville CA.

Meanwhile, Dyer's new company would be called the Pacific Coast Sugar Company.

The Pacific Coast Sugar Company, built by E.H. Dyer & Co., in Alvarado 1889

In January 1888, it was announced that the new mill at Alvarado would be able to process 200 tons of beets daily. The new company anticipated refining 3,250 tons of sugar in the coming campaign.

But on October 1, 1888, it was announced that this years' campaign had been a failure due to the lack of rain. In January 1889, the Spring Valley Water Company of San Francisco brought suit against the sugar mill at Alvarado over water rights to the Alameda Creek. The water company had bought the water rights (by fee simple and riparian rights) to the Alameda Creek Watershed east of the Bay foothills, and to all water to Alameda Creek itself past Union City to the west. The loss of water from the Alameda Creek could cripple the mill.

On January 30, 1889, a newspaper article indicated that an offer by E.C. Burr to buy the Pacific Coast Sugar Company was refused. However, a committee had been formed by the Alvarado company to seek a buyer.

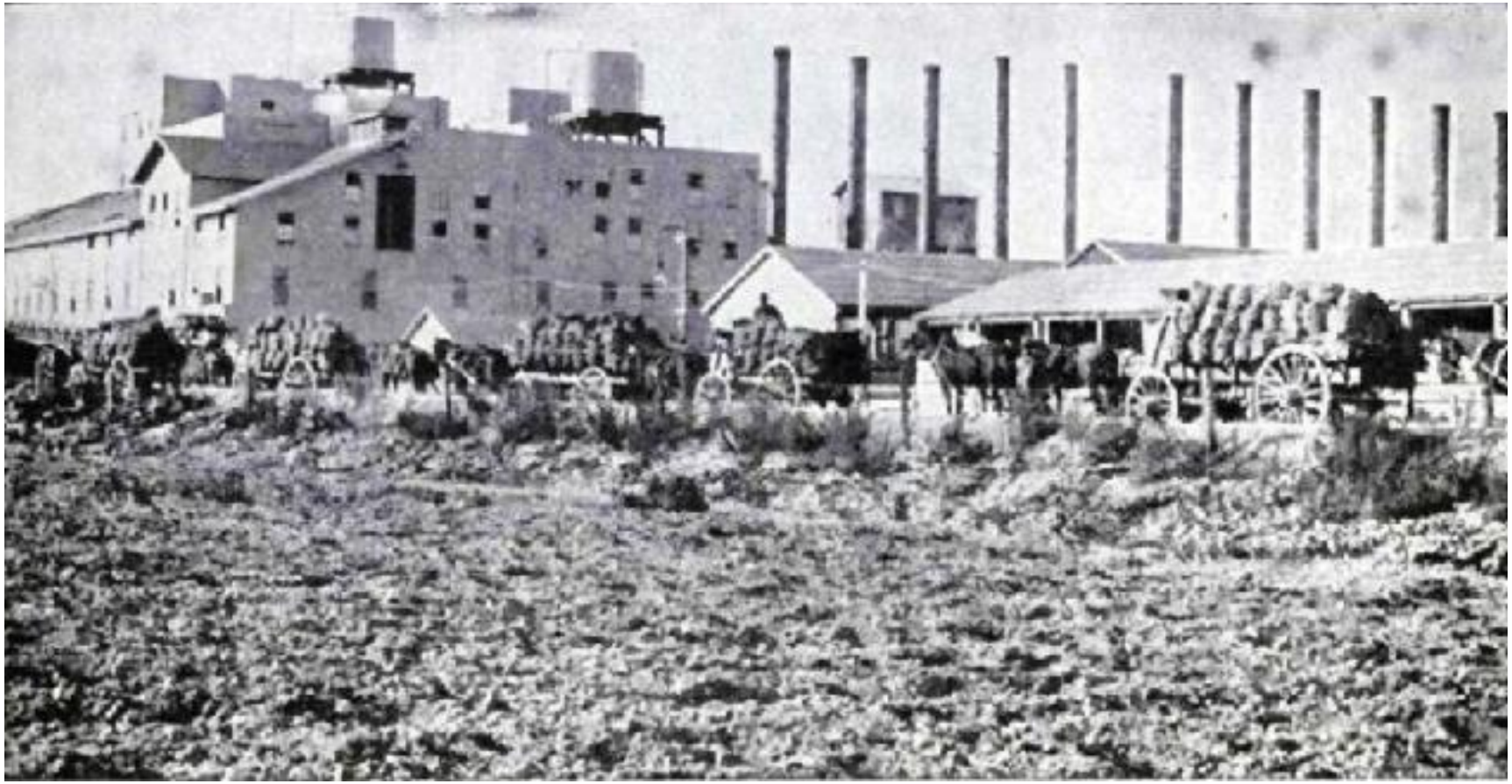
On February 20, 1889, papers were filed with the State of California to incorporate a new company known as the Alameda Sugar Company to operate a beet sugar mill in Alvarado. This company had purchased the Pacific Coast Sugar Company from E. H. Dyer. One of the principals of the new company was E.C. Burr, who had been the superintendent of the American Sugar Company's mill.

The new company had a relatively successful season in 1889, so the company increased the number of boilers to twelve in anticipation of a good season in 1890.

Meanwhile E. H. and E.F. Dyer were in Salt Lake City, Utah, where they were designing a beet sugar mill in that State for a group of investors.

In 1891 the Alameda Sugar Company advertised to extend its reach for beets to San Jose, when it advertised for farmers in the San Jose area that transportation to the Alvarado Mill could be had on the SPCRR Narrow Gauge Railroad.

On April 1, 1891, the president of the Alameda Sugar Company expressed dismay over the scant profits for the past two years, all of which had been reinvested in the company. The company; did however, receive some help from the government in 1891, when the sugar companies in the U.S. received a 2¢ subsidy for each pound of sugar produced in the U.S.



THE FATHER OF AMERICA'S BEET SUGAR FACTORIES

This is a partial view of the Alameda Sugar Company's factory at Alvarado, California. It fully deserves the above title. The original mill was built in 1870 by E.H. Dyer. Alvarado had long been the only commercially successful beet sugar factory in the United States, and it was not until 1888 that the Spreckels factory was built in Watsonville, Cal., followed by the Oxnard factory at Grand Island in Nebraska. This pioneer factory at Alvarado had a checkered career to its early days, but is now so successful that in 1897 its capacity was doubled, and now the managers are building a much larger mill in Los Alamitos. Too much credit cannot be given to the Dyers and to Alvarado as the "fathers" of the now promising beet sugar industry.

The Alameda Sugar Company would contract for over 3,000 acres of beets with farmers in the Washington and Eden Townships for the 1894 campaign. In 1895 a railroad spur to the Alvarado mill was added from the Hayward Decoto area that would enable beets grown in Pleasanton-Livermore (Murray Township), and Contra Costa County to be delivered straight to the mill in Alvarado.

February 1897 saw the capacity of the Alvarado mill doubled to process 800 tons of beets per day. With a larger plant Alvarado needed more beets, so they started scouting to the north.

In 1897 they were in the Napa area testing soil and interviewing farmers. During 1897 the Alameda Sugar Co. had 6,000 acres of beets under contract. In 1898 the mill at Alvarado started investigating the area around the delta and islands about the Sacramento River for the growing of beets.

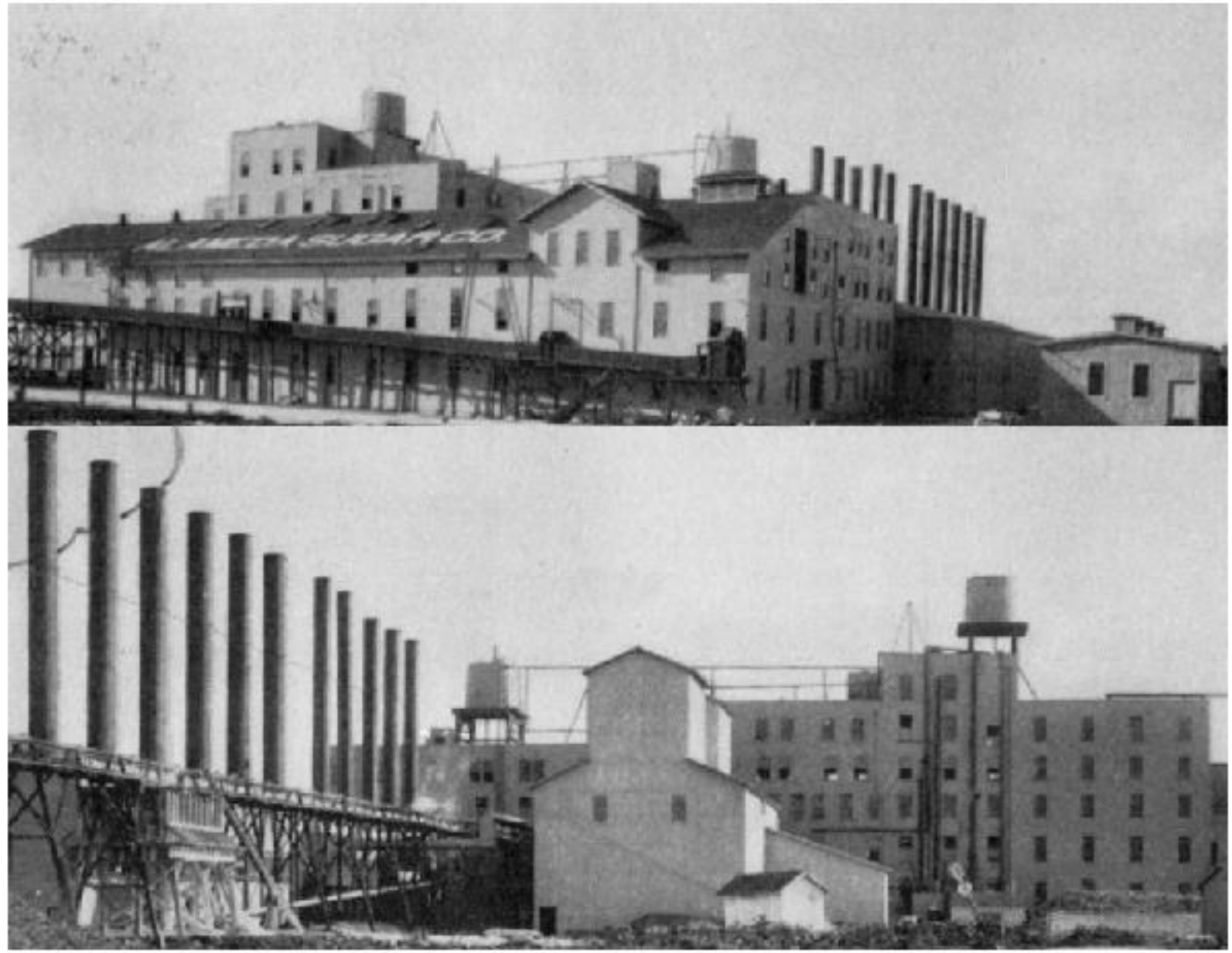
In 1899 Alvarado had the fourth largest mill in the United States, behind the Spreckles Sugar Co. in Salinas (3,000 tons per day); the Pacific Beet Sugar Co. in Oxnard (1,000 tons per day); the Chino Valley Beet Sugar (1,000 tons per day); and the Alameda Sugar Co. in Alvarado (800 tons per day). The daily average of all beet sugar mills in the U.S. in 1899 was 10,900 tons per day.

The year 1900 saw the sugar mill contract for beets in Lodi and Placerville, which were to be delivered by rail to Alvarado. In August 1901, the mill began harvesting sugar beets on the Finnel Ranch south of Red Bluff in Tehama County. The mill had 15,000 acres under cultivation in Tehama County. For the year 1901, the sugar mill processed 67,000 tons of beets, which produced 7,250 tons of sugar for a yield of 10.8%.

1903 saw the Alvarado mill taken into the U.S. Sugar Trust, which had garnered control of most of the sugar mills in the U.S. with the sole purpose of raising the price of sugar to the consumer substantially without benefit to the growers.

The year 1904 saw the Alvarado mill testing the soil about Modesto as a future spot to obtain beets. The following year George Gray, field representative for the Alvarado sugar mill, was in Yolo County (Woodland & Davis) looking at future ground for growing beets.

The quality of Alvarado sugar received notoriety in February 1905, when the Alameda Sugar Company received a Gold Medal at the St. Louis World Fair and International Exposition for its refined sugar. The company then followed this up with winning a Gold Medal at the Portland Exposition for refined sugar, alcohol and an exhibit showing the manufacture of sugar from beets.



The Alameda Sugar Company mill at Alvarado circa 1905.

February 1906 saw George Gray in Woodland signing up farmers to grow beets. Over 500 acres would be tried in 1906. In 1907 the Alameda Sugar Company began buying assets for planting and harvesting beets in Yolo County. But they had competition from the Sacramento Valley Co., who had constructed a new beet sugar factory in Hamilton City, California.

In the fall of 1909 the sugar mill began farming in Yolo County in earnest, purchasing two steam plows for $25,000. The plows, which work in tandem at each end of the rows, are linked to a balance plow via cables from each steam plow, which then pulls the plow in one direction, and when at the end of the row the plow at the opposite end then pulls it back. These plows can go down 12 to 14 inches getting almost all of the beet. The sugar in beets is concentrated mostly on the bottom half of the beet and in the past a lot of potential sugar was left in the field.

Ebenezer Herrick Dyer died at his home in Alvarado on July 15, 1910, at the age of 88 years.

It was rumored in November 1910 that the Alameda Sugar Co. was about to erect a plant at Woodland, where they have 14,000 acres of sugar beets under cultivation.

The cost of transportation of the raw material between Woodland and Alvarado was such that the company intended to put the beets through the raw stages of sugar making near Woodland, and then ship the product to Alvarado for refining. The sugar company continued to sink capital into expanding in Woodland with the purchase of a Caterpillar tractor for the area, and a $25,000 irrigating plant. Also the company was buying up farmland in Yolo County to grow more beets.

The company's intention to move their operations north became evident in September 1911 when the entire acreage of the Alameda Sugar Company north of Pleasanton was leased to Antone Goularte. The company's machinery and other paraphernalia in the Pleasanton area was then shipped to its Woodland holdings.

The Alameda Sugar Co. announced in October 1911 that it would move its refinery to Meridian, California. Meridian is approximately 40 miles north of Sacramento. The company had secured options there on 10,000 acres of sugar beet land. The company's representatives announced that the actual transfer of the plant would be completed in early 1913.

In June 1912 the sugar company announced that it would sell 6.48 acres of its land in the Alameda Sugar Fair Ranch to John S. D'Avila. The Fair Ranch was located in the area of today's Casa Verde tract that stretched from the Fremont City line north to the Alameda Creek, from Alvarado Niles Road on the East to Alvarado Boulevard on the West. This did indeed sound the apparent death knell for the sugar mill in Alvarado.

Here is a map depicting Northern California circa 1952 from an old Flying "A" Road Map. The highway from Woodland to Hamilton City is the old "99." This map gives a sense of where the sugar mill was headed in 1913.

The Alvarado sugar mill expected the 1913 crop would be shipped to the Alvarado factory. At the end of 1913 the erection of the new factory would be commenced at Meridian and would be ready to handle the 1914 crop. The company expected that the entire 12,000 acres in Yolo County would be producing sugar beets. The Alvarado factory would then be dismantled.

A bond issue of about $15,000,000 was needed to construct the new mill. The new plant was calculated to produce in excess of 20,000 tons of sugar each season, which would mean handling approximately 180,000 ton of beets.

An announcement from the stockholders meeting, held in November 1913, stated that the Alvarado sugar mill would continue to run, although the company had decided to quit raising beets themselves. From now on the company would rely on obtaining beets through contracts with farmers.

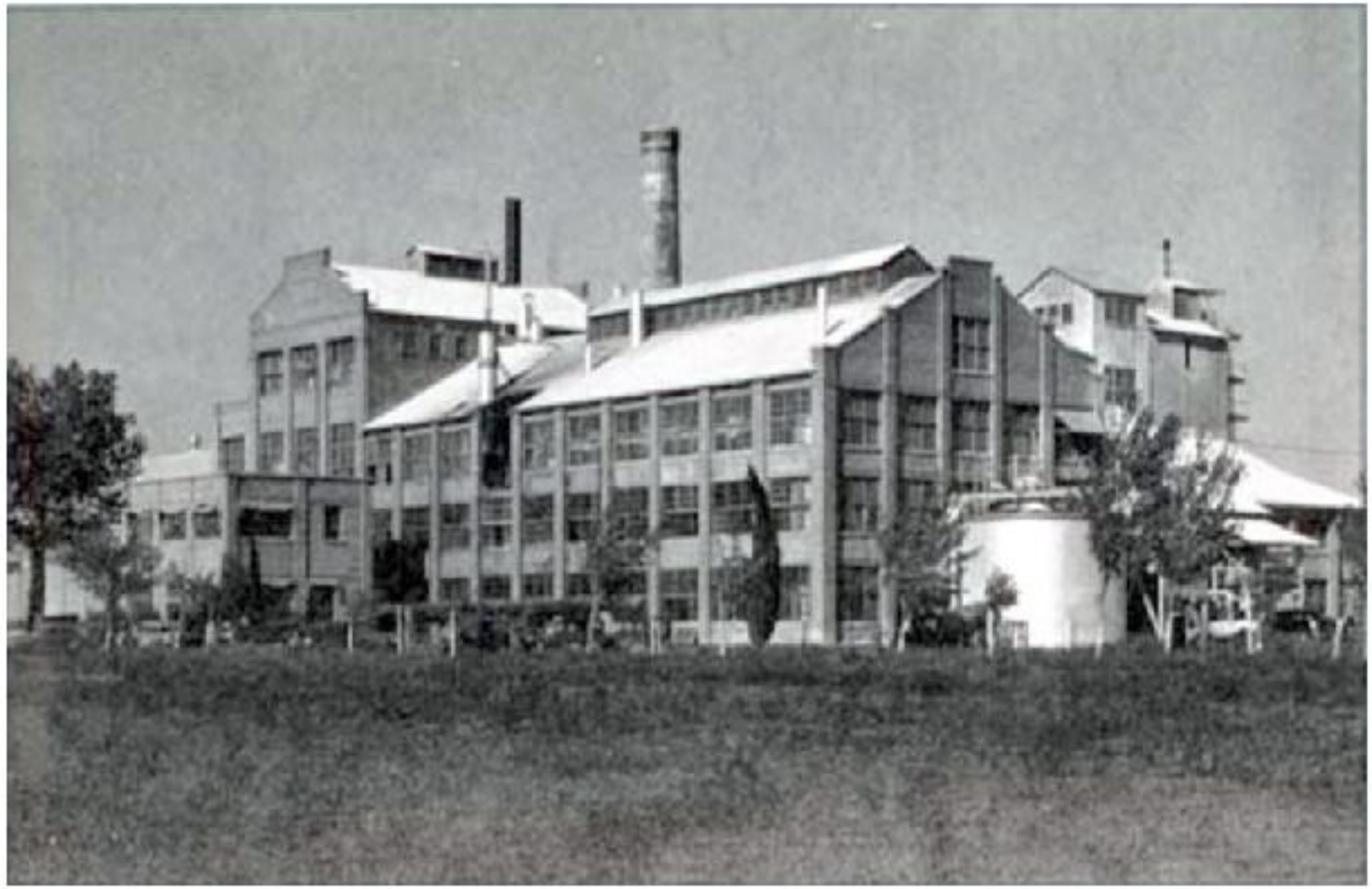
To show that the Alameda Sugar Company was to positively abandon the farming of the Woodland area, the company shipped twelve carloads of company owned farm equipment, from Washington Township property, to Yolo County, including farming utensils and livestock to Meridian in November 1913. Property shipped included horses, mules, wagons, harness, carts, troughs and tanks, pipe, a motorcycle, road graders and other articles.

This was good news for the farmers of Alvarado, Pleasanton and Woodland. It showed that the Alameda Sugar Company stockholders would resume full operations at the Alvarado refinery beginning in 1915.

More than 30,000 shares of stock had voted in favor of resuming operations in Alvarado. It was also decided that the Alameda Sugar Company would get out of the sugar beet farming business and would purchase all of its beets from individual farmers on contract.

On October 15, 1915, Alvarado school children blew the whistle at the factory and threw in the first beets that started operations at the sugar factory at Alvarado after it had been closed down for two years. The factory would be kept running for 100 days without a break.

With the planting of 9,000 acres of sugar beets, the refining plant of the Alameda Sugar Company at Alvarado underwent extensive improvements to cope with the 1916 increased output. The acreage of beets dealt with at the mill was a record and employment would jump to 250 men. The Alvarado mill would handle the main output in the future and the company had dismantled its mill at Woodland and moved the machinery to Alvarado. The war had created an extra-large sugar demand and was responsible for the local activity.



In March 1920 the Alameda Sugar Company purchased the Pacific Sugar Corporation at Tracy, Cal. Six years later when the Alameda Sugar Co. would be purchased by Holly Sugar the Tracy plant would be rebranded as a Holly Sugar plant.

The water use at the Alvarado mill was 3,000,000 gallons of water daily, one of the largest users of water in Southern Alameda County. Plans were made by the Alvarado mill for the coming 1917 campaign. There were several hundred men employed at the Alvarado mill and the wages ranged from $2.20 to as high as $3.25 per day.

World War I was still raging, and the U.S. had just entered the war theater in 1917. This lead to a shortage of workers in the agricultural communities. The Alvarado mill was no different and in September 1917 the mill put out a call for men via a classified ad.

The year 1917 also saw the Holly Sugar mill land a baseball team under the name "The Alameda Sugars of Alvarado." In May 1919 the Alvarado Sugars defeated a tough team from San Francisco. Playing for Alvarado was Joseph Jacinto (Sr.). He would later own a grocery store at the corner of Vallejo St. and the Alvarado Centerville Road (today that section of the street is part of Horner Street).

In March 1920 the Alameda County Sugar Company concluded a deal for the purchase of the sugar factory of the Pacific Sugar Corporation at Tracy, Cal. A photo of that plant is shown in the slide above.

In 1924 the mill contracted beet acreage in Lovelock, Nevada, as a test. Also in 1924 the hotel of the Alameda Sugar Company in Tracy opened in mid-June. The hotel would house some employees of the company's million-dollar beet sugar plant at Tracy. The plant been completely renovated after being idled for several years. It would start up by the middle of August 1924.

The Alameda Sugar Company opened its Alvarado plant to the fall work in mid-August 1924. The mill had been completely overhauled in order to handle the beets from the approximately 14,000 acres in California and Nevada. This was the first year that the sugar company had entered the Nevada fields, but with the reopening of the Tracy plant it was necessary to find a larger acreage than usual in order to supply both mills.

The price for sugar was depressed in 1925, and there was not a bright outlook for 1926. The Alameda Sugar Co. lost almost $1 million in 1925. The Holly Sugar Co. leased, and upgraded Alameda Sugar Company's plant at Tracy for the 1926 campaign. The Alvarado mill did not operate during the 1926 season.

In December 1926 the Alvarado and Tracy plants of the Alameda Sugar Company were sold to the Holly Sugar Corp. The company also controlled the Alameda Farms Company, which owned 10,035 acres of sugar beet land in Sutter County. These lands were being subdivided and would be sold.

The Alameda Sugar Company as it looked at the time of the sale of the property in December 1926 to the Holly Sugar Company. The buildings were showing signs of great wear to the exterior and within ten years had to be replaced with new construction. Note the number of smoke stacks, each boiler had its own smoke stack. When the old buildings were replaced with new construction in 1936, one 204-foot smoke stack would replace the eleven that had previously existed.

The Holly Sugar mill opened near the first of October 1927 for a run of about eight weeks. This was the first resumption of work since the plant was closed three years ago.

Repairs were made to the old plant that were badly needed because of its three years of inactivity. At this same time the Holly Sugar mill's plant capacity at Tracy was increased to about 1,000 tons of beets daily.

The construction of a million dollar sugar beet factory in the territory of Disappointment Slough, San Joaquin County, was begun by the Holly Sugar Co. in October 1929. The factory would have a daily capacity of 1,000 tons of sugar produced daily and would be the third mill in northern California for the Holly Sugar Co.

The largest output of beet sugar in the history of the Alvarado sugar plant was reported by the sugar mill, which had started its seasonal run in August 1930, with some 200 persons under employment and the daily production of about 4,000 100-pound sacks of sugar every day.

The facilities of the Alvarado plant was improved with the addition of a beet unloading conveyor, a new evaporator, and other new machinery.

A plea for increased home consumption of California beet sugar came from officials of the Alvarado sugar mill. It was pointed out that while many Southern Alameda County men are employed at the Holly Sugar mill, their product is crowded out of the local markets by cane sugar to a large extent in Southern Alameda County and throughout California.

California, which produced 165,000 tons of beet sugar in 1931, used only 70,000 tons of it. At the same time Californian's consumed about 230,000 tons of cane sugar. As a result 95,000 tons of California sugar product had to be shipped under heavy freight charges to eastern markets.

On May. 31, 1935, fire destroyed the old home of E.H. Dyer, which had been built in 1863 on property adjacent to property of the Holly Sugar mill in Alvarado. The two-story 14-room home, with its adjacent grounds, had just been sold to the Holly Company. The Holly Sugar Co. had recently purchased the home, and the surrounding farm, and planned to erect a large addition to the sugar mill in 1936. The old house was to be wrecked over the summer

Following the close of the annual sugar beet harvest of 1936, the Alvarado factory would be the scene of building operations that would complete a three-year, million-dollar construction program.

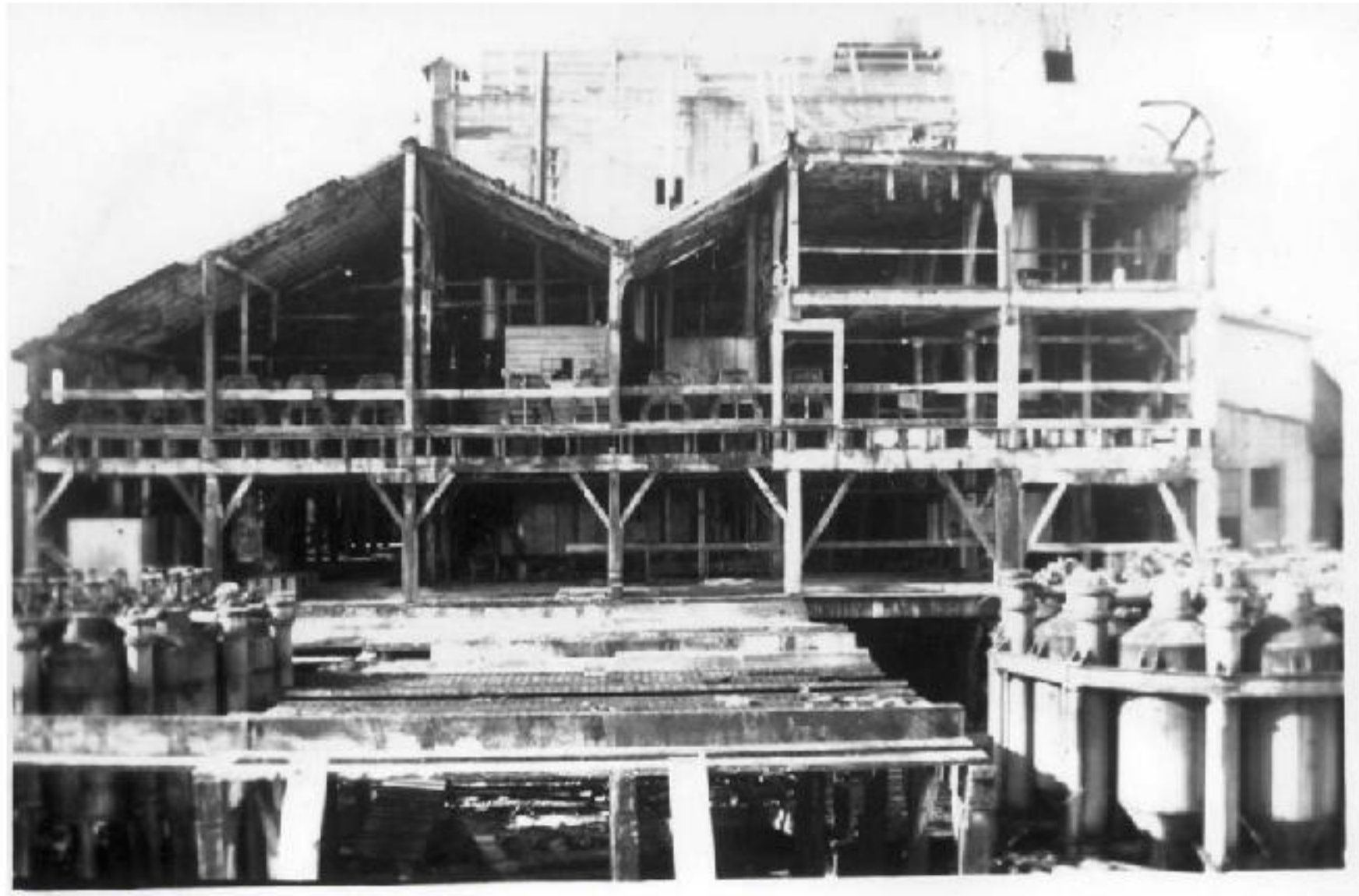
A PHOTO OF THE HOME OF E.H. DYER

~

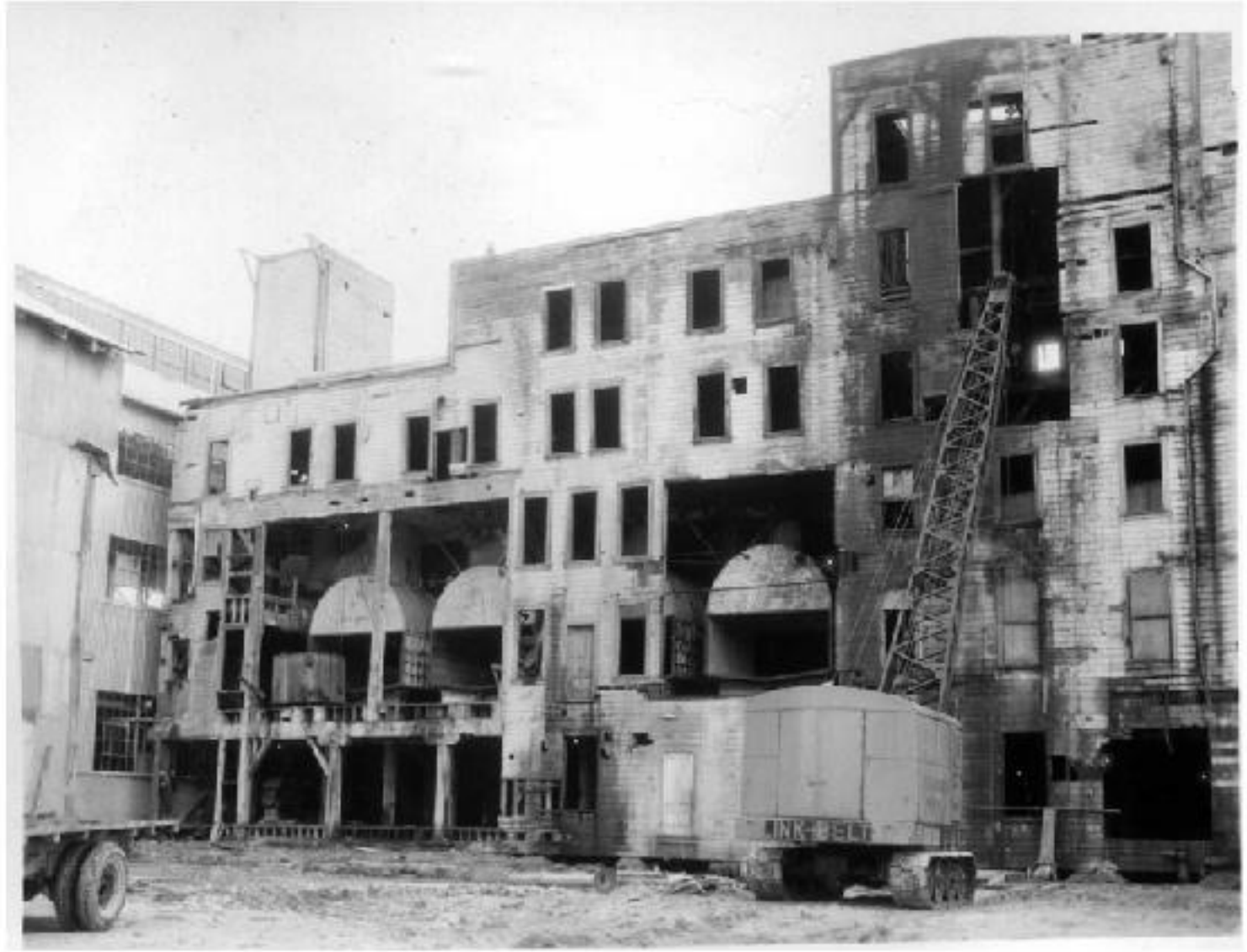
PHOTOS OF THE DEMOLITION OF THE OLD ALVARADO SUGAR MILL BUILT IN 1889

The home of Ebenezer Herrick Dyer in Alvarado on what would be today's Dyer Street. Built in 1864 it burned to the ground on May 31, 1935. The home had been bought by the Holly Sugar Co. and was to be demolished in the summer of 1936.

The old sugar mill built in 1889 stands just in front of the new steel sided building that had just been erected. The old wooden building would then be torn down. This photo taken circa 1936 and shows the poor state of the old building.

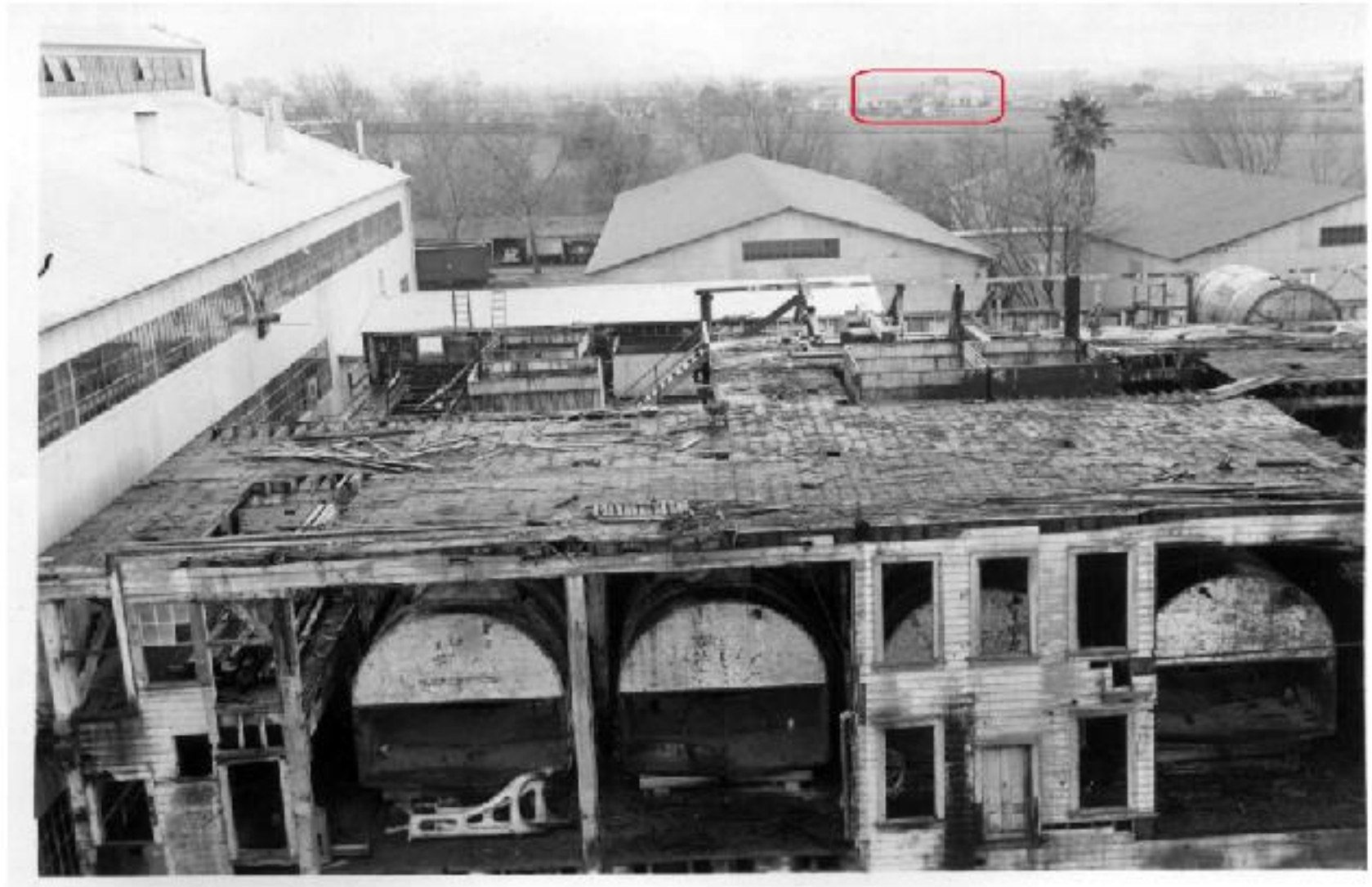


A view of the inside of the old building when opened up.



Starting the tear down the side of the old building with the new addition abutting the old structure.

The old structure partially torn down. This photo taken from the east and shooting west shows the branches of the trees of the Alameda Creek behind the building and the town of Alvarado in the distance. To give a proper perspective I have outlined the Alvarado Grammar School on Smith street in red in the upper left.



Another photo with the old building stripped of another floor. From a slightly different angle than before the Alvarado Grammar School is shown again outlined in red in the background.

The old building just about stripped down to the ground with the now familiar sugar mill building we came to know in the 40's & 50's fully comes into view.

The new building with the signature "Holly" smokestack completed. The old building is in the process of demolition in the background.

Continuing the renovation with another new building. Nearing completion of the job.

The light & airy inside of the new sugar mill at Alvarado circa 1936.

The Holly Sugar plant we came to know, nearly completed circa 1936.

An Employees Cooperative Association was formed at the Holly Sugar Company plant in in Alvarado in April 1937 with the approval of company officials. The association was formed for the purpose of collective bargaining. The union name was the Alvarado Sugar Refinery Workers Union Local 20603.

Sugar Act Wage provisions for the 1939 sugar beet crop was announced in February 1939 by the U.S. Government for Southern Alameda County sugar beet field workers as follows: Blocking and thinning, $7.50 per acre or 40¢ per hour; first hoeing, $2.00 per acre or 35¢ per hour; second and subsequent hoeing; second and subsequent hoeing $1.50 per acre or 35¢ per hour.

The Alvarado harvest of sugar beets in 1940 ended in mid-December. From mid-December forward until the end of the season on January 1st, the mill used beets from Sacramento. These beets arrived via the railroad at the rate of 42 carloads per day.

Most of the sugar manufactured at the sugar mill after the end of November 1941 was shipped in by SP railway from the Lawrence Station near San Jose at the rate of 35 carloads a day. Trucks also brought in some sugar beets from Centerville, Alvarado and Mount Eden.

Ass't Air Raid Chief Andrew Logan moved the Air Raid Observation post from the Hall Station location to the Sugar Mill in February 1942. The gatekeeper's office was used by the kindness of the Holly Sugar Corp., and was specially secured through the courtesy of Andrew Logan, who was an employee of the mill. The new location was warmer than the tent at the former location. Andrew Logan deserves credit for charting this new move. The observation station was used as a lookout for enemy planes during the early phase of WWII and was manned until an observation tower was erected on the Alvarado Grammar School grounds.

Thirty Washington Union High School boys spent four hours daily thinning beets on the Andrade ranch near Centerville during May 1942. Other farmers also become interested in this program.

With more men being taken into the Armed Forces field, labor was scarce and farmers were scrambling to secure a work force. In October 1942 the sugar mill was populated by female processors for the first time in its nearly 75 years of existence. Women were employed for the first time in the processing department and they represented 75 of the 300 plant employees.

Another 400 workers were harvesting and topping the beets, which included 75 Mexican youths imported from Mexico City, 100 high school boys from San Francisco, 75 local beet workers, and another 150 service club men from the bay section who signed up to spend weekends in the beet fields. The season would continue until the beginning of January 1942.

The 1942 campaign of processing beets would be the final run until the war was over in 1945. After the war the shortage of men was still in place and the Holly sugar mill had to go out and advertise for help for the opening of the new season on September 17, 1945:

APPLY NOW

SEASON STARTS SEPT. 17th

HOLLY SUGAR CORPORATION

NEEDS MEN and WOMEN

Process Station Operators

Mechanics and Oilers

Laboratory Workers

Warehouse Workers

Laborers

Six and Seven Day Week for 80 Day Run

Good Rates — Excellent Working Conditions

Room and Board for Men

APPLY AT

PLANT OFFICE in ALVARADO, CALIF.

THE ALVARADO SUGAR MILL IS IDLED FROM 1943 TO 1945

~

THE POST WAR YEARS UNTIL CLOSURE IN 1968

After World War II the problem of labor shortages continued to plague industry and farmers in Washington Township for the first few years. But the plant also faced two new problems that still face us today. One issue was a continued drought and the other issue was environmental.

A water problem plagued farmers and industrialists in the East Bay. The drought and the continued use of pumping ground water to keep the mill running was doing harm to cities and farmers wells. This became an issue in 1947, and in 1948 the new plant Supt., John Ratekin, said that Holly Sugar would strive to cut its water usage in half.

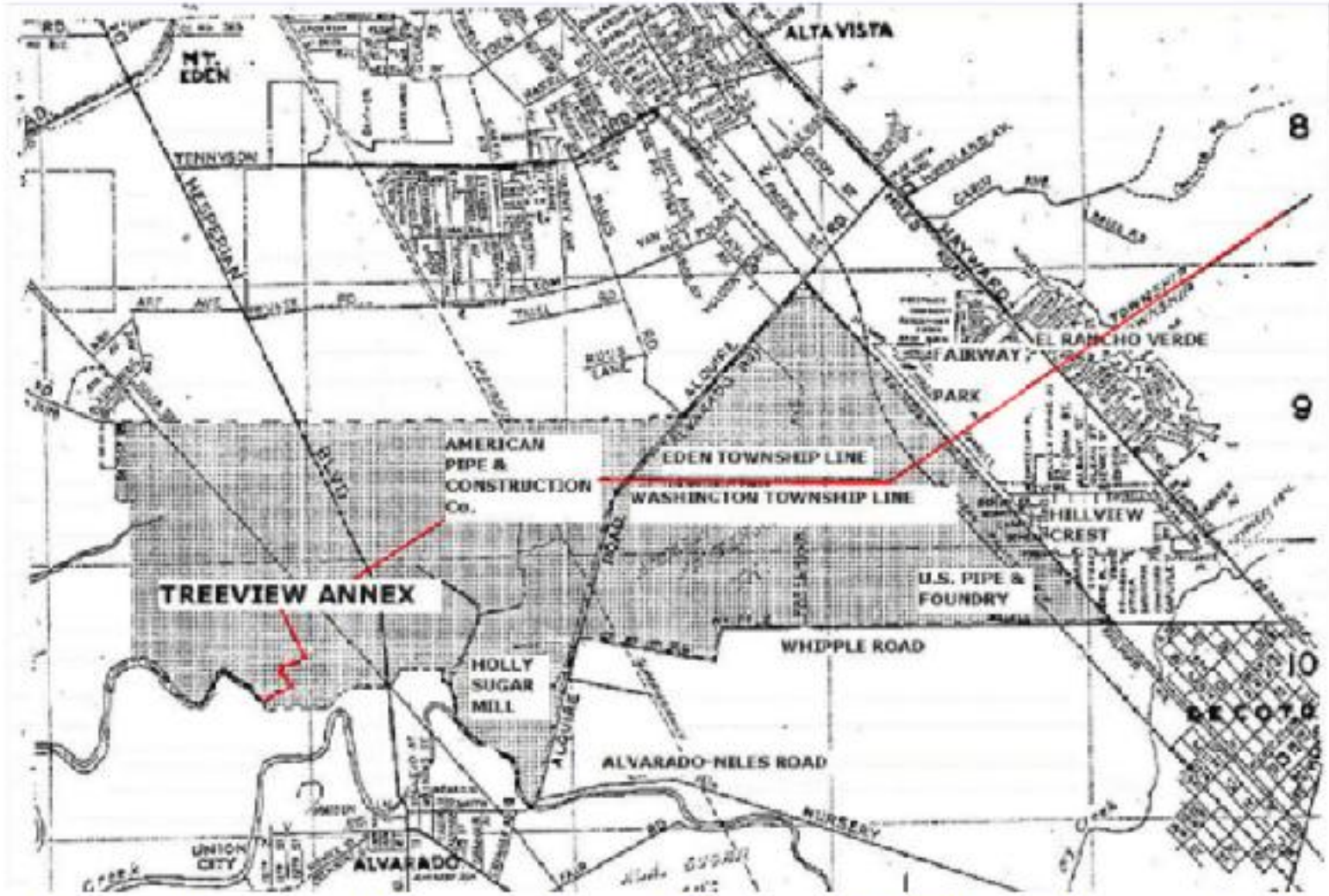
Also in 1947 it was noted that Holly Sugar's waste water was polluting the marshes west of old Union City with water that was used in the production of sugar from beets. Not only was the waste water not thoroughly treated, it was also being dumped in early spring when the mosquito breeding season was beginning, and this added to the problems of the Alameda County Mosquito Abatement District. People of East Bay began to take note of two seldom used words in our area, smog and pollution.

In 1947 Holly Sugar Corporation's plant in Alvarado produced more than 95,000,000 pounds of sugar. The plant processed 278,000 tons of sugar beets and the plant was in full operation during the summer for the first time in its history. But this record production came at the cost of dumping waste water into the Alvarado marshes in the spring, which caused a dramatic rise of the mosquitos in our area.

The sugar mill ended its 81st sugar making campaign in April 1951 with the largest production in its history. This factory, first established in 1870, would produce about 1,100,000 100-pound bags of granulated sugar during the 1951 season, which started July 15, 1950.

Holly Sugar would process nearly 100,000 tons of sugar beets in the spring of 1954 that would require 300 additional employees. The work would run for nearly two months and would produce between 26 and 30 million pounds of sugar. The sugar company, which usually employs an off season staff of 75, would have to expand staff to nearly 300 to handle the added work. The extra work this early in the season came from the Imperial Valley, where 53,000 acres of beets would be harvested.

Later, in February 1955 a new problem arose for the sugar mill; and also for Alvarado, Decoto, and Washington Township. The city of Hayward proposed what they called the "Treeview Annex" that would take in the Hillview Crest housing tract and a swath of land from Mission Blvd. in the east to near the town limits of Baumberg in the west. The land grab totaled 2,400 acres. In the proposed annexation area would be the U.S. Pipe & Foundry on Whipple Road, the American Pipe Co. at the bend of Alquire Road, and Alvarado's beloved Holly Sugar Mill. Neither the sugar mill nor U.S. Pipe wanted to be part of Hayward.



The City of Hayward's proposed Treeview Annex of February 1955. The red line running through the middle of the slide is the boundary line between Eden Township and Washington Township. The gray area is the proposed Treeview Annex. Also included in the annex but not shaded was the entire area of the Hillview Crest housing tract. Within the shaded area is the U.S. Pipe and Foundry on Whipple Road, the American Pipe & Const. Co. at the bend in Alquire Road, and the Holly Sugar Mill on Alquire Road. The loss of these industries would be devastating to Alvarado and Decoto.

The takeover of Hillview Crest, and the "Treeview Annex" (with all of its open land to the west including three of the township's prime industrial plants) caused great consternation to the people in Decoto & Alvarado. Two of the three industrial plants, U.S. Pipe & Foundry, and Holly Sugar did not want to be part of Hayward because of one very important factor; pollution. Although a relatively new phenomenon in the early 50's about the East Bay, pollution had already earned the reputation as a game changer for the future for industrial companies. The two companies thought they could fare better under a new city, rural Union City, rather than they could under a bedroom community such as Hayward.

The area under annex carried an estimated $5,000,000 in assessed valuation from Washington Township and would chip away almost an eighth of the assessed valuation of the proposed new Union City.

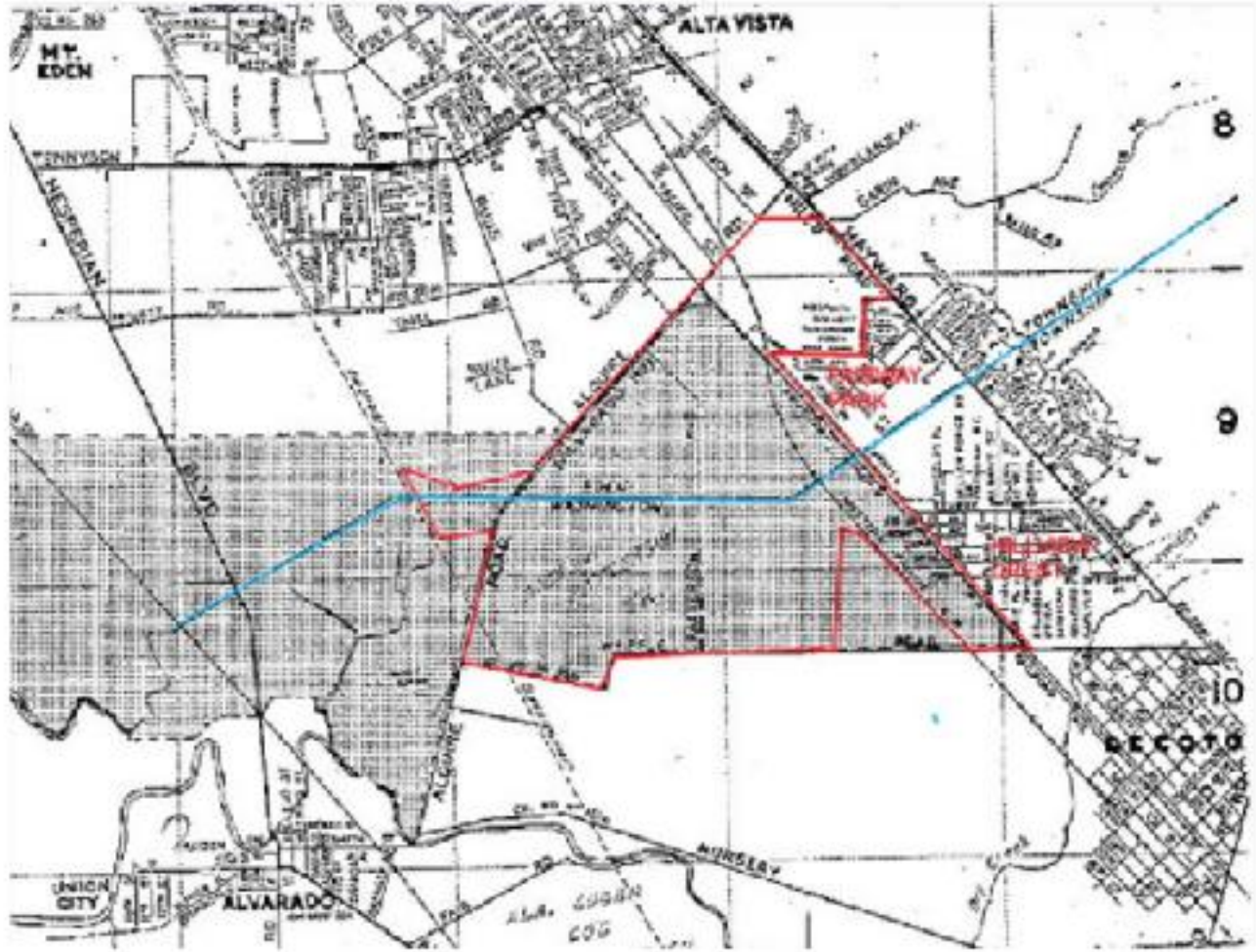
Also in the proposed annexation area were the industrial plants of M&S Tile Company of Decoto, and the Leslie Salt Co. land in the Alvarado marshes. In addition to all this industry, the annex would also take all the farmlands along Whipple Road in Decoto, valuable as future industrial sites.

Holly Sugar joined forces with U.S. Pipe & Foundry in August 1955 to fight the City of Hayward in their attempt to annex land in Washington Township. Holly Sugar worked closely with the Union City Steering and Incorporation Committees, although it had not joined the lawsuit to prevent the Hayward takeover.

In February 1957 a committee was formed by the Union City Steering Committee to pick the best alternative; incorporating into Union City, annexing to the City of Hayward, or to align with Fremont. Named to the committee were Oscar Dowe, V.P. of Pacific States Steel Corp.; Edward Dana, Holly Sugar Corp. executive of San Mateo; George Hocking, Alvarado hardware store owner; Keith Whipple, rancher; and Dr. Harold Schoenfeld, Supt. of the Decoto School District.

On April 23, 1957, the City of Hayward filed a new Treeview Annex cutting down the area from 2,400 acres to 1,132 acres. The annex eliminated U.S. Pipe & Foundry and the Holly Sugar mill from the annexed area.

Thus these two industries were freed from the possibility of becoming part of the City of Hayward. But this would not eliminate the activity of the sugar mill executives in taking an active part in the formation of the City of Union City. Pacific States Steel in Decoto joined with the Holly Sugar Company to help Alvarado and Decoto incorporate into the City of Union City. Hillview Crest had already become part of the City of Hayward by this time so they were not included in the revised Treeview Annex filing.



The new Treeview Annex of April 1957 by Hayward is shown above. The shaded area is the old Treeview Annex of 2,400 acres. The new Treeview Annex is shown by the red line and includes the area above Fairway Park. Hillview Crest is not shown within the red line because by this time they had already been annexed by the City of Hayward. The blue line is Eden-Washington Township boundary line. Note the little red finger at the bend of Alquire Road. This is the area where Hayward took the American Pipe & Const. Co. You can also note the curious wedge on Whipple Road just west of the Western RR tracks. That area surrounds U.S. Pipe & Foundry, thus eliminating them from being annexed into the City of Hayward.

In December 1957 the incorporation of Alvarado and Decoto was put in jeopardy when a petition was filed with Alameda County to annex the town of Decoto into the City of Fremont.

One week later the Union City Chamber of Commerce elected new officers with Decoto Fireman Kenneth Garcia elected as President. Elected to serve with him were John Ratekin of the Holly Sugar mill, Vice President, and Mrs. Florence Spencer of Decoto was reappointed as Secretary.

Several days later Hayward filed for its largest annexation in history. The city, acting on a petition by the Leslie Salt Company and other owners, filed boundaries of Leslie Annex No. 3, consisting of 11-square miles with the Alameda County Boundaries Commission.

The annex would take all marshland west of Alvarado into the city of Hayward. It would connect with the City of Fremont at the Lowry Road flood channel. Alvarado had lost their historical salt operations and would now be landlocked.

Edwin Dana, Holly Sugar Co., and Bud Thomas of Pacific States Steel, pledged continued support for the fight to incorporate Union City. The two executives of the largest industries in Washington township told a crowd of Union City Supporters: "Local industries have paid 95 per cent of the cost so far of the three year legal battle and these industries will continue to carry the load." Added Bud Thomas, "I'm here to say we are 100 per cent behind Union City. If we're going to be taxed we want to be represented."

In June 1958 ,the forces for the incorporation of Decoto & Alvarado into the City of Union City, defeated the force to bring the town of Decoto into the City of Fremont via annexation proceedings. Alvarado and Decoto were now free to vote on the incorporation of the two towns. John Ratekin of the Holly Sugar Co. said: "This time we mean business. We're going ahead with incorporation, providing the people want it."

In November 1958 John Ratekin, Superintendent of the Holly Sugar mill in Alvarado, took out papers to file for a seat on the Union City City Council. Five candidates would be seated out of the fifteen that ran. John Ratekin finished second among the 15 candidates, thus earning him a seat on the city council. John Ratekin finished just behind Tom Kitayama for the most votes. Also joining him on the city council from local industries were Oscar Dowe from Pacific States Steel, and Joseph Lewis Sr., a retired Standard Oil salesman.

Soon after the end of WWII the inflation rate in the U.S. shot up dramatically, then subsided, then inched up again in the early 50's, and then finally settled in what we consider normal levels. Here are the inflation rates by year: (1946 2.2%); (1947 18.1%); (1948 10.2%); (1949 1.3%), (1950 -2.1%); (1951 .1%); (1952 4.3%).

During the 1950's labor strikes became more frequent, even though the inflation rate in the mid-50's had moderated considerably. But many had come through the war where prices and wages were tightly controlled by the government. After the war the economy slowly built up steam and by the early 1950's the business environment improved dramatically. It was probably because of these factors and because labor wanted a larger share of the growing American business profits that strikes became widespread in the U.S. during this period.

The AFL Central Council met on May 25, 1956, to discuss a strike sanction request from the Sugar Worker's Council. Sugar workers were negotiating with three major sugar producers including Alvarado's Holly Sugar. Sugar beet workers initiated a labor strike on April 26, 1957, and began picketing the Holly Sugar Company's Alvarado refinery.

Sixty-two members of the AFL-CIO Sugar Refinery Worker's, Local 20630 began striking at 5:00 a.m. The union sought a shorter workweek and a ten to twelve per cent hourly wage hike. The present scale ran between $1.59 to $2.28 an hour. The company offered pay increases of 4.5¢ to 9¢ an hour for off-season workers and a 44-hour straight timework week this fall reduced to 40 hours in 1958. Overtime would only be paid after 44 hours a week.

One week later the men picketing the mill included sympathy strikers from the Decoto Pacific States Steel plant. The men from the steel plant joined the ranks of the strikers when the sugar union asserted an unfair labor practice by the company in using office personnel to clean and load syrup cars.

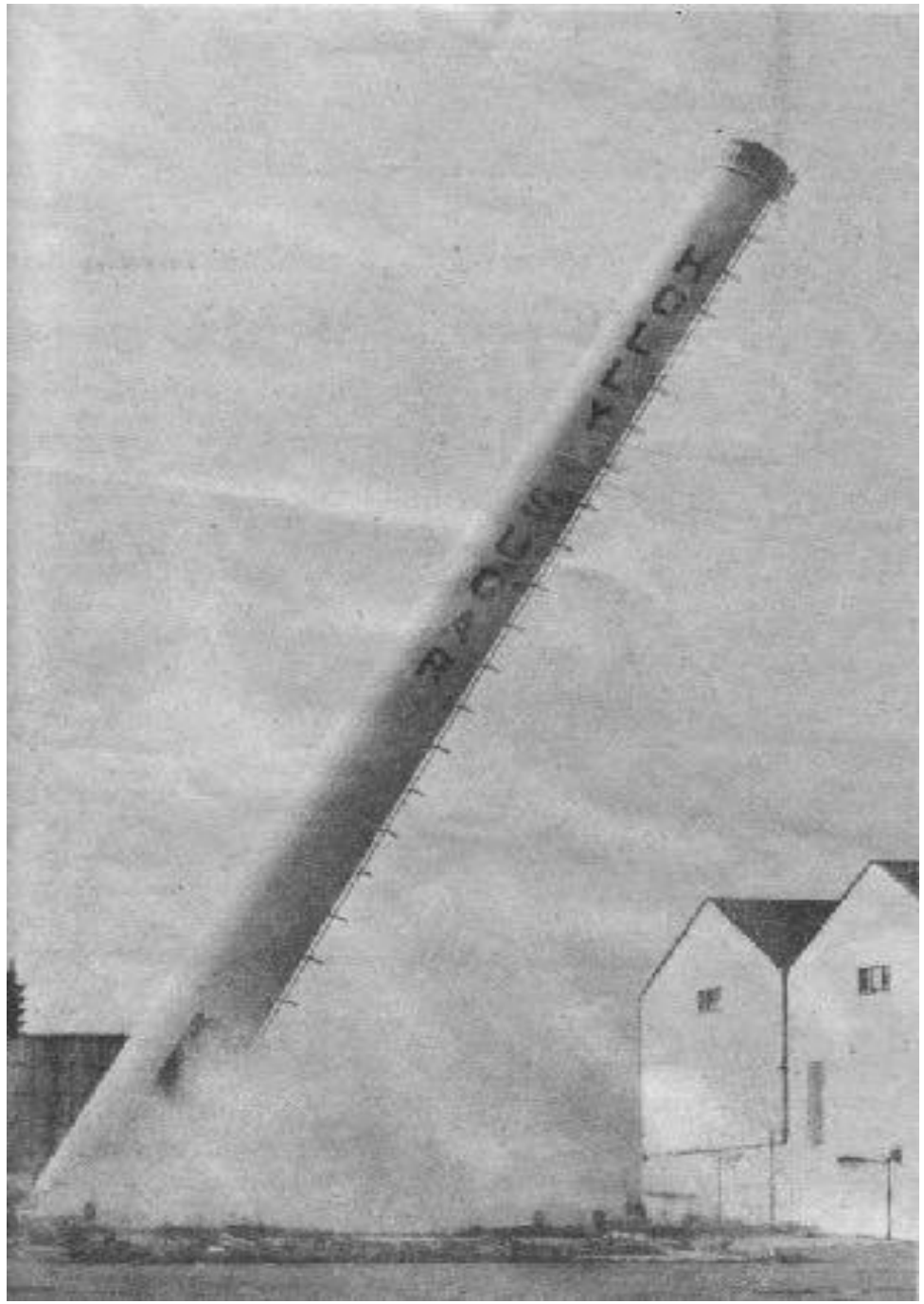
Two-weeks later on May 17, 1957, Holly Sugar lodged an unfair labor practices complaint with the National Labor Relations Board against the teamsters and sugar workers unions. Holly Sugar charged that the unions had violated the secondary boycott provisions of the Taft-Hartley Act. One complaint named Oakland's Local 70 of the Teamsters Union. The union was accused of inducing members of Local 70 not to handle the Holly's sugar at the Haslett Warehouse Terminal in Oakland.

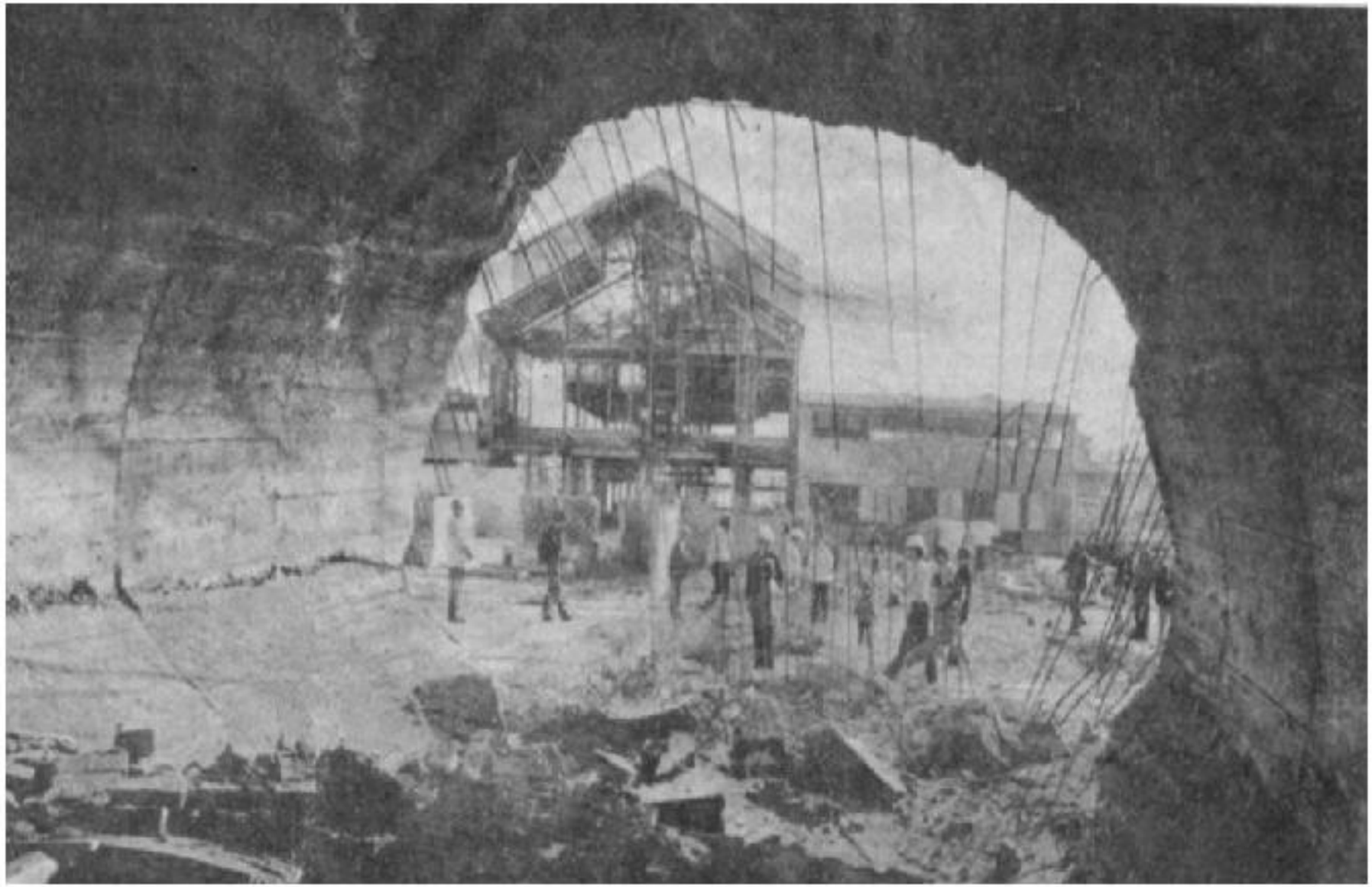
The following day the Holly Sugar Company placed an in The Hayward Daily Review for strike breakers to work at the sugar mill. The ad read: "HELP WANTED: The Holly Sugar Corporation wants men immediately to work at it's Alvarado Factory during a strike. Weekly pay ranges $63.60 and up for a 40 hour week."

The union strike, which now affected 10 California sugar mills, put out a call for a boycott on California produced beet sugar on May 23rd. That same day a new contract was offered by the sugar companies providing wage increases ranging from two to seven cents an hour in each of the two years and overtime pay for work over 44 hours weekly this year and 40 hours next year.

Sugar beet workers went back to work on May 27th after they accepted a two-year agreement, which called for hourly wage raises from 2¢ to 10¢ during each of the next two years. Overtime would be paid after 44 hours weekly during seasonal operations this year and after 40 hours next year. The 48-hour workweek will remain in effect during seasonal operations.

THE HOLLY SUGAR MILL'S 204-FOOT SMOKE STACK COMES DOWN IN JANUARY 1977





The inside of the Holly Sugar smoke stack showing the old main building in the process of being dismantled. This was the end of the line for Alvarado's sugar mill. Holly's Tracy plant continued to operate until December 2000 after passing through the hands of the Imperial Sugar Company and others before buyers could not be located to keep the mill running. Much of the land that was the mill's is now the city's Legacy Fields sports complex.

BEET CULTURE

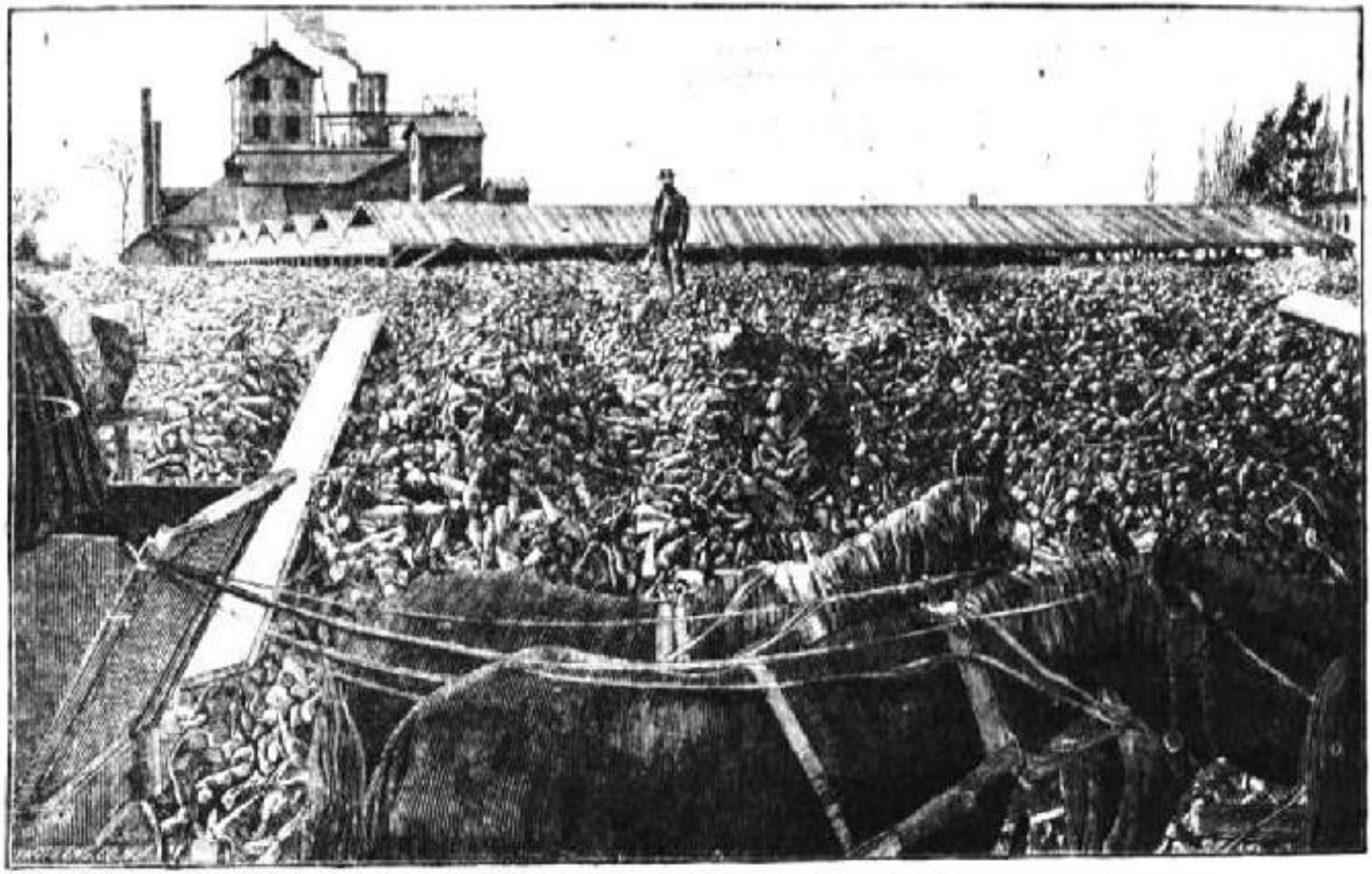
THE CULTIVATING HARVESTING & PROCESSING OF THE SUGAR BEET

SCENES FROM AROUND THE ALVARADO SUGAR MILL PRIOR TO 1900

This photo was taken near the sugar mill probably facing towards Mission Peak (to the southeast). In the background would have been the Alvarado-Niles Road. The home and farm in the background would have more than likely been the Cheng farm of the 50's & 60's where today's I-880 cloverleaf sits on the Alvarado-Niles Road.

Receiving Beets at Alvarado

Showing the outisde of the shed and pile containing several thousand tons of beets. Observe the long line of teams ready to discharge their load of beets.



Twenty Thousand Tons of Sugar Beets at the Factory in Alvarado California.

A BIG PILE OF BEETS AT ALVARADO CALIFORNIA

Showing the sluiceway of running water by which the beets are carried to the factory.

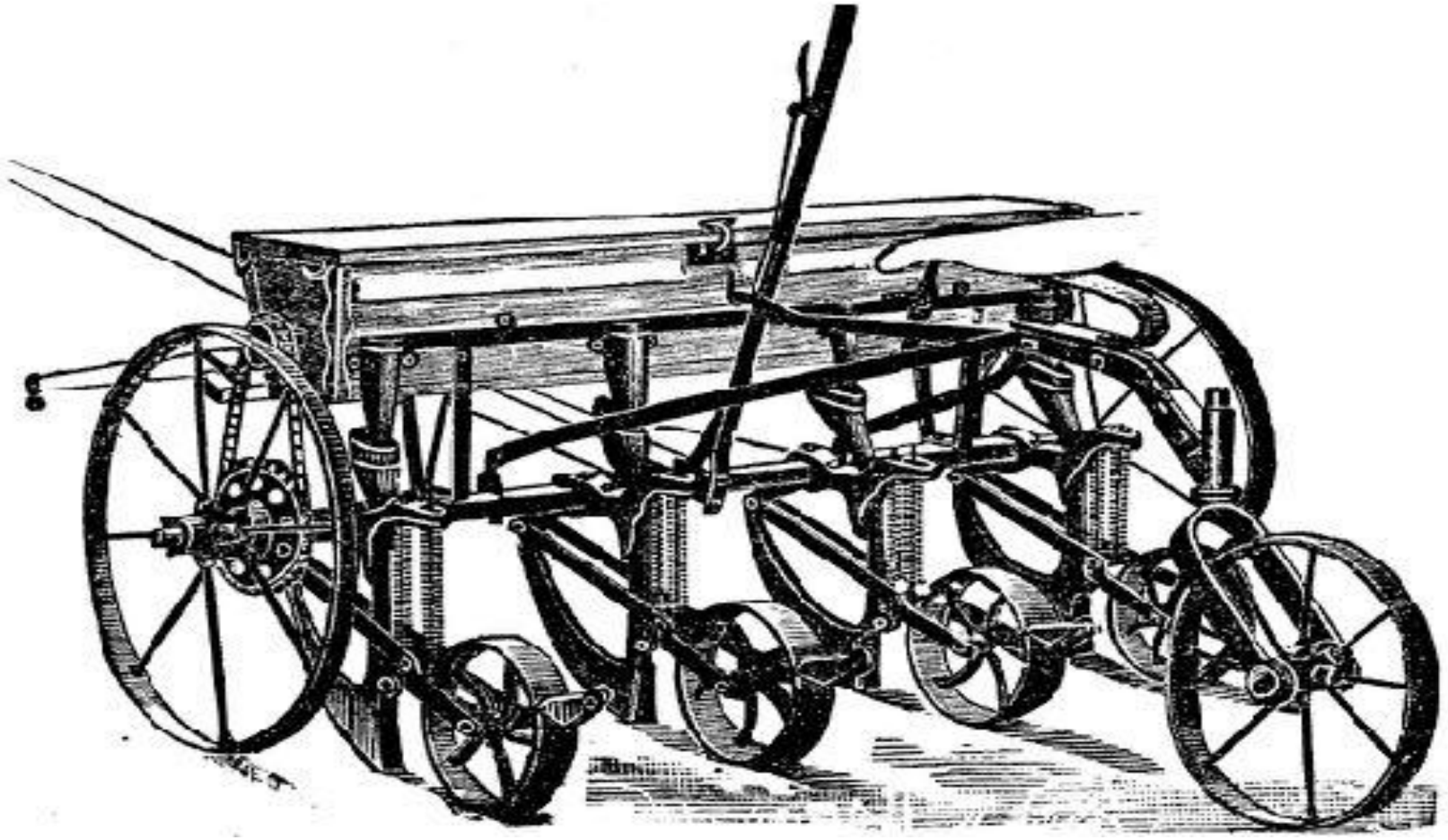
RAISING BEETS

PLANTING

THINNING

WEEDING

PLANTING BEETS



A horse drawn four row sugar beet seed planter. The beet seeds are placed in the hopper above and between the outer wheels. As the two main wheel turns the seeds in the hopper are agitated and fall into one of the four tubes leading down to one of the four drills. The seeds fall behind the drill and are then covered up by the roller. Each drill creates a small furrow where the seed drops into the furrow created by the drill. The rate at which seeds fall into the furrow can be set at various rates depending on the rate which gives the best germination. The wheel behind the drill covers the furrow and the dropped seeds. The handle raises and lowers the bar to begin the drilling process. When the bar is raised the drills ride above the ground and no seeds are dropped. When the handle is dropped the drills drop onto the ground and begin the furrowing process and also the dropping of the seeds into one of the four furrows.

THINNING BEETS

SHORT HOE

LONG HOE

In thinning beets there are two types of hoes that were used. The short hoe, which was best for close work but was backbreaking for prolonged use, and the long hoe, which did not require spending long hours bent over. In 1975 the California Supreme Court ruled that the short hoe "was an unsafe hand tool' and would be banned from use under California State Law.

VIDEO SLIDE

TO VIEW THE VIDEO PLACE YOUR CURSOR OVER THE TITLE PAGE AND THE “PLAY VIDEO” BAR WILL APPEAR.

Japanese workers hoeing beets. Note the use of the short hoe.

Weeding thinned beets.

HOEING & THINNING BEETS

WEEDING BEETS

Japanese workers weeding a beet field using the long hoe.

HARVESTING BEETS

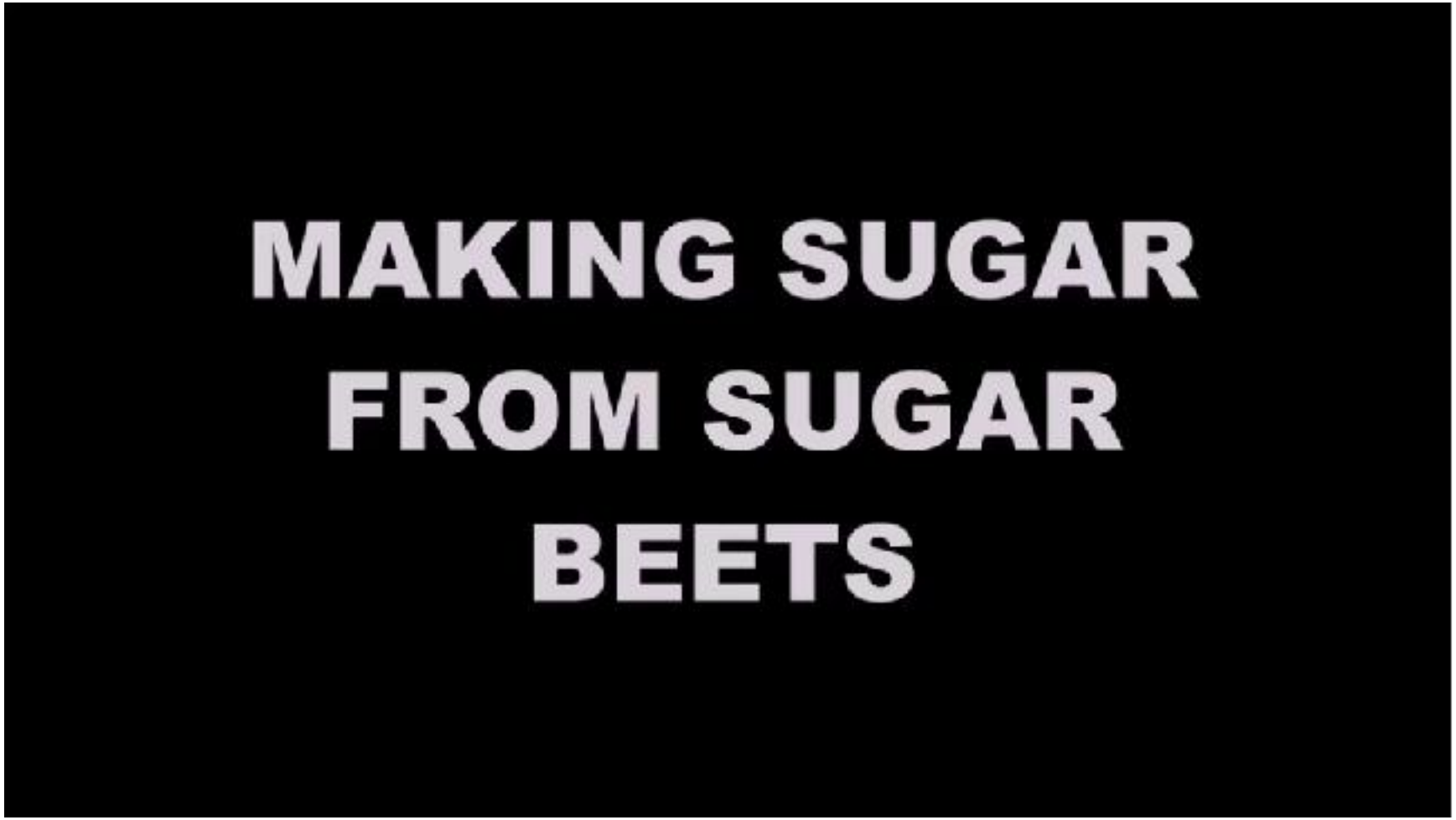
DIGGING

TOPPING

LOADING

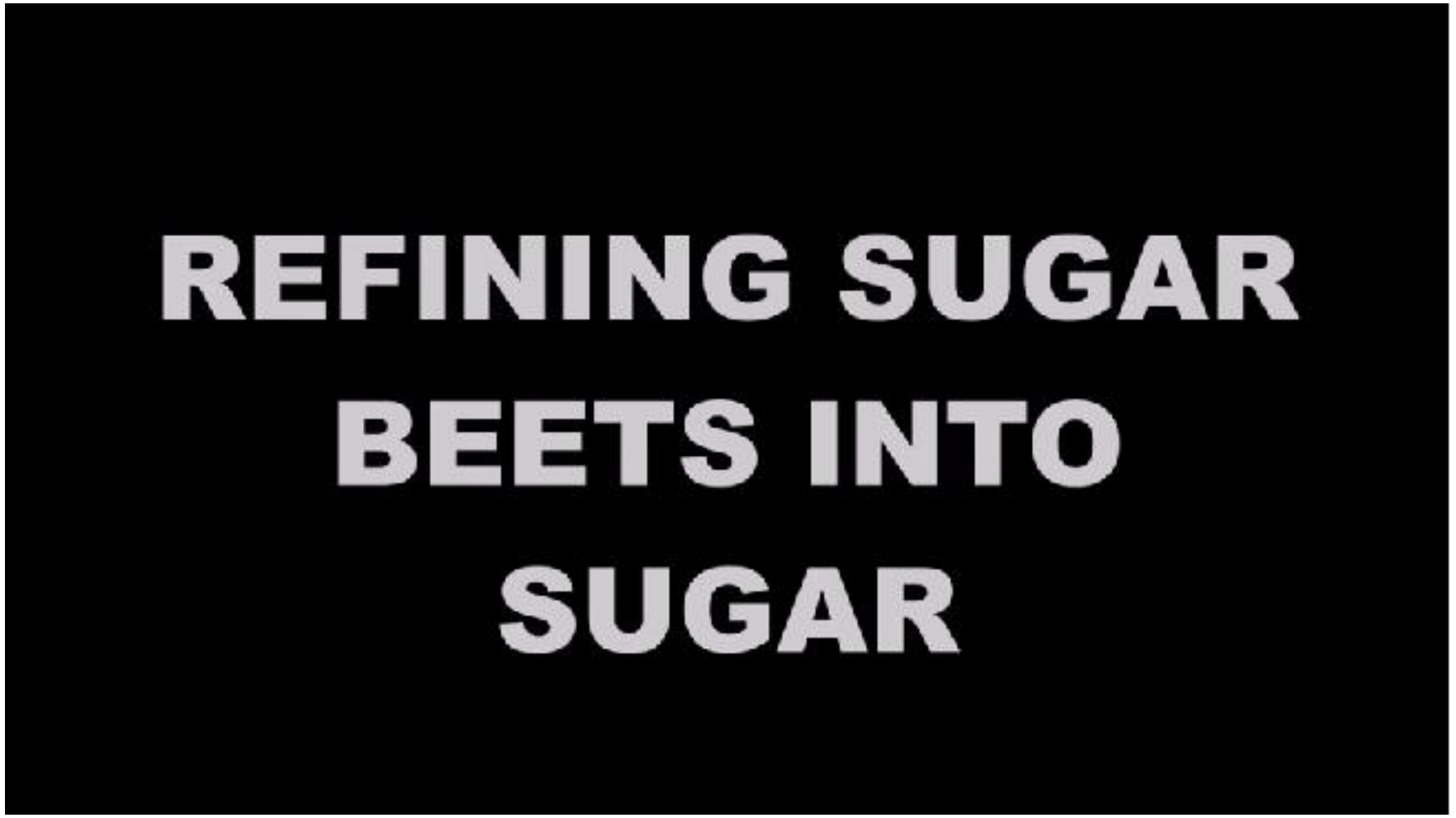
REFINING

VIDEO SLIDE



TO VIEW THE VIDEO PLACE YOUR CURSOR OVER THE TITLE PAGE AND THE "PLAY VIDEO" BAR WILL APPEAR.

VIDEO SLIDE



TO VIEW THE VIDEO PLACE CURSOR OVER THE TITLE PAGE AND THE "PLAU VIDEO" BAR WILL APPEAR.

MODERN METHODS OF HARVESTING

MODERN SUGAR BEET PLANTER

ONE OF THE FIRST BEET LIFTERS, TOPPER, AND LOADERS ALL IN ONE, CIRCA 1945

MODERN ALL IN ONE LIFTER, TOPPER, LOADER BEHEMOTH

VIDEO SLIDE

TO VIEW THE VIDEO PLACE YOUR CURSOR OVER THE TITLE PAGE AND THE “PLAY VIDEO” BAR WILL APPEAR.

THE COMING OF THE AUTOMATED BEET DIGGER, TOPPER & LOADER

With the labor shortages experienced during World War II in the agriculture fields, necessity became the mother of invention. In December 1943, the farmers in Washington Township witnessed the demonstration of the new automated sugar beet harvester, which would revolutionize the industry from a labor standpoint. Twenty of these machines, and as many men, could replace 500 laborers according to Andrew Logan, field agriculturalist for the Holly Sugar Corporation at Alvarado.

Potato farmers will recognize a major part of the digger was taken from a potato digger. The first automated potato digger was pulled by horses circa 1885. Later potato diggers would be pulled by tractors. The digger and the conveyor on the early sugar beet diggers was taken from the original design of the 1880's.

This video shows an early tractor-pulled beet topper, puller and loader circa 1950 in Britain. The men shown in the video are evaluating the performance of the new combine. The conveyor used to load the sugar beets is what had been used for almost a century in potato harvesting.

VIDEO SLIDE

TO VIEW THE VIDEO PLACE YOUR CURSOR OVER THE PICTURE AND THE VIDEO PLAY BAR WILL APPEAR

VIDEO SLIDE

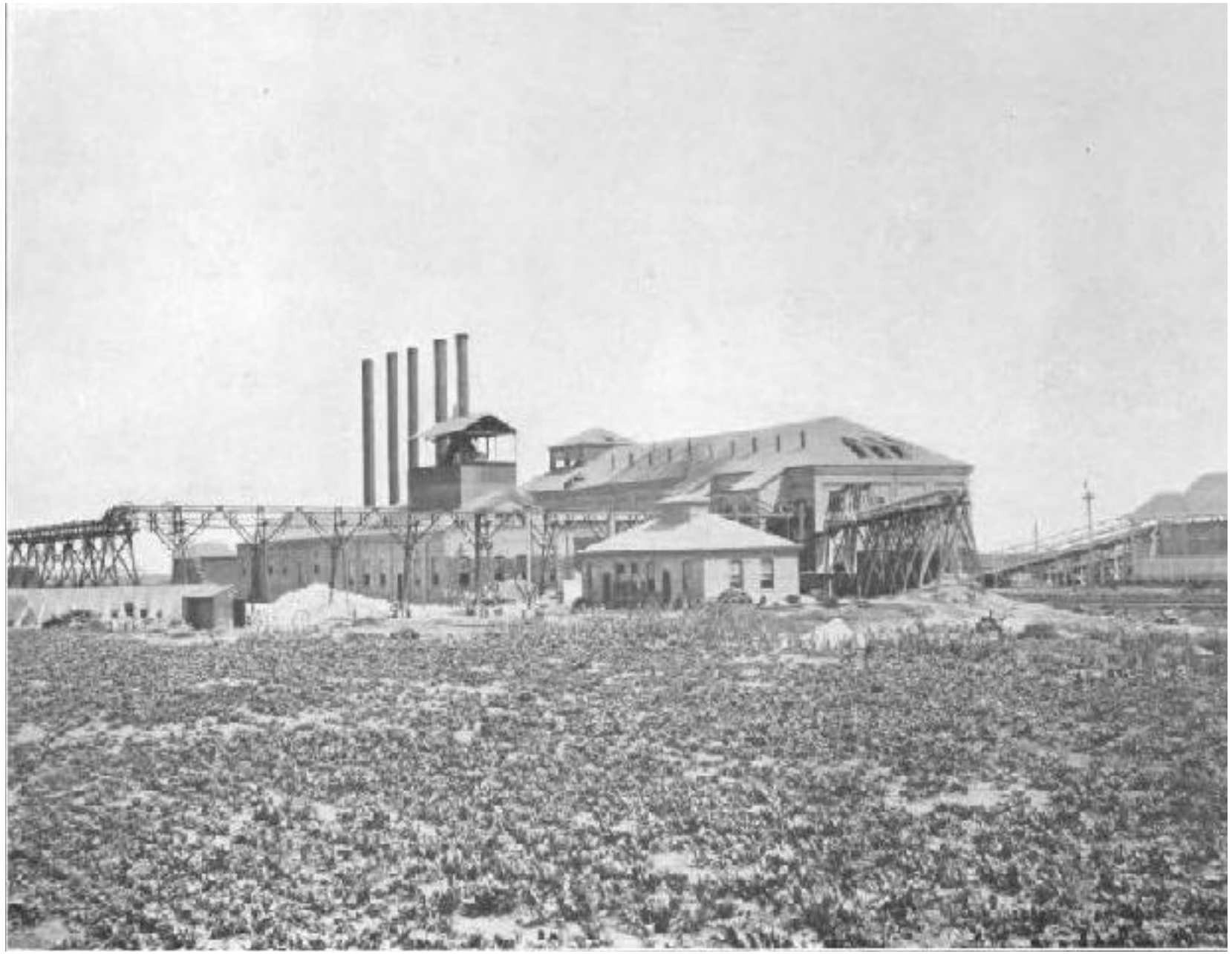
Here is a modern 12-row beet digger, topper and loader from Europe. Not much to say, just sit back and watch.

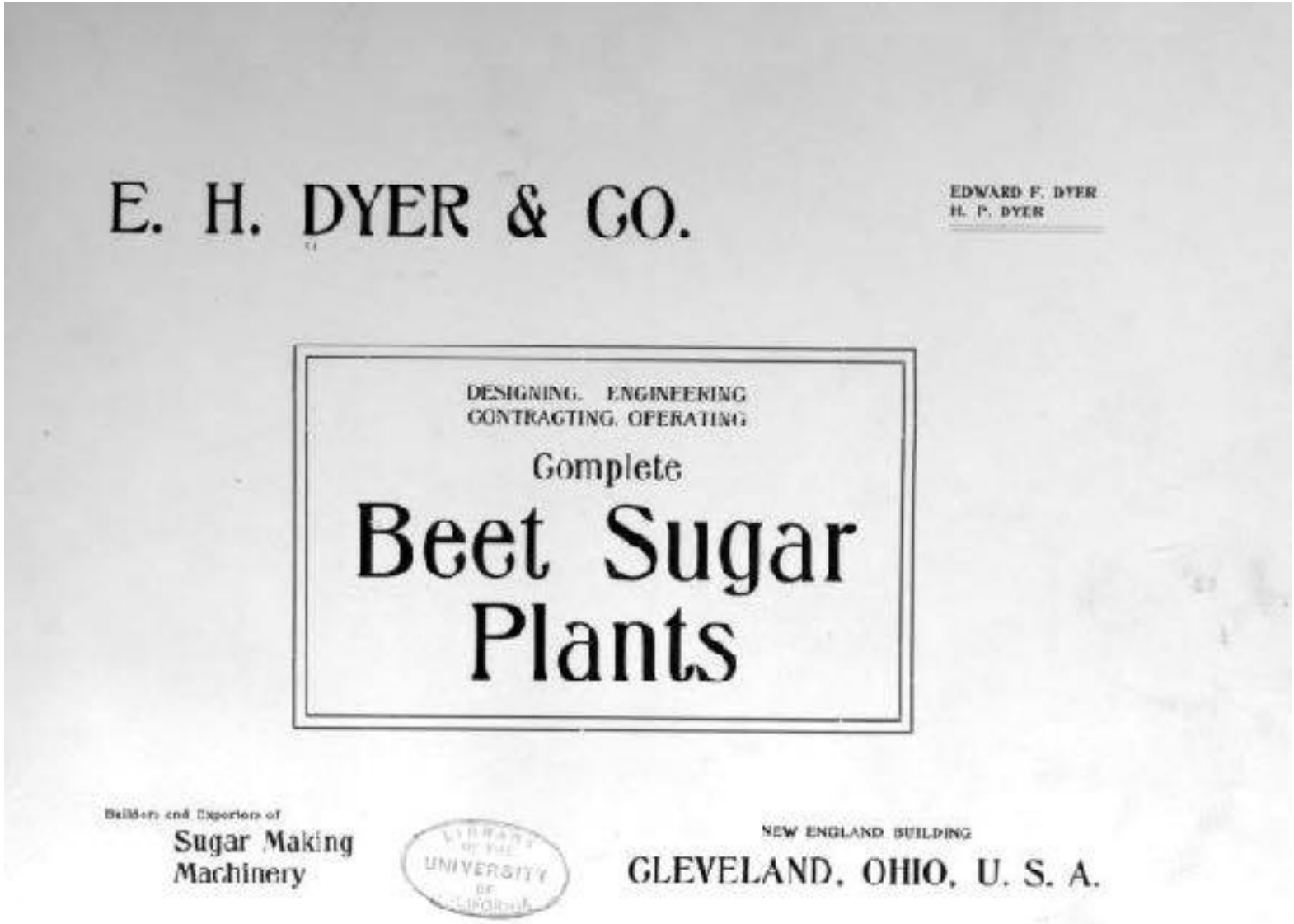
TO VIEW THE VIDEO PLACE YOUR CURSOR OVER THE PICTURE AND THE VIDEO PLAY BAR WILL APPEAR

AMALGAMATED SUGAR CO., PAUL IDAHO – A MODERN PLANT

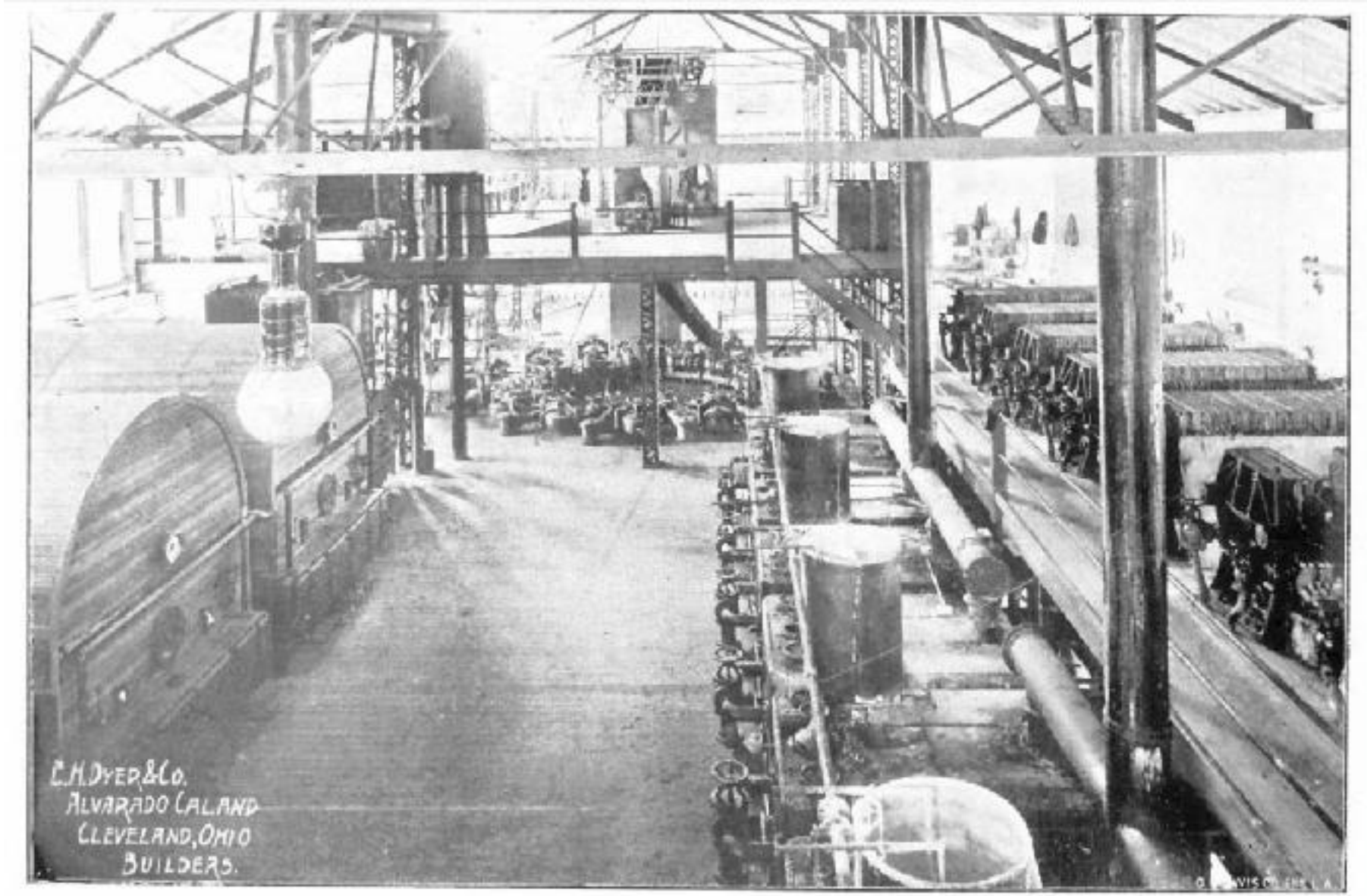
TO VIEW THE VIDEO PLACE YOUR CURSOR OVER THE PICTURE AND THE VIDEO PLAY BAR WILL APPEAR

THE LOS ALAMITOS SUGAR MILL BUILT BY E.H. DYER AND CO. OF ALVARADO, CALIFORNIA IN 1897





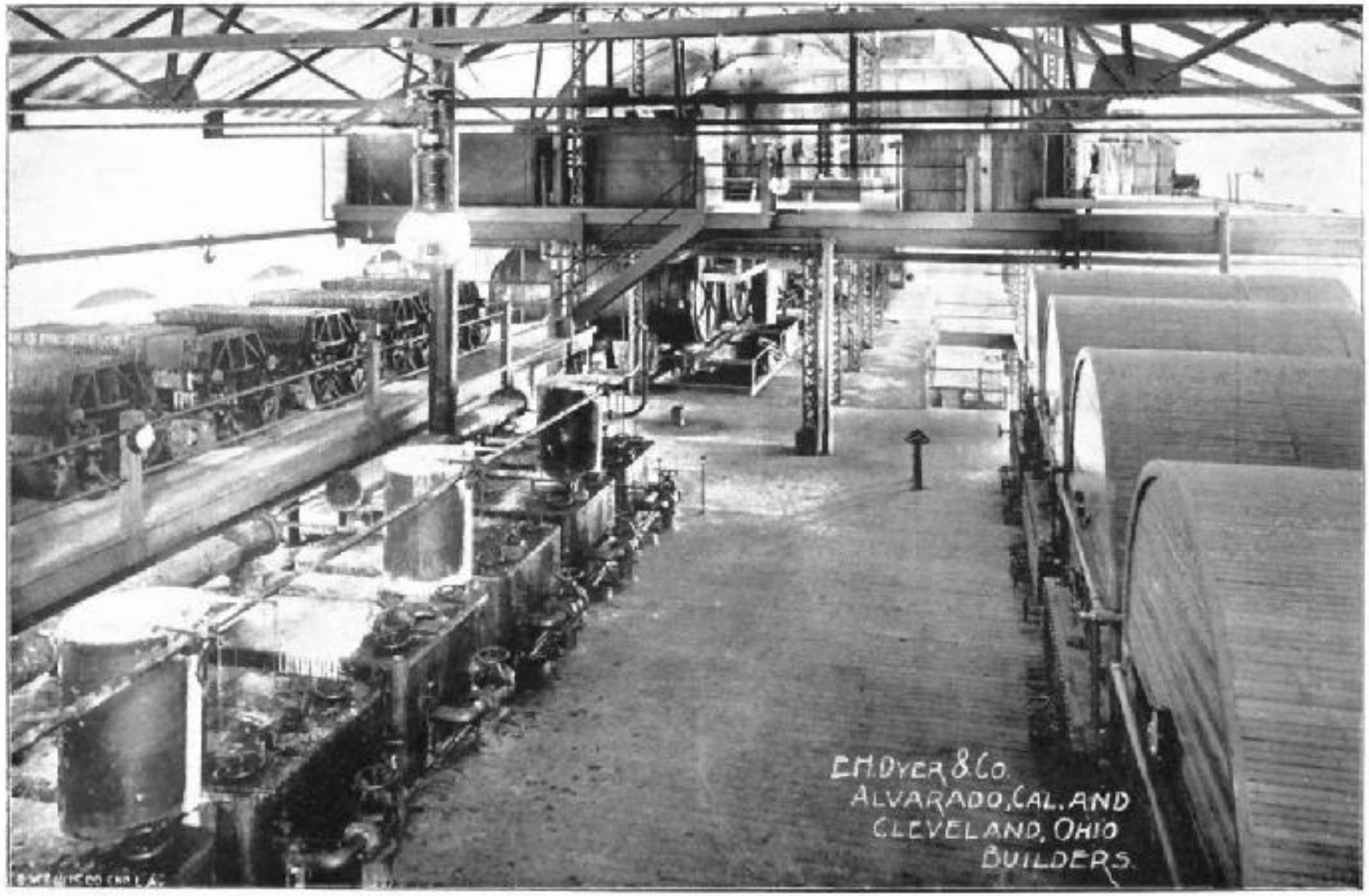
THE FOLLOWING PHOTOS AND DISCRIPTIONS WERE TAKEN FROM THIS BOOK.



THE CENTER OF THE LOS ALAMITOS SUGAR FACTORY SECOND FLOOR.

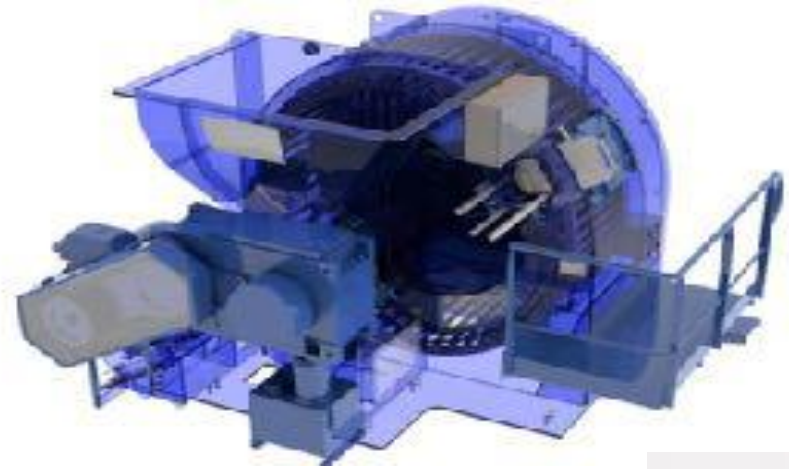
Showing evaporators on the left, carbonation tanks on the right, with filter press on the third floor right, the diffusion batteries in the center. The steel frame and general design is worthy of the closest scrutiny. E. R. Dyer & Co., were the architects as well as the builders of the sugar machinery.

Central part of the second floor. Note the chute coming down from the second floor in the top center of the photo. The chute is attached to the beet slicer (grinder) and the chute carries the sliced to beets (cossettes) to one of fourteen diffusers on the first floor. Note E.H. Dyer's name on lower left of photo.

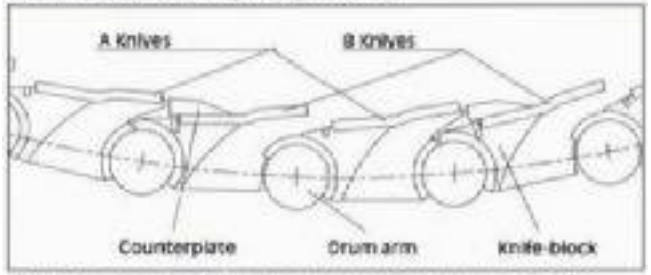


CENTRAL VIEW LOS ALAMITOS SUGAR FACTORY.

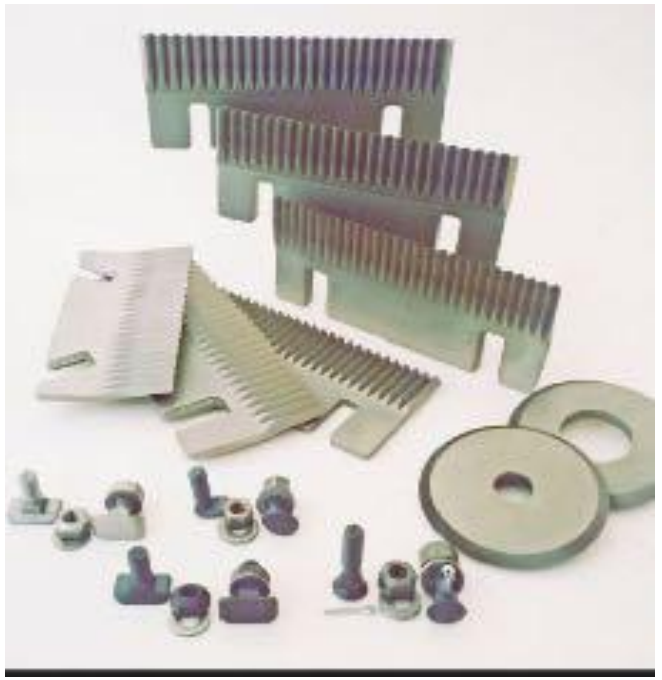
Filter presses and carbonation tanks on the left, quadruple effect evaporators on the right. In the construction, light and liberal floor space is a special feature.



Double knife-block - total weight 18 kg with knives

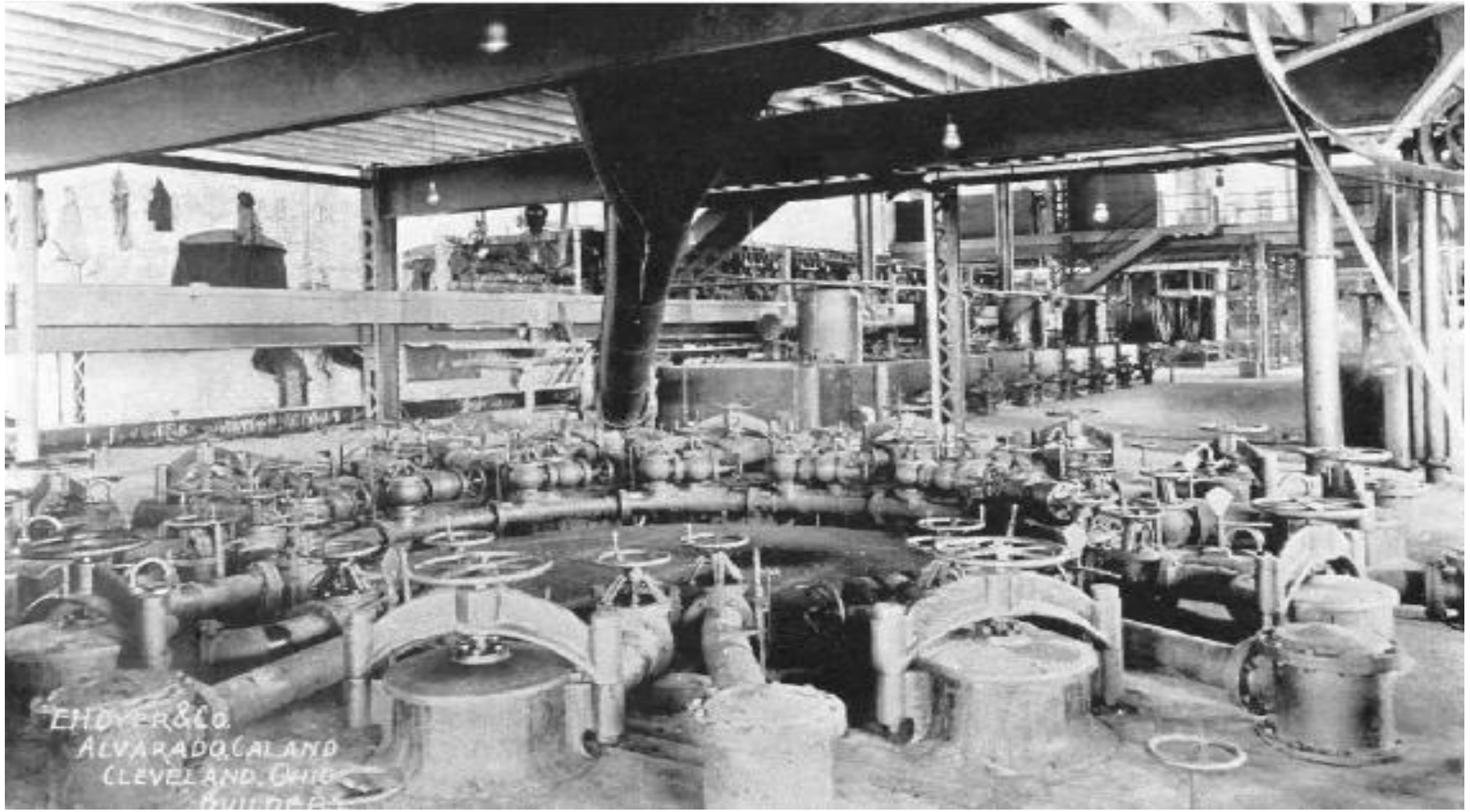


Knife-block arrangement for maximum output: MACSUIN patent n° 0651-693



SLICING (GRINDING) BEETS:

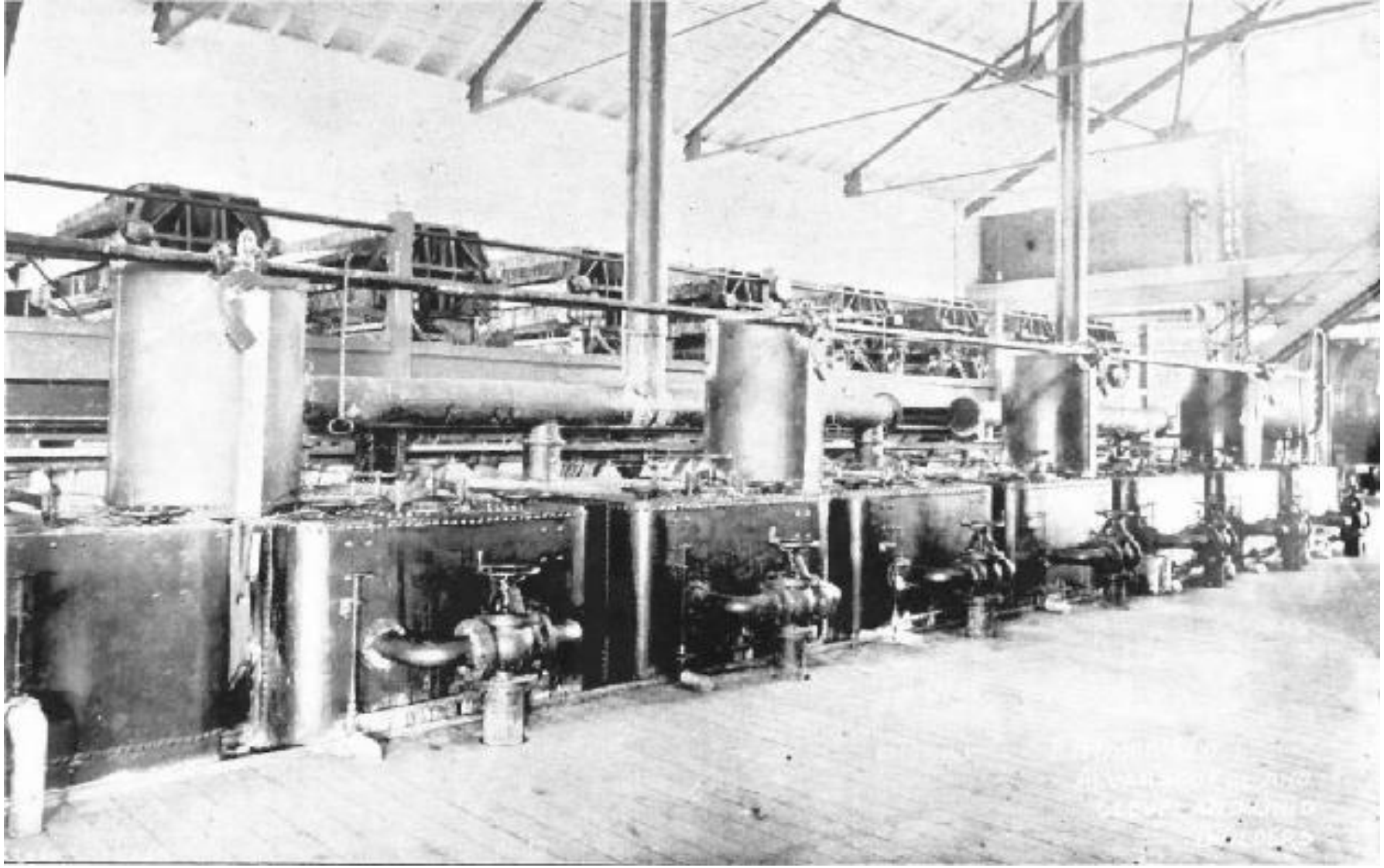
Most beet sugar companies employ the drum type beet slicer. The newer type of beet slicers used today can grind 8,000 tons per day. This grinder has 22 knife boxes, each holding six knives. Boxes can be easily inserted and removed from the drum with a minimum of down time. The knives must be clean and sharp to cut the best cossettes. Newly sharpened knives must be precisely set on the block for best performance. Beets enter the drum from the top and the cossettes exit at the bottoms. A knife block is shown on the left, and the knives themselves are shown on the right.



(Beet slicer shown on 3rd floor with chute reaching down to 1st floor diffusion batteries.)

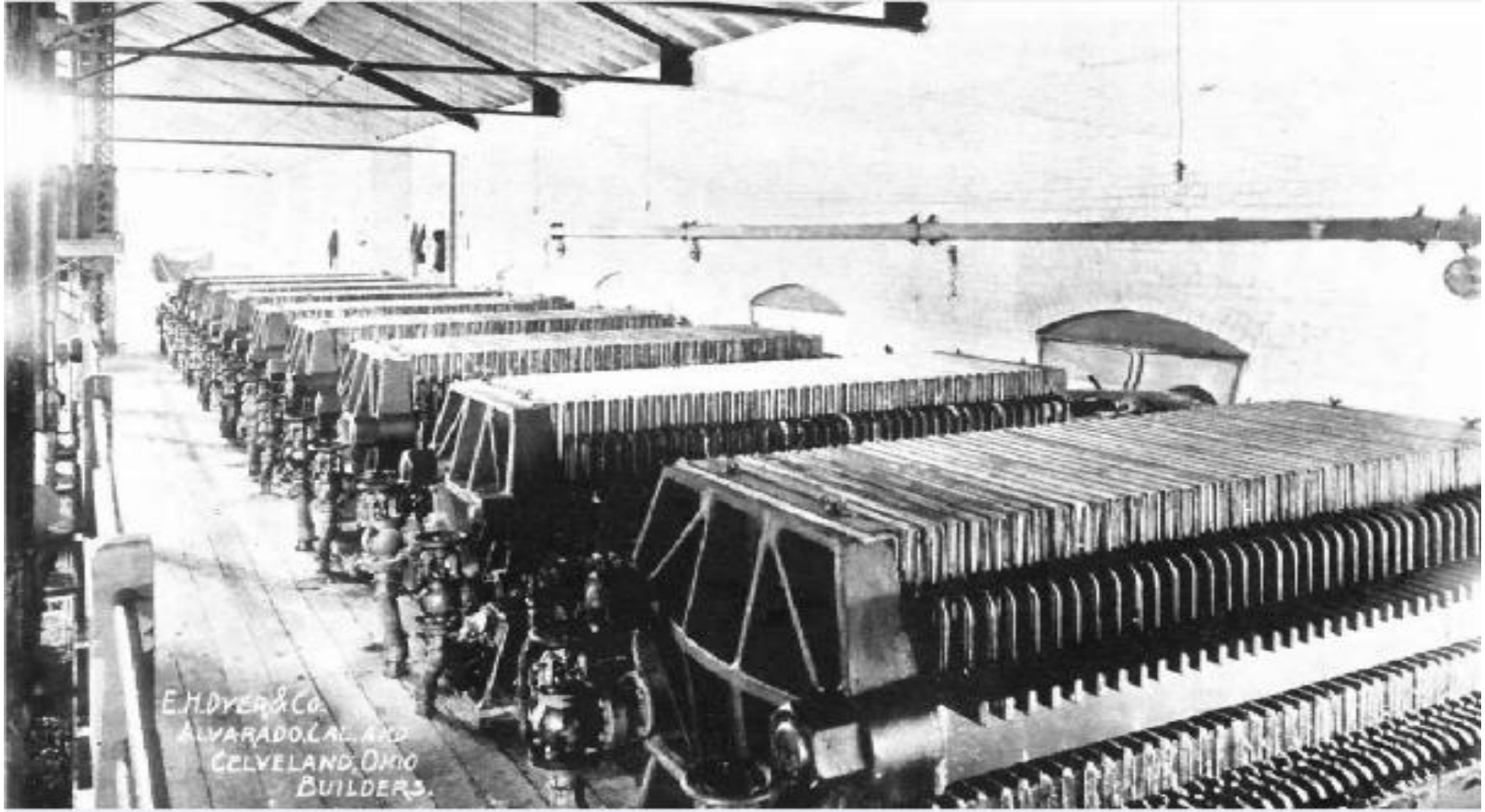
DIFFUSION BATTERY:

From the slicer the beets are transported by gravity through a chute to the diffusion batteries (which consist of 14 tanks connected by piping and valves, each holding 2½ tons of sliced beets), where the sugar is extracted by a series of leaching's with hot water. The sugar is held in solution in the cells of the beets. These cells also contain most of the impurities. The object of the diffusion process is to obtain the sugar with as few of the impurities as possible. First, in the cutting, the machine and the knives are selected with a view of cutting the beets in such a form as to rupture as few cells as possible, and at the same time prepare a large surface for the action of the water or dilute juice in the operation in the battery, without destroying the rapid circulation of the liquid.



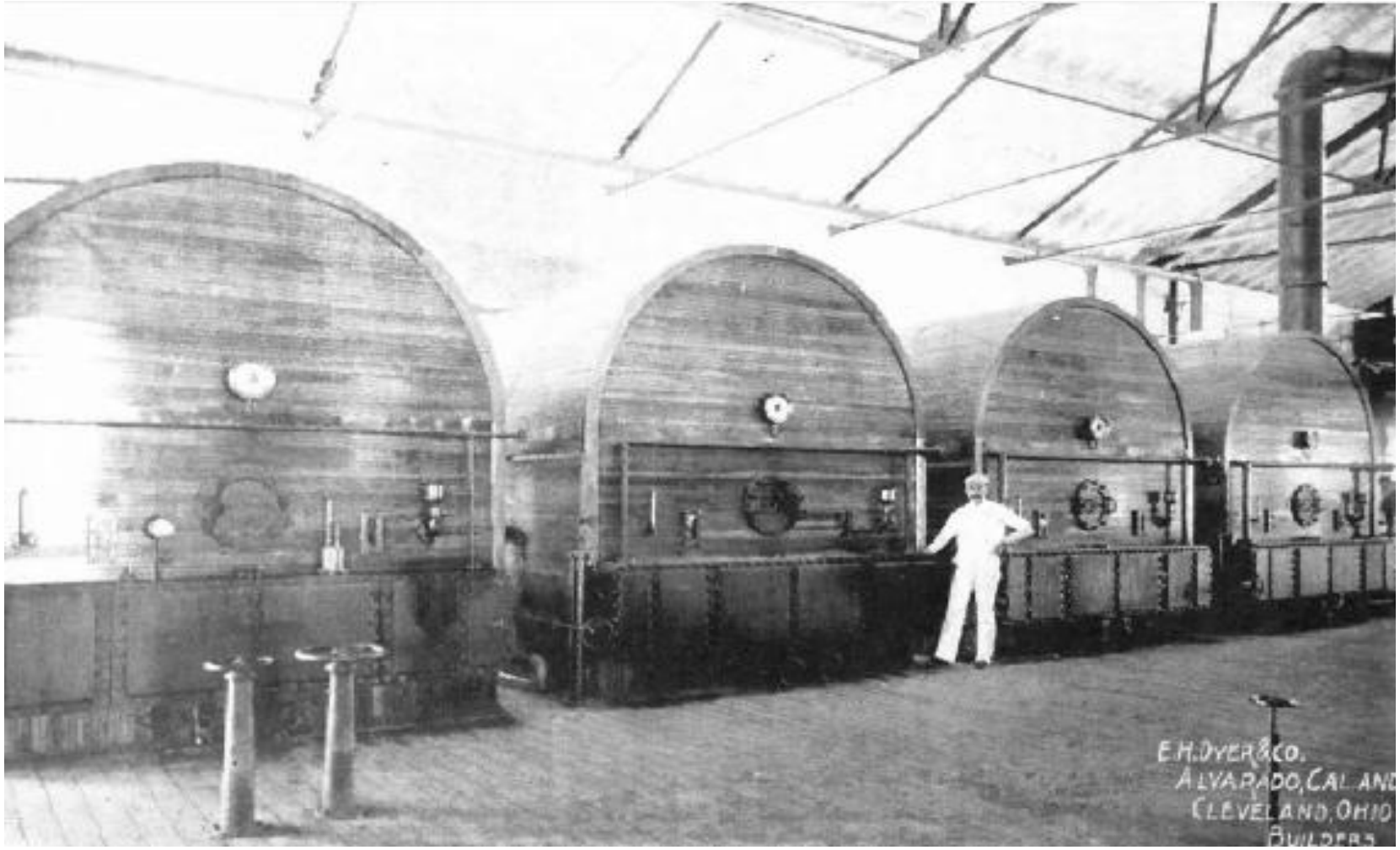
CARBONATION:

The juice flows by gravity into a heater where it is heated to 190 Fah. This is important, as it is necessary to coagulate all albuminoids before the presence of lime. From the "heater" the juice flows to the "carbonator" (a large closed tank with suitable valves and appliances for admitting the juice, lime, carbonic acid, etc.). To the heated juice there is admitted from 2 to 3 per cent of lime in the form of milk of lime; this lime combines with the greater part of the impurities and forms an insoluble precipitate. The lime also combines with the sugar, forming a sucrate of lime, which if not decomposed would be lost during filtration; this is done by injecting carbonic acid gas, which is made in burning the lime used in clarification, forming an insoluble precipitate of carbonate of lime.



Filtration:

After carbonation the whole contents of the carbonator, juice and precipitate, are drawn off and forced through filter presses by means of a pump, at a pressure of 60 lbs. PSI, the whole compressed by means of screws or hydraulic pressure; this is to make tight joints between the frames, and does not in any way compress the contents of the press when working. The juice is forced into the frames of the press by the afore-mentioned pump, the clear juice passing through the cloth into the screen, from which the filtered juice passes to a trough, through a cock in the screen; this is continued till the frames are completely filled with the lime precipitate, when the flow of juice into the press is stopped, and hot water forced through instead, till the adhering juice is washed out of the lime cake and cloths; the press is then opened and the lime cake removed, when the press is again closed and is ready for further use.

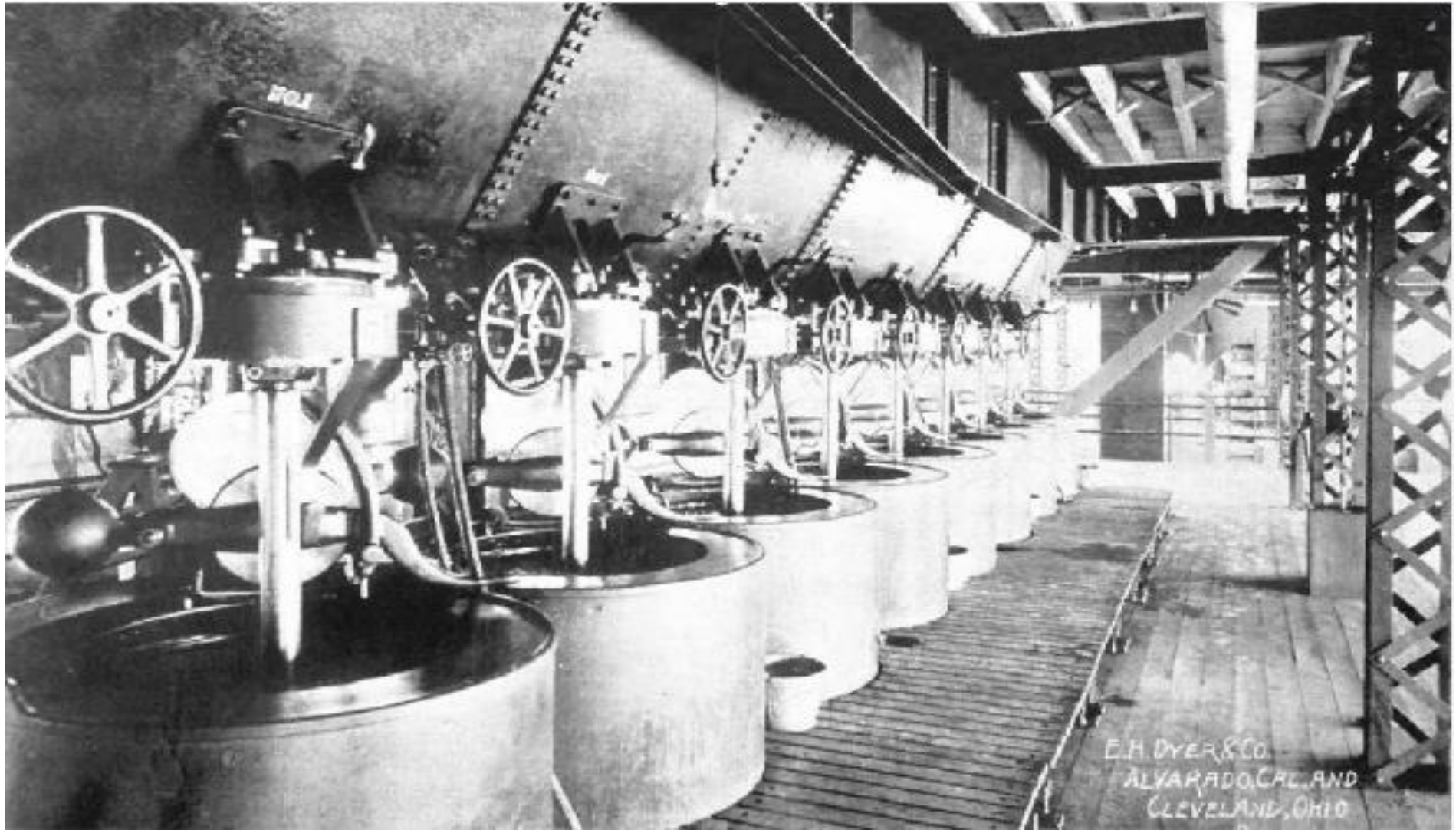


THE QUADRUPLE EFFECT EVAPORATOR:

The juice is then passed through a second carbonation and then through a sulphitor, which decolorizes the juice and precipitates the remainder of the lime. The juice then goes through another filtration. The juice at this stage is between 3 to 10 percent sugar. The juice is then passed on to the evaporator. The quadruple effect evaporator consists of four bodies, each of which is arranged with a steam chamber and tubes, with room for the vapors to disengage; the upper part, or vapor chamber of each body is connected with the steam chamber of the next body, so the vapors from the boiling liquor may pass into the steam chamber of the next. The juice, flowing through the four effects, becomes more condensed as it passes along, going in at a density of about 10, and coming out at 50, which not only concentrates the sugar, but the impurities also; this, which is technically called "thick liquor," is again submitted to the fumes of sulphurous acid, which neutralizes it, destroys coloring matter, etc. The "thick liquor" is again passed through mechanical filters that remove any solid foreign matters, after which it is boiled in the vacuum strike pan where the sugar is crystallized.

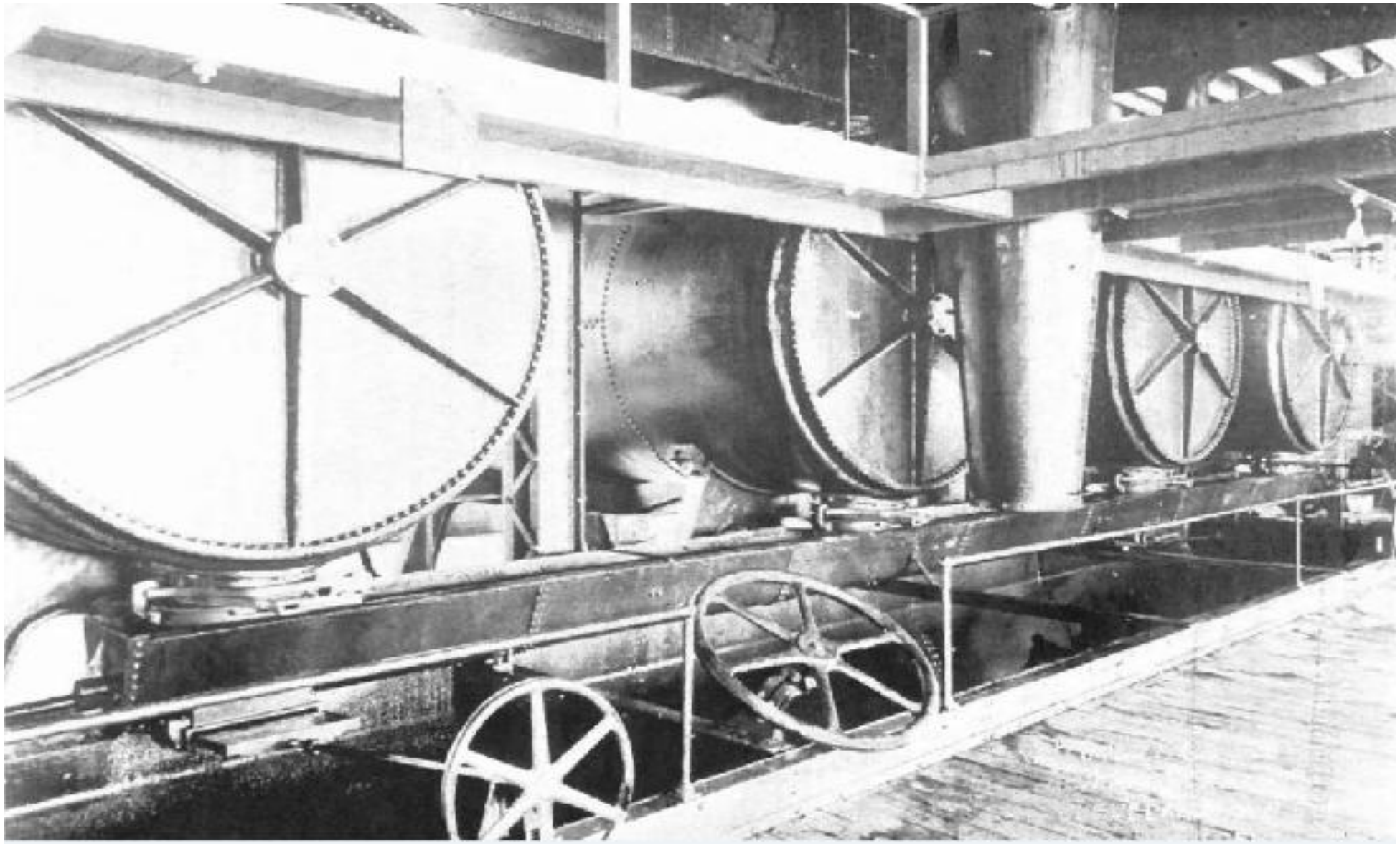
VACUUM STRIKE PAN:

The ''vacuum strike pan" is a closed cast-iron vessel, about 11 feet in diameter and 14 feet high, and holds 35 tons of "melada" (sugar and molasses) when full. In the lower portion are situated a number of copper coils through which the steam passes without coming in contact with the boiling mass ; the vapor arising passes to the condenser; a pump draws off the non-condensable vapors. During the operation a vacuum is maintained in the apparatus, the mass boiling at a low temperature, which prevents burning. The operation is as follows: Juice is admitted to the pan, and when about half full steam is turned on and the contents evaporated till it is "just about to sugar"; at this moment fresh juice is admitted, and the whole mass thinned, but not enough to dissolve the microscopic crystals ; it is again allowed to concentrate by evaporation, thickened, and the sugar in the freshly admitted juice will join the microscopic crystals, which increasing in size will now be apparent to the eye ; the mass is not allowed to concentrate enough to form more microscopic crystals, but again thinned by adding fresh juice before that point arrives which causes the crystals to grow in size without forming new ones ; this operation of concentrating and diluting the mass goes on till the "strike pan" is full, the size of the crystal and the hardness depending upon the way in which the operation is conducted. It is at the will of the operator whether large, small, hard or soft crystals are made; by keeping the average of the boiling mass thin, the crystals will be large; thick, they will be fine; hot, they will be hard; cool, and they will be soft. The "magma" falls into a large iron tank, with revolving propeller arms constantly revolving, which is termed a "mixer." Attached to and directly underneath the mixer, are 8 centrifugals, 40 inches diameter.



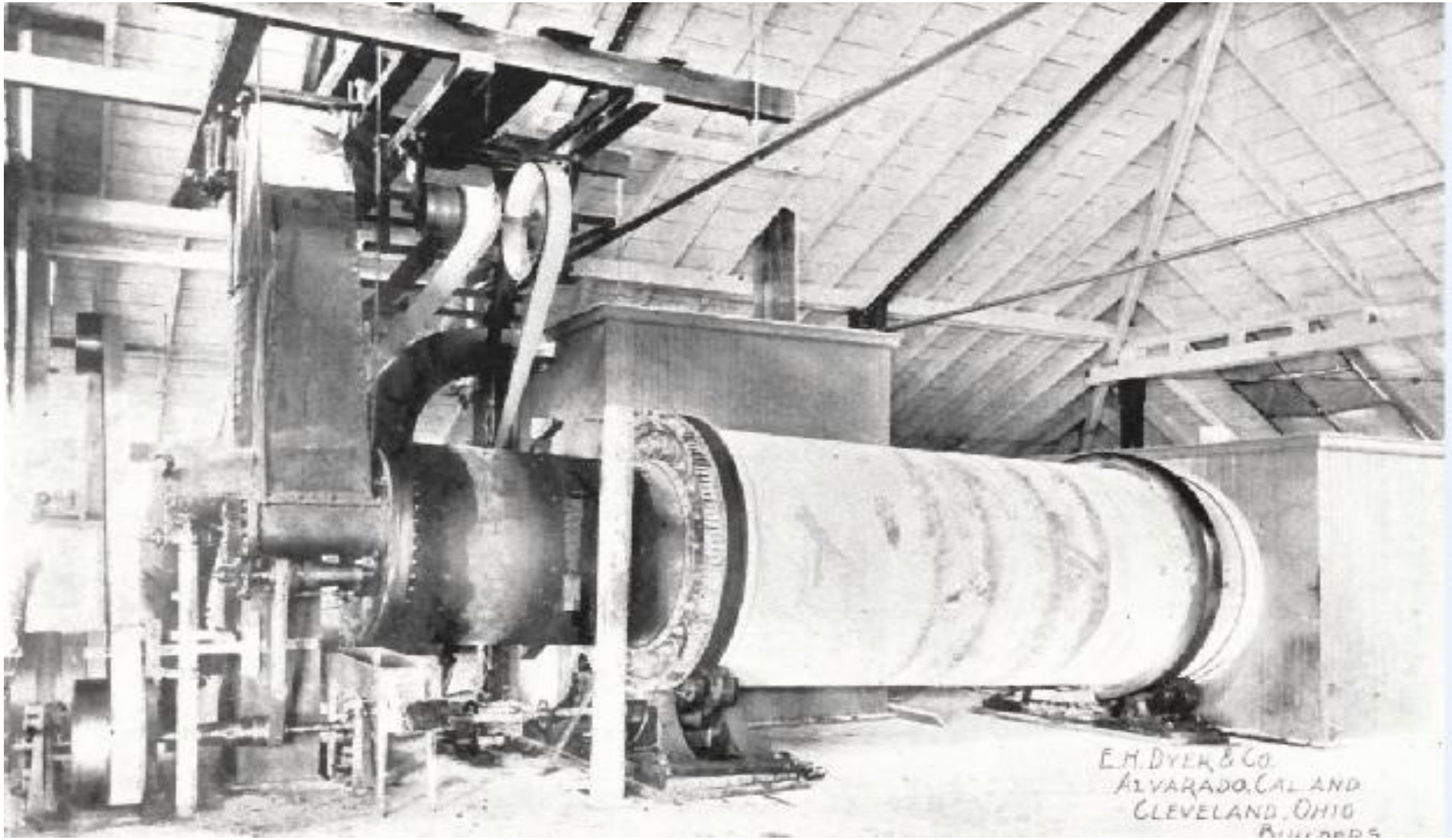
THE CENTRIFUGALS:

These machines consist of revolving "baskets" surrounded by safety curbs; the baskets are lined with a finely perforated brass screen. About 500 pounds of the "magma " is taken into a centrifugal at a time ; the machine is caused to revolve by means of suitable belts and pulleys till it attains a velocity of 1000 revolutions a minute; the centrifugal force, which is about 40 pounds per square inch, throws the " magma " to the sides, the screen holding the sugar back, the molasses is thrown off through the screen till it strikes the sides of the safety curb, flows off in a pipe at the bottom, and is collected in tanks for further manipulation. After the "magma" has been in the revolving centrifugal a few minutes, it is entirely freed from syrup, then a jet of water is sprayed on it to remove the last trace of molasses, the machine is stopped, and the sugar falls through an opening in the bottom into a conveyor which carries it to an elevator connected with the dryer.



THE CRYSTALIZER:

The molasses separated in the centrifugals still contains a percentage of sugar, the crystals being formed by the slow movement of molasses for a short period in the steel tanks shown here.

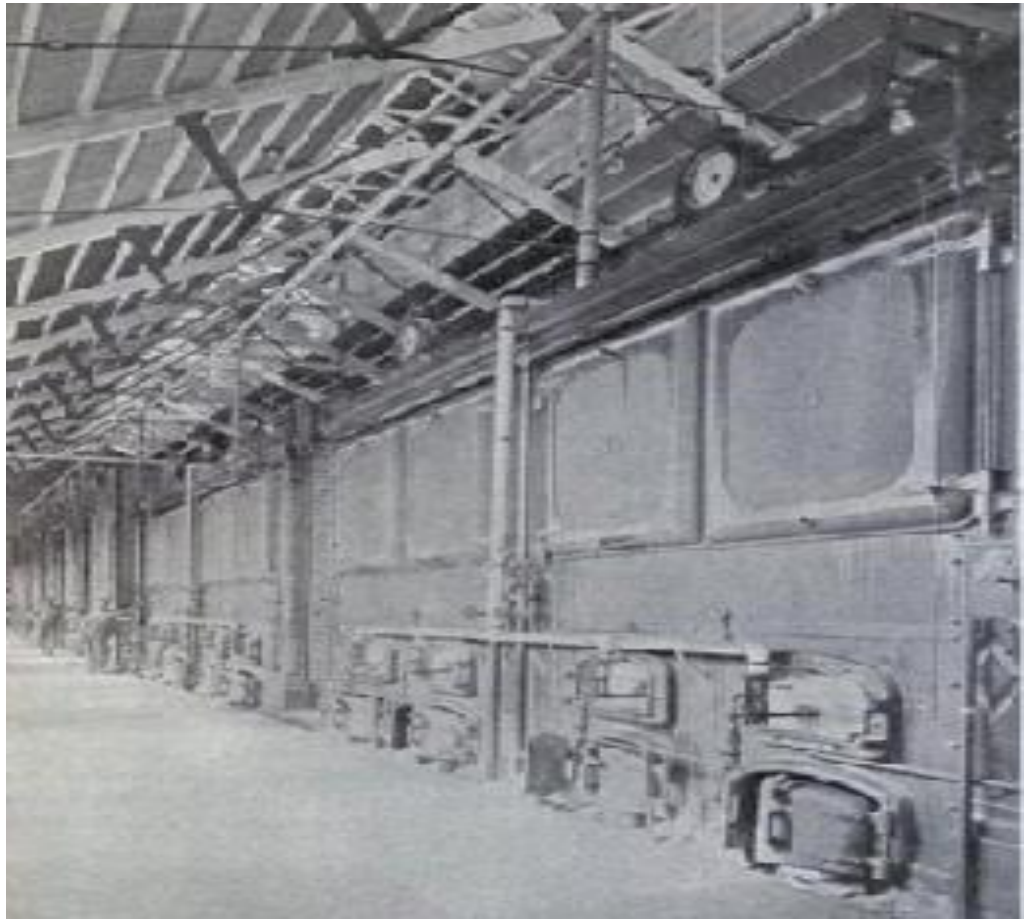


THE DRYER:

The "dryer" is a hollow iron cylinder 6 feet in diameter by 30 feet long, which revolves slowly; this motion causes the sugar to be continually dropped on warmed pipes, which, with a current of hot air that is forced through it, completely removes every vestige of moisture from the sugar; the sugar passing from the "dryer" goes over a screen which removes any lumps that may have formed, and falls into a hopper from which it is sacked or barreled and is ready for the market. The molasses that came from the "magma" is again boiled in the vacuum strike pan, and another crop of sugar obtained from it, and also another lot of molasses; this second lot of molasses is too poor in sugar to be again crystallized in the vacuum pan; it is, however, concentrated to what is called "string proof" in the vacuum pan, and dropped when finished into crystallizers, where it is continually agitated, which, with careful attention to temperature, causes all sugar that can be obtained to crystallize.

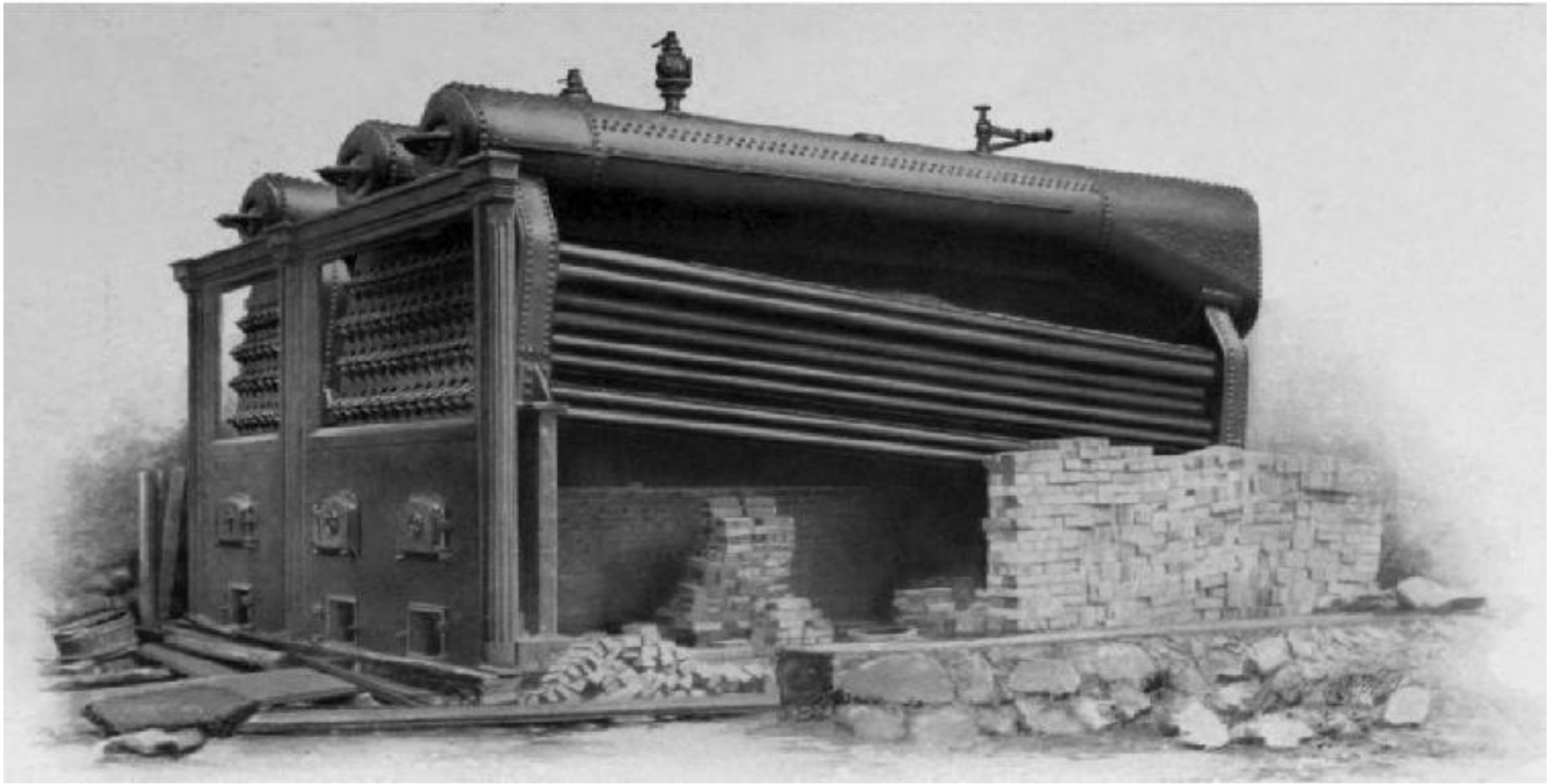
STEAM BOILERS

The heart of a sugar beet factory is the boiler system. The boilers supply the heat and steam to operate many of the machines in the factory. Back in the 19th century you could tell how many boilers a mill had by the number of smokestacks. When Holly Sugar built its signature smokestack in Alvarado in 1936 it replaced eleven smokestacks. So at that time the Alvarado mill had eleven boilers lined up side by side. Boilers were a dangerous source of power. In the 1880's the Alvarado mill suffered two explosions due to boiler malfunctions. Each instance caused the death of an employee in the boiler room. The workers were known as "firemen," which can be misconstrued as being "firefighters," especially when one lost his life during an explosion and subsequent fire. Firemen in the late 19th century could easily mean a person who tended a fire as well as being a firefighter. Alvarado had a slate of firemen in the late 1800's, they being employed at the sugar mill, the salt companies and on steam trains.



A large mill with many boilers.

A ghastly example of stoking a single boiler. Although I doubt that Alvarado was ever this bad it probably wasn't a picnic either.



A steam boiler of the type used in the beet sugar industry. Note the bricks being used to build the fire box, the grate in the front for stoking the fire and a viewing hole for checking on the fire. The tubes above the fire box carry water, which will be heated by the fire below and steam would accumulate in the tanks above. There would be a faceplate above the grate and viewing hole with gauges for water pressure and water level in the boilers. Alvarado had a series of eleven boilers in 1936 in a series of two or three boilers. Originally the boilers would be heated by coal, wood or bone black. Bone black were animal bones that were burned into charcoal. After the beginning of the 20th century gas would be used as a heat source.