



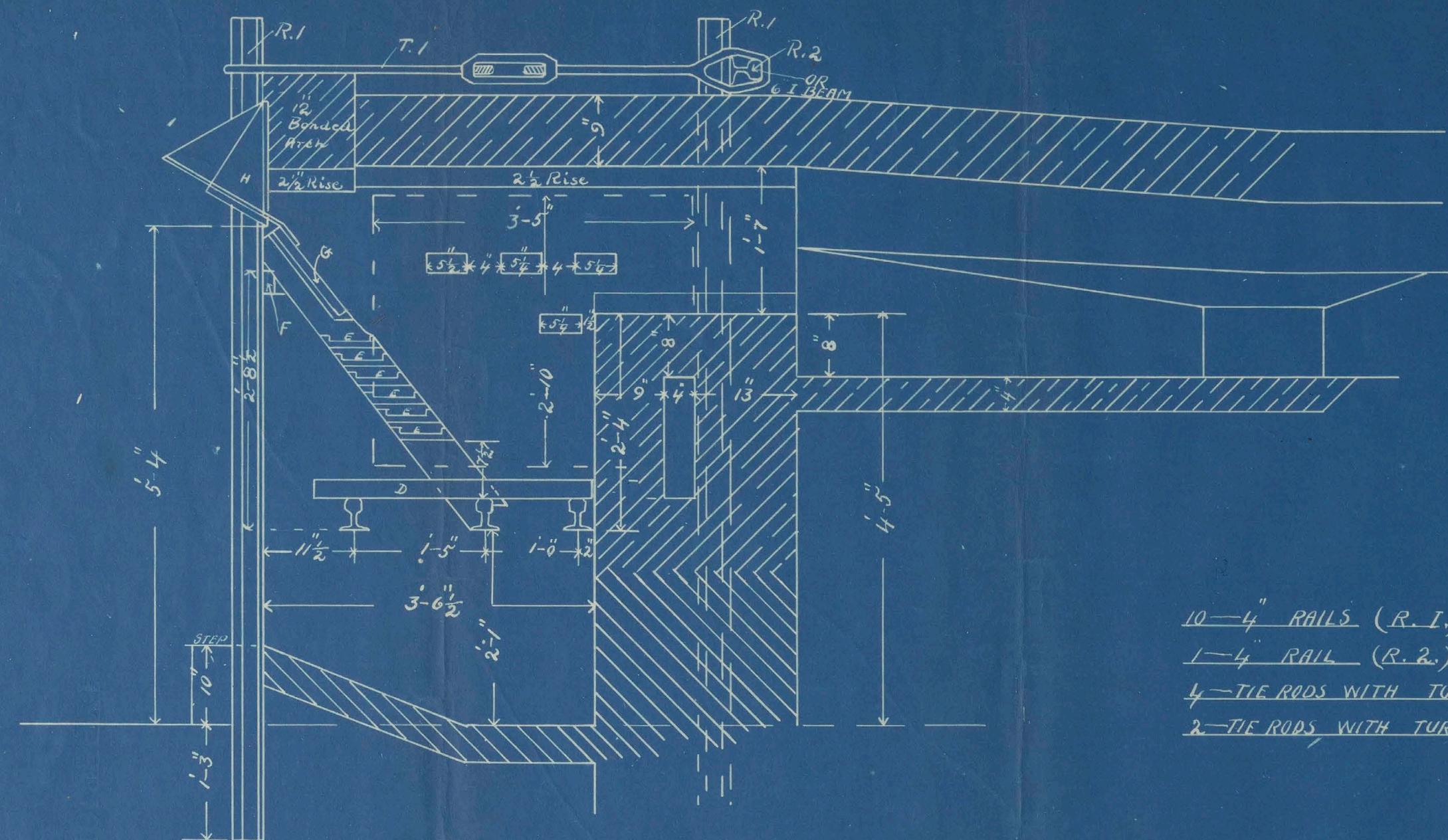
Reed and Hyde Families Papers.

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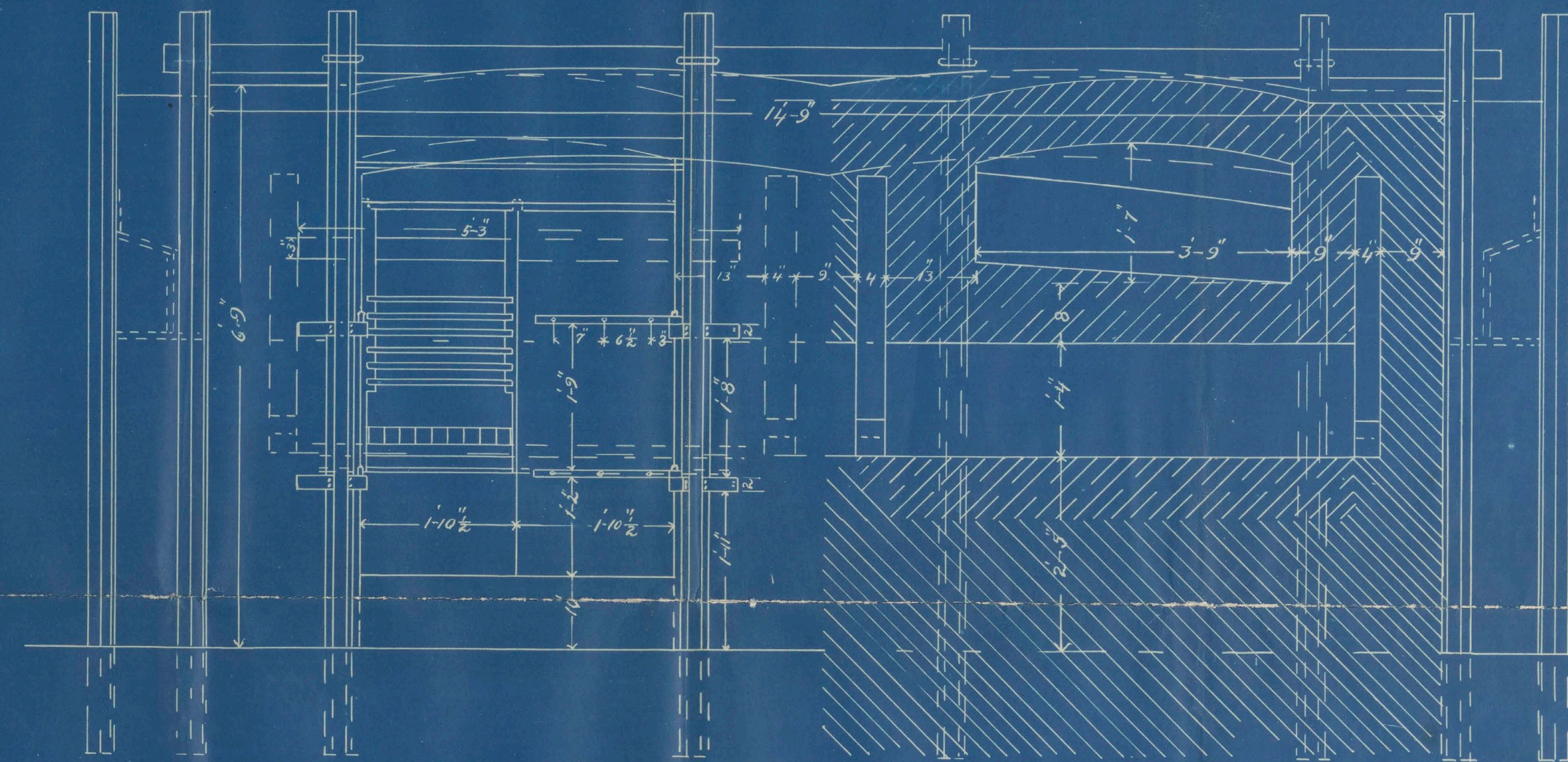
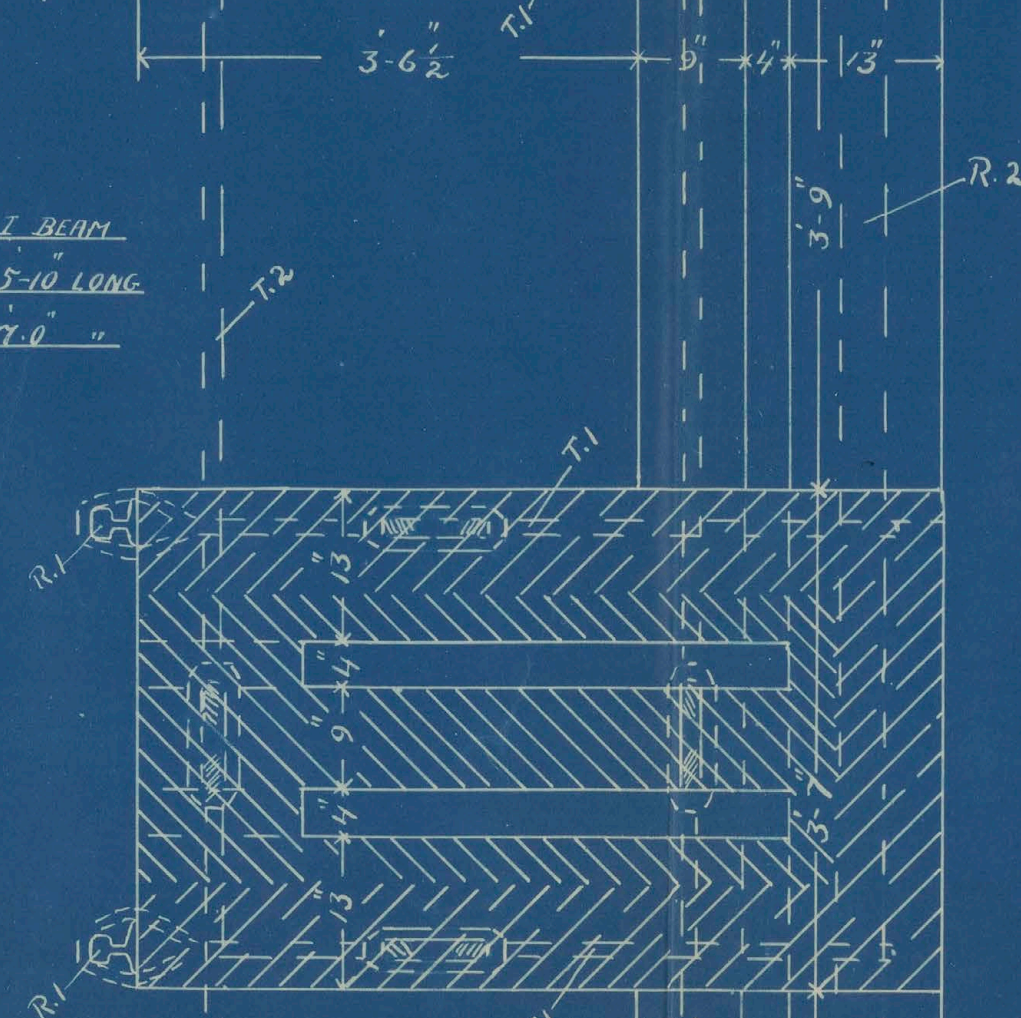
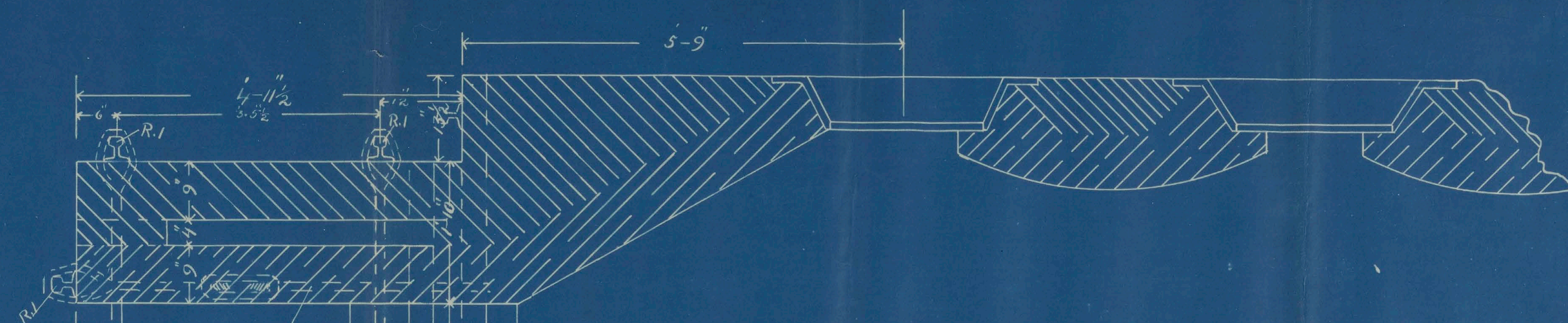
El Paso I. W. R.

Roaster No. 1 attached to
Step grate - April 14/97

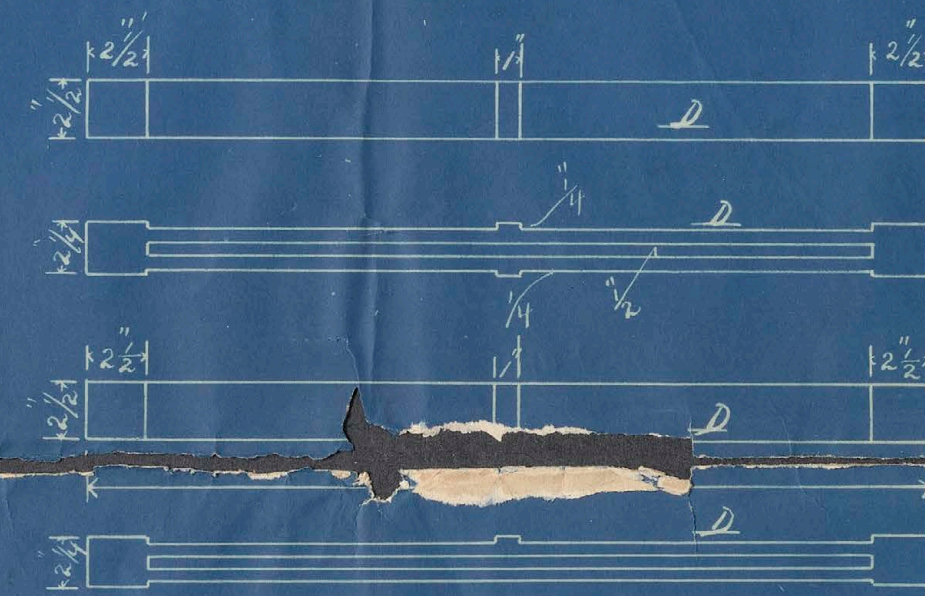


PART LONGITUDINAL SECTION

10-4" RAILS (R.1) 8'-10" LONG
 1-4" RAIL (R.2) 17'-0" ON 6" I BEAM
 4-TIE RODS WITH TURN BUCKLE (T.1) 5'-10" LONG
 2-TIE RODS WITH TURN BUCKLE (T.2) 17'-0" LONG



FRONT ELEVATION - AND - CROSS SECTION

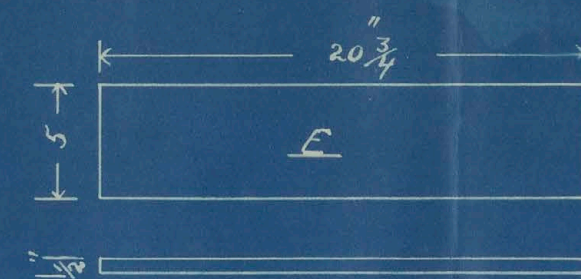


GRATE BAR CAST IRON
 28 WANTED

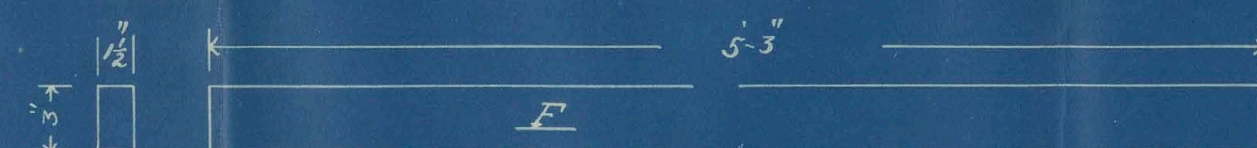
GRATE BAR CAST IRON
 8 WANTED

SCALE FOR DETAILS

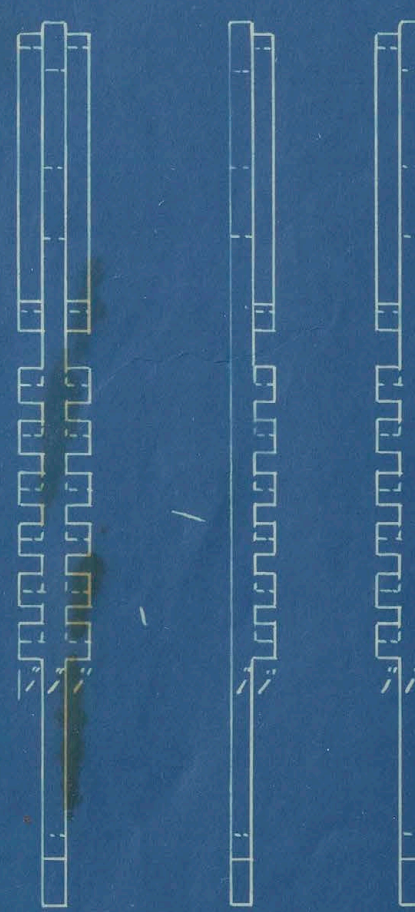
1/2" = 1 FOOT



GRATE BAR WROUGHT IRON
 24 WANTED



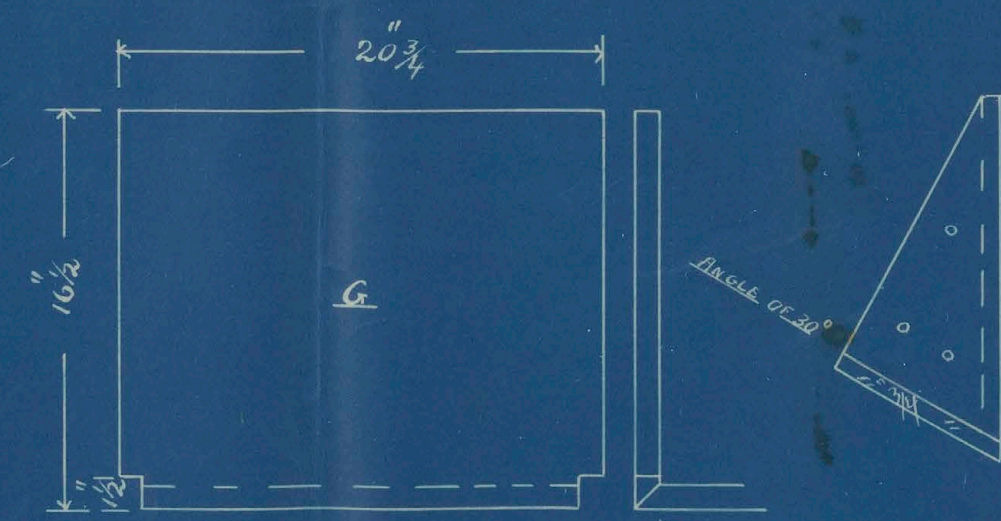
BEARING BAR CAST IRON
 2 WANTED FOR 1 ROASTER



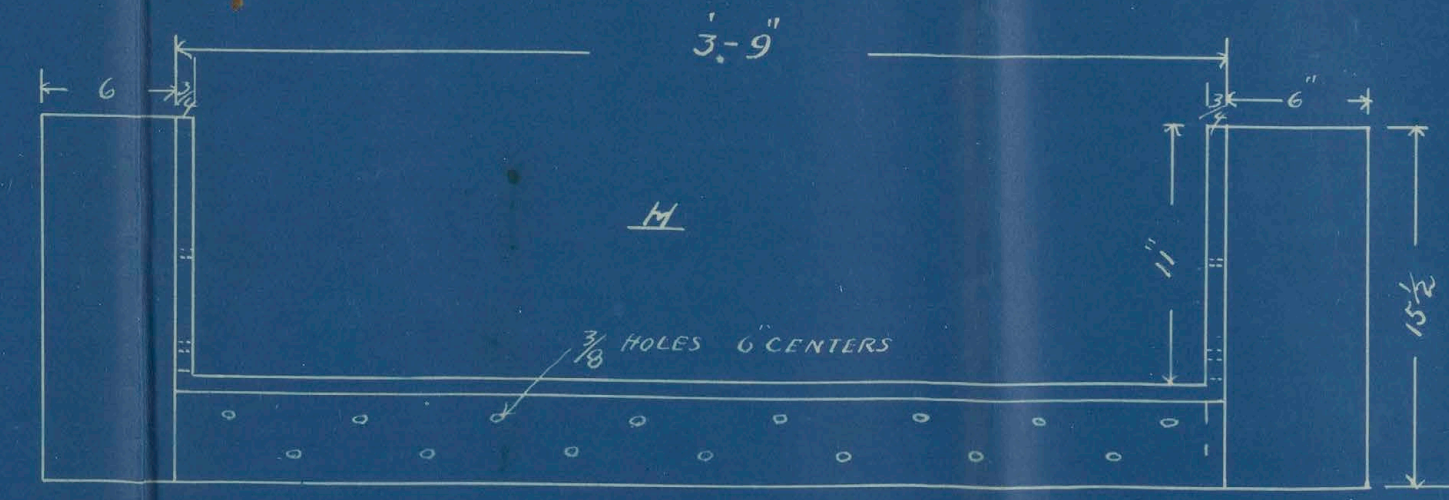
CENTRE AND SIDE BARS FOR STEP GRATES - CAST IRON

FOR 1 ROASTER WANTED

2 OF A
 2 OF B
 2 OF C



DEAD PLATES CAST IRON
 4 WANTED



HOPPER FRAME CAST IRON
 2 WANTED

PART-PLAN

SCALE 3/4" = 1 FOOT

PLAN-ELEVATION-SECTION AND DETAILS
 OF FIRE BOX
 FOR ROASTER
 E.P.O.W 4/14/97

DWIGHT & LLOYD SINTERING COMPANY, INC.

(In dissolution)

~~19 RECTOR STREET~~

NEW YORK, N.Y.

CABLE ADDRESS "SINTERER" NEW YORK

REMOVED TO
31st FLOOR
70 PINE ST.
NEW YORK 5

January 23, 1948

\$ 7.20

To the Stockholders:

The last remaining asset of your Company, referred to in a letter to the stockholders dated April 10, 1947, having been disposed of, your Board of Directors have now declared the final distribution of \$1.20 per share to stockholders of record on January 21, 1948, and we enclose check covering the corresponding number of shares standing in your name. With this fourth and final payment, the total distribution amounts to \$21.70 per share.

As indicated in our previous letters, the cost to original stockholders is \$17.36 per share. It is probable, however, in the case of some stockholders a different cost basis would obtain, depending on how and when they acquired their present holdings. The cost will determine whether there is a Capital Gain or Loss, and each stockholder should consider his or her situation accordingly. At any rate, this matter should be given consideration in the preparation of your income tax return for the calendar year 1948.

The Company is retaining the necessary cash to take care of additional income taxes assessed for the fiscal year ended February 28, 1947 and for current income taxes, together with incidental operating expenses.

Joseph C. Benson
Treasurer

DWIGHT & LLOYD SINTERING COMPANY, INC.
(In dissolution)
19 RECTOR STREET
NEW YORK, N.Y.

CABLE ADDRESS "SINTERER" NEW YORK

April 10, 1947.

To the Stockholders:

You were advised by previous communications of the dissolution of your Company. The Directors of your Company have now declared the third distribution, of \$3.50 per share, to stockholders of record on April 8, 1947, and we are enclosing check covering the corresponding number of shares standing in your name.

With this third payment, we have made a total distribution of \$20.50 per share. As we indicated in our previous letters, the cost to original stockholders is \$17.36 per share. It is probable, however, in the case of a great many stockholders a different cost basis would obtain, depending on how and when they acquired their present holdings. That cost will determine whether there has been a Capital Gain or Loss, and each stockholder should consider his or her situation accordingly.

This payment substantially liquidates your Company, except for certain cash reserves which it has been necessary to retain for unpaid income taxes and other contingencies, and also a license to the Eagle-Picher Mining & Smelting Company, which your Directors are endeavoring to dispose of in the best interests of the stockholders.

Joseph C. Benson
Treasurer

DWIGHT & LLOYD SINTERING COMPANY, INC.

In Dissolution
19 RECTOR STREET

NEW YORK, N.Y.

CABLE ADDRESS "SINTERER" NEW YORK

October 7, 1946.

To the Stockholders:

Under date of December 28, 1945 you were advised of the dissolution of your Company. At that time we made the first liquidating distribution of \$10. per share. The directors have now declared the second distribution of \$7. per share to stockholders of record on October 5, 1946, and we are enclosing herewith check covering the corresponding number of shares standing in your name.

This second distribution, as in the case of the first, represents a return of capital and should not be considered taxable income to the stockholders. It should, however, be taken into account for the purpose of determining Capital Gain or Loss, as more fully outlined in our letter to you dated December 28, 1945. That letter indicated, among other things, that in the case of original stockholders the auditors had computed cost basis as being \$17.36 per share, so that the present distribution should not result in any capital gain, but now reduces that cost by a total of \$17., leaving a balance of 36 cents to be applied against any subsequent liquidating distribution.

We cannot at this time say when or for what amount the final distribution will be, as the remaining assets of the Company are not liquid. They consist principally of patents, licenses and also an investment in the capital stock of the Sintering Machinery Corporation, all of which may take time to convert into cash for the purpose of making the final liquidating payment.

Joseph C. Benson
Treasurer

DWIGHT & LLOYD SINTERING COMPANY, INC.

In dissolution.

19 RECTOR STREET

NEW YORK, N.Y.

CABLE ADDRESS "SINTERER" NEW YORK

60.00
12/28/45
December 28, 1945

To the Stockholders:

The corporation having been dissolved, pursuant to vote of the stockholders at the special meeting on December 12th, 1945, of which you were notified, and a certificate of dissolution having been issued by the Secretary of State of Delaware, on December 17th, 1945, and since recorded and published as required in Delaware, the Directors have now declared the first liquidating distribution, at the rate of \$10. per share, to stockholders of record on December 26th, 1945, and we are enclosing check herewith covering the corresponding number of shares standing in your name.

This initial distribution represents a return of capital and should not be considered taxable income to the stockholders. It should, however, be taken into account for the purpose of determining Capital Gain or Loss, as hereinafter mentioned.

Our auditors have prepared a report, reflecting the capital which has been returned to stockholders in dividend payments heretofore made during the existence of the corporation. A copy of such report is enclosed, for your assistance in determining the present basis of your stock in order to compute the amount of any Capital Gain realized as a result of this or any subsequent payment in liquidation, or the amount of Capital Loss sustained after the liquidation of the corporation has been fully completed. We hope to accomplish this within a year - although the law permits a period of three years from the date of dissolution for such purpose.

You will observe from the auditor's report that, in the case of original stockholders, they have computed the present cost as being \$17.36 per share - so that the present distribution of \$10. would not result in any Capital Gain, but would reduce the cost of \$17.36 by \$10.00, leaving a balance of \$7.36 to be applied against any subsequent liquidating distribution.

Joseph C. Benson
Treasurer

Alvin M. Powell & Co.

ACCOUNTING AND TAX SERVICE

50 CHURCH STREET

NEW YORK

ALVIN M. POWELL, C. P. A.

GEORGE M. GREMMEL, C. P. A.

CORTLANDT 7-2286

December 7, 1945

Col. Arthur S. Dwight, President,
Dwight & Lloyd Sintering Company, Inc.,
19 Rector Street,
New York, N. Y.

Dear Sir:

In compliance with the request of Mr. J. C. Benson, we have made a detailed analysis of the Surplus Capital and related accounts of DWIGHT & LLOYD SINTERING COMPANY, INC., to serve as a basis for our opinions with respect to the contemplated liquidation distribution.

Since all distribution received by Stockholders in final liquidation, in excess of the adjusted cost basis of the Stock in the hands of the recipient stockholders represents Capital Gain, it was necessary to determine how much of the dividends paid by the Corporation since its inception constituted a return of Capital. Any and all dividends received by the Stockholders which constituted such return of Capital, serve to reduce the cost basis of the stock in the hands of the stockholders.

The Tax Law relating to such dividends, which is the basis of the theories employed in our analysis resulting in the opinion herein expressed, is as follows:

INTERNAL REVENUE CODE-SECTION 115b-

Source of Distributions:-

For the purposes of this Chapter every distribution is made out of earnings or profits to the extent thereof and from the most recently accumulated earnings or profits. Any earnings or profits accumulated, or increase in value of property accrued, before March 1, 1913, may be distributed, exempt from tax, after the earnings and profits accumulated after February 28, 1913 have been distributed, but any such tax free distribution shall be applied against and reduce the adjusted basis of the stock.....

Regulation 111-Section 29.115-6

No distribution may be made from depreciation or depletion reserves until all the profits of the corporation have first been distributed.

Cases cited in Commerce Clearing House Tax Service Par. 834-06 and 061:

Notwithstanding intention expressed in declaration of the dividend or the action in making the distribution, no distribution can be made from the depletion or depreciation reserves except to the extent that the distribution exceeds the post 1913 earnings.

The analyses and computations necessary to arrive at the results herein stated were briefly, as follows:

A detailed analysis of the Profit and Loss, (Surplus Account), was made in order to determine the annual net income per books from the inception of the Corporation. The Federal Income Taxes paid per books and the amortization charges per books were added back in order to determine the annual profit before taxes and amortization and dividends. Correct annual Federal Taxes, additional assessments and accepted amortization charges and rates were determined from an analysis of the tax returns as filed and an examination of the numerous Internal Revenue Department reports, letters and schedules.

From the annual profits before taxes, amortization and dividends, determined as heretofor described, was deducted the proper annual charges for Federal Taxes and amortization charges to determine the corrected annual net profits before dividends.

The dividends paid from the inception of the Corporation were applied against the corrected annual net profits in accordance with the date of payment of the dividend in order to determine the annual excess of dividends paid over the net profits available for dividends, such excess payments representing returns of capital.

This reconstruction of the Profit and Loss Account, (Surplus), as briefly described above, in order to determine the earnings available for dividends in each year, which was thus used as a basis for the apportionment of the dividends paid each year as between distribution of earnings and return of capital, results in the following conclusion:

The dividends paid by the corporation in excess of accumulated earnings and which therefore are returns of capital, are as follows:

DATE OF PAYMENT	TOTAL DIVIDENDS PAID		AMOUNT THEREOF WHICH IS A RETURN OF CAPITAL	
	AMOUNT	PER SHARE	AMOUNT	PER SHARE
1/2/14	\$ 15,000	\$1.50	\$14,007.86	\$1.40
4/1/14	15,000	1.50	14,007.85	1.40
7/1/14	15,000	1.50	8,729.87	.87
10/1/14	35,000	3.50	20,369.68	2.04
1/2/15	25,000	2.50	14,549.77	1.45
4/1/15	25,000	2.50	14,549.77	1.45
7/1/15	25,000	2.50	13,463.82	1.35
10/1/15	50,000	5.00	26,927.64	2.69
4/1/16	70,000	7.00	37,698.69	3.77
10/1/16	100,000	10.00	42,306.83	4.23
4/1/17	90,000	9.00	38,076.15	3.81
10/1/17	90,000	9.00	35,681.69	3.57
4/1/18	65,000	6.50	25,770.11	2.58
10/1/18	100,000	10.00	60,779.99	6.08
4/1/19	65,000	6.50	39,507.00	3.95
10/1/19	40,000	4.00	35,765.29	3.58
4/1/20	60,000	6.00	53,647.94	5.36
10/1/20	40,000	4.00	22,057.99	2.21
4/1/21	50,000	5.00	27,572.48	2.76
10/1/21	20,000	2.00	20,000.00	2.00
4/1/22	35,000	3.50	35,000.00	3.50
10/2/22	30,000	3.00	30,000.00	3.00
4/1/23	35,000	3.50	35,000.00	3.50
10/1/23	35,000	3.50	20,899.11	2.09
			<u>\$686,369.53</u>	<u>\$68.64</u>

All other dividends paid were paid out of earnings.

Applying the above schedule of dividends representing return of Capital as reduction of cost or bases, we find the present basis of stock in the hands of original stockholders to be as follows:

Value of Original Investment as Determined by the Internal Revenue Department in Establishing the Original Invested Capital of the Corporation and the Capitalizable Value of Patents, Licenses and Contingent Ownership in Sintering Machinery then installed	\$860,025.28 or \$86.00 per share
Less: Capital Returned in Dividends as Reflected above	<u>686,369.53</u> or <u>68.64</u> " "
PRESENT BASIS TO ORIGINAL STOCKHOLDERS FOR GAIN OR LOSS	<u>\$173,655.75</u> or <u>\$17.36</u> per share

SUMMATION

It is our opinion that the foregoing schedule correctly reflects the amounts of Capital returned to stockholders in dividends and that these returns of Capital may be used to adjust the cost basis of stock in the hands of stockholders and that only the excess of liquidating dividends received over and above this adjusted basis will be subject to taxation as a long term capital gain and any deficiency in liquidation dividends will represent a capital loss.

For example:

The present basis, (adjusted cost), of stock in the hands of the original stockholders, (acquired during 1913), is \$17.36 per share. All liquidating dividends to a total amount of \$17.36 per share will represent a return of capital - any excess will represent a taxable gain and, if the liquidation payments do not equal in total \$17.36 per share, the unrealized cost will represent a capital loss.

The present basis of stock in the hands of subsequent purchasers, (after 1913), will be determined as follows:

For example: - Stock bought January 1, 1922 at \$50.00 per share:

Original Cost of Stock		\$50.00 per share
Capital Returned in Dividends:	Subsequent to	
Purchase: - 4/1/22	\$3.50 per share	
10/2/22	3.00 " "	
4/1/23	3.50 " "	
10/1/23	<u>2.09 " "</u>	<u>12.09 " "</u>
<u>PRESENT BASIS OF STOCK</u>		<u>\$37.41 per share</u>

All liquidating dividends to a total amount of \$37.41 per share in this case will represent a return of capital - any excess will represent a taxable gain and any deficiency of total liquidating payments will represent a capital loss.

Respectfully Submitted
Alvin M. Powell & Co.
by George M. Gremmel
Certified Public Accountant

Dwight & Lloyd Sintering Company, Incorporated

Report of the President to the Board of Directors,
at the meeting November 8, 1945

The time has come in the affairs of the Dwight & Lloyd Sintering Company when the Board of Directors must pause and consider the present status of the Company, its outlook for the future and then plan a policy that will meet wisely the conditions that confront us.

As a background for that decision, it may be well to recall briefly the high points in the history of the Company. A. S. Dwight and R. L. Lloyd were granted a series of basic U. S. patents, beginning with the underlying "down-draft process" patent, applied for March 22, 1906; issued as Patent No. 882,517, March 17, 1908, and the "moving pallet carrier process" patent, applied for July 30, 1906; issued as Patent No. 882,518, March 17, 1908.

These two basic process patents with their corresponding apparatus patents and auxiliary features signalized a great improvement in the technique of both non-ferrous and ferrous metallurgy. The D&L system was rapidly adopted by the large companies, and older methods were quickly displaced. Greater efficiency of operations and saving of labor resulted with increased metal recoveries. The national resources of metals were augmented by the reclamation of millions of tons of by-products previously considered as waste. The terrible and deadly scourge of lead-poisoning among the lead workers in the lead smelters was practically eliminated.

The preliminary period of development and introduction which lasted about three years was financed solely by myself to a total expenditure of about \$20,000. before earnings from royalties began to come in.

In 1909 the Dwight & Lloyd Metallurgical Company was organized under the laws of New Jersey with a capital of \$50,000. In 1912 the Dwight & Lloyd Sintering Company was organized under the laws of Delaware with a capital of 10,000 shares, par value \$100. per share, to take over the sintering of metallic materials in North America, leaving the D. & L. Metallurgical Co. the right to sinter substances other than metallic, and also the entire foreign field for all materials.

The original basic patents expired; but by research and experience new improvements were developed and patented, by which the period of dominating the sintering field was prolonged from the original 17 years to nearly 38 years, or practically up to the present.

As the dominating sintering patents gradually expired, the value of the shares was gradually written down, until today the authorized value of this Company's shares is \$25.00 per share.

The operations of your Company have been carried on by a small but efficient staff, which, however, has been successively depleted to a serious extent, first by the sudden death on June 19, 1937 of Mr. Richard L. Lloyd, a founder and Vice President; then by the resignation on May 6, 1942 of Mr. Reed W. Hyde, Vice President in charge of research and patents; and finally by the sudden death on July 31, 1943 of Captain Henry J. Stehli, Vice President and Superintendent, who had been

connected with the development of the business from the very beginning in the United States, and who was responsible for some of the most valuable improvements. Three of the surviving members of the staff have been with the Company for over 32 years.

I have given much thought to the question of continuing the life of the D. & L. Sintering Company along the line of general engineering in addition to such consulting work in sintering as might develop. The Company has achieved an honorable place in the field of metallurgical engineering and the D&L name stands high. But looking at the problem realistically the following objections stand out clearly among others that might be mentioned:

- (a) Our basic and dominating patents will soon have practically all expired and be free to the public.
- (b) The non-ferrous field reached the "saturation point" several years ago.
- (c) In the ferrous field many sintering plants were built by United States Government money during the late war, many of which are now idle.
- (d) On account of the depletion of our staff, it would be necessary to organize a practically new engineering staff and face the uncertainties that go with untried talent and personalities.

From the above considerations, it seems evident that very little new sintering business can be reasonably expected during the years immediately ahead, and it would take time to break into general engineering practice. Very likely there will be a revival of sintering when low-grade iron ores come to be worked on a large scale to counteract the rapid depletion of high-grade iron ore deposits, a serious situation now facing the American iron and steel industry. But can we afford to wait for that time to arrive?

Your Company now has a surplus in its treasury which was accumulated before the advent of the Personal Holding Company Tax, which since its advent has compelled our Company to pay out in dividends each year all its net earnings. This surplus has been carried as an emergency fund against possible litigation, etc. It might suffice to finance the Company over a period of lean years; but would it not be more sensible to start now to wind up the affairs of the Company with the intent of disposing of its assets by the time the two remaining license contracts expire and distribute the proceeds to the stockholders?

It is now a matter of regret that during the abundant years we never established a Retirement Fund for the staff. Instead, however, a profit sharing policy was consistently followed, whereby a portion of every declared dividend was set aside by the Directors for distribution among members of the staff as a Salary Bonus. Messrs. Dwight and Lloyd did not share in this distribution. If the stockholders decide to dissolve the Company, it is my hope that they will by vote authorize the Directors acting as Trustees in Liquidation to follow a similar policy of participation in favor of any members of the staff, with respect to liquidating payments to stockholders representing distributions of accumulated or current earnings, who in the judgment of the President merit such consideration.

I have the honor to submit the above report to the Board of Directors for its consideration and action, with my recommendation that the Directors suggest to the stockholders the liquidation of the Company.

Arthur S. Dwight
President

Notice of Special Meeting
of Stockholders
of

DWIGHT & LLOYD SINTERING COMPANY, INCORPORATED

A special meeting of the stockholders of the above named corporation will be held on the 12th day of December, 1945, at 11:30 o'clock in the forenoon, at the office of the corporation, located at No. 19 Rector Street, New York 6, N.Y., for the purpose of voting on the advisability of dissolving the corporation, the payment of a salary bonus to employees, and for the transaction of such other business as may properly come before the meeting. The meeting will be held pursuant to the following resolutions adopted at a meeting of the Board of Directors, held the 8th day of November, 1945:

RESOLVED, that it is deemed advisable in the judgment of the Board of Directors and most for the benefit of this corporation that it should be dissolved.

FURTHER RESOLVED, that a meeting of the stockholders having voting power on the dissolution of the corporation to take action upon the foregoing resolution be and it hereby is called to be held on the 12th day of December, 1945, at 11:30 o'clock in the forenoon, at the office of the corporation, located at No. 19 Rector Street, New York 6, N.Y.

Dated, November 9th, 1945.

Charlotte M. Stanley,
Secretary.

A copy of the President's report of November 8th, 1945, to the Board of Directors is submitted herewith. If you cannot attend the meeting, please execute the attached proxy and return it in the accompanying stamped envelope.

DWIGHT & LLOYD SINTERING COMPANY, INC.

19 RECTOR STREET

NEW YORK, N.Y.

CABLE ADDRESS "SINTERER" NEW YORK

April 7, 1942.

To the Stockholders:

You may recall a letter which we sent to you under date of December 20, 1938, calling attention to the litigation which our Company has had for some years with one of our licensees. We are pleased to announce that this litigation has been settled and that the Courts have awarded us practically all of our claims.

The Company proposes to declare a dividend of \$10.00 per share to be payable some time on or before May 15, 1942. In the meantime, however, in order to meet the requirements of the Treasury Department in regard to Corporation taxes, it is necessary for the Company to have each stockholder agree to include this dividend in his or her taxable income for the calendar year 1942, and therefore we are enclosing two copies of Treasury Department Form 972, which we ask you to sign before a notary public and return both signed copies to us in the enclosed stamped envelope at your earliest convenience. The Consent is to be signed on the back of the form on the first line (Consenting Stockholder) and the notarial acknowledgment affixed thereunder.

We might point out that the dates which we have filled in (March 1, 1941 to Feb. 28, 1942) cover this Company's fiscal year.

DWIGHT & LLOYD SINTERING COMPANY, INC.

Joseph C. Benson
Treasurer

The amount of your dividend will be \$60.00

Charge to the account of _____ \$

CLASS OF SERVICE DESIRED	
DOMESTIC	CABLE
TELEGRAM	ORDINARY
DAY LETTER	URGENT RATE
SERIAL	DEFERRED
OVERNIGHT TELEGRAM	NIGHT LETTER
SPECIAL SERVICE	SHIP RADIOGRAM

Patrons should check class of service desired; otherwise the message will be transmitted as a telegram or ordinary cablegram.

WESTERN UNION

1206-B

A. N. WILLIAMS
PRESIDENT

NEWCOMB CARLTON
CHAIRMAN OF THE BOARD

J. C. WILLEVER
FIRST VICE-PRESIDENT

CHECK
ACCOUNTING INFORMATION
TIME FILED

Send the following telegram, subject to the terms on back hereof, which are hereby agreed to

STRAIGHT WIRE

5/1/42

WANT A REPLY?

"Answer by WESTERN UNION"
or similar phrases may be
included without charge.

MR J C BENSON
DWIGHT & LLOYD SINTERING CO. PANY, INC.
19 ~~XXXXXX~~ RECTOR STREET
NEW YORK, N.Y.

SIGNED CONSENT SENT YOU AIRMAIL THIS MORNING. SORRY ORIGINAL
LETTER NEVER RECEIVED

A D HYDE

CHG PERSONAL ACCT

DUPLICATE FOR TELEGRAPH DEPT.

ALL MESSAGES TAKEN BY THIS COMPANY ARE SUBJECT TO THE FOLLOWING TERMS:

To guard against mistakes or delays, the sender of a message should order it repeated, that is, telegraphed back to the originating office for comparison. For this, one-half the unrepeatable message rate is charged in addition. Unless otherwise indicated on its face, this is an unrepeatable message and paid for as such, in consideration whereof it is agreed between the sender of the message and this Company as follows:

1. The Company shall not be liable for mistakes or delays in the transmission or delivery, or for non-delivery, of any message received for transmission at the unrepeatable-message rate beyond the sum of five hundred dollars; nor for mistakes or delays in the transmission or delivery, or for non-delivery, of any message received for transmission at the repeated-message rate beyond the sum of five thousand dollars, unless specially valued; nor in any case for delays arising from unavoidable interruption in the working of its lines;

2. In any event the Company shall not be liable for damages for mistakes or delays in the transmission or delivery, or for the non-delivery, of any message, whether caused by the negligence of its servants or otherwise, beyond the actual loss, not exceeding in any event the sum of five thousand dollars, at which amount the sender of each message represents that the message is valued, unless a greater value is stated in writing by the sender thereof at the time the message is tendered for transmission, and unless the repeated-message rate is paid or agreed to be paid, and an additional charge equal to one-tenth of one per cent of the amount by which such valuation shall exceed five thousand dollars.

3. The Company is hereby made the agent of the sender, without liability, to forward this message over the lines of any other company when necessary to reach its destination.

4. Except as otherwise indicated in connection with the listing of individual places in the filed tariffs of the Company, the amount paid for the transmission of a domestic telegram or an incoming cable or radio message covers its delivery within the following limits: in cities or towns of 5,000 or more inhabitants where the Company has an office which, as shown by the filed tariffs of the Company, is not operated through the agency of a railroad company, within two miles of any open main or branch office of the Company; in cities or towns of 5,000 or more inhabitants where, as shown by the filed tariffs of the Company, the telegraph service is performed through the agency of a railroad company, within one mile of the telegraph office; in cities or towns of less than 5,000 inhabitants in which an office of the Company is located, within one-half mile of the telegraph office. Beyond the limits above specified the Company does not undertake to make delivery, but will endeavor to arrange for delivery as the agent of the sender, with the understanding that the sender authorizes the collection of any additional charge from the addressee and agrees to pay such additional charge if it is not collected from the addressee. There will be no additional charge for deliveries made by telephone within the corporate limits of any city or town in which an office of the Company is located.

5. No responsibility attaches to this Company concerning messages until the same are accepted at one of its transmitting offices; and if a message is sent to such office by one of the Company's messengers, he acts for that purpose as the agent of the sender.

6. The Company will not be liable for damages or statutory penalties in any case where the claim is not presented in writing to the Company within sixty days after the message is filed with the Company for transmission; provided, however, that this condition shall not apply to claims for damages or overcharges within the purview of Section 415 of the Communications Act of 1934.

7. It is agreed that in any action by the Company to recover the tolls for any message or messages the prompt and correct transmission and delivery thereof shall be presumed, subject to rebuttal by competent evidence.

8. Special terms governing the transmission of messages according to their classes, as enumerated below, shall apply to messages in each of such respective classes in addition to all the foregoing terms.

9. No employee of the Company is authorized to vary the foregoing.

12-40

CLASSES OF SERVICE

DOMESTIC SERVICES

TELEGRAMS

A full-rate expedited service.

DAY LETTERS

A deferred service at lower than the standard telegram rates.

SERIALS

Messages sent in sections during the same day.

OVERNIGHT TELEGRAMS

Accepted up to 2 A.M. for delivery not earlier than the following morning at rates substantially lower than the standard telegram or day letter rates.

SHIP RADIOGRAMS

A service to ships at sea, in all parts of the world. Plain language or code language may be used.

CABLE SERVICES

ORDINARIES

The standard service, at full rates. Code messages, consisting of 5-letter groups only, at a lower rate.

DEFERREDS

Plain-language messages, subject to being deferred in favor of full-rate messages.

NIGHT LETTERS

Overnight plain-language messages.

URGENTS

Messages taking precedence over all other messages except government messages.

THERE IS A SPECIAL LOW-RATE WESTERN UNION SERVICE FOR EVERY SOCIAL NEED

Telegrams of the categories listed at the right, to any Western Union destination in the United States

TELEGRAMS OF PRESCRIBED FIXED TEXT—	—	—	—	—	25¢
TELEGRAMS OF SENDER'S OWN COMPOSITION. First 15 words	—	—	—	—	35¢
LOCAL CITY TELEGRAMS. —	—	—	—	—	20¢

TOURATE TELEGRAMS, for TRAVELERS. First 15 words	—	—	35¢
(Additional Words, 2½¢ each)			

GREETINGS AT

Christmas	New Year	Easter
Valentine's Day	Mother's Day	Father's Day
Jewish New Year	Thanksgiving	

CONGRATULATIONS ON

Anniversaries	Weddings
Birthdays	Commencement
Birth of a Child	

MISCELLANEOUS

Bon Voyage telegrams	"Pep" telegrams
Kiddiegrams (No 35¢ rate)	

ASK AT ANY WESTERN UNION OFFICE OR AGENCY FOR FULL INFORMATION

CLASS OF SERVICE

This is a full-rate Telegram or Cablegram unless its deferred character is indicated by a suitable symbol above or preceding the address.

A. N. WILLIAMS
PRESIDENT

NEWCOMB CARLTON
CHAIRMAN OF THE BOARD

J. C. WILLEVER
FIRST VICE-PRESIDENT

WESTERN UNION

1201

(42)

SYMBOLS

DL=Day Letter

NT=Overnight Telegram

LC=Deferred Cable

NLT=Cable Night Letter

Ship Radiogram

The filing time shown in the date line on telegrams and day letters is STANDARD TIME at point of origin. Time of receipt is STANDARD TIME at point of destination

CDU 13 14=RP NEWYORK NY 1 1033A

ARTHUR D HYDE=

1942 MAY 1 AM 9 45

GEN MILLS=MPLS=

AWAITING SIGNED CONSENT MAILED YOUR HOUSE WITH LETTERS DATED
APRIL SEVENTH AND TWENTY SEVENTH=

J C BENSON TREASURER.

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

May 1, 1942

Mr. J. C. Benson
Dwight & Lloyd Sintering Company, Inc.
19 Rector Street
New York, N.Y.

Dear Joe:

I am very sorry but I did not receive your letter of April 7th which was sent to 4536 Dupont Avenue South. We have not lived at this address for several years and the letter probably went astray.

Our present address is 2701 East Lake of the Isles Blvd.

I hope you are well and wish I might have a chance to see you.

Best regards.

Very truly yours,

ADH:R

DWIGHT & LLOYD SINTERING COMPANY, INC.

19 RECTOR STREET

NEW YORK, N.Y.

CABLE ADDRESS "SINTERER" NEW YORK

April 7, 1942.

To the Stockholders:

You may recall a letter which we sent to you under date of December 20, 1938, calling attention to the litigation which our Company has had for some years with one of our licensees. We are pleased to announce that this litigation has been settled and that the Courts have awarded us practically all of our claims.

The Company proposes to declare a dividend of \$10.00 per share to be payable some time on or before May 15, 1942. In the meantime, however, in order to meet the requirements of the Treasury Department in regard to Corporation taxes, it is necessary for the Company to have each stockholder agree to include this dividend in his or her taxable income for the calendar year 1942, and therefore we are enclosing two copies of Treasury Department Form 972, which we ask you to sign before a notary public and return both signed copies to us in the enclosed stamped envelope at your earliest convenience. The Consent is to be signed on the back of the form on the first line (Consenting Stockholder) and the notarial acknowledgment affixed thereunder.

We might point out that the dates which we have filled in (March 1, 1941 to Feb. 28, 1942) cover this Company's fiscal year.

DWIGHT & LLOYD SINTERING COMPANY, INC.

Joseph C. Benson
Treasurer

The amount of your dividend will be \$60.00

AIR MAIL

DWIGHT & LLOYD SINTERING COMPANY, INC.

19 RECTOR STREET

NEW YORK, N.Y.

CABLE ADDRESS "SINTERER" NEW YORK

April 27, 1942

Mr. Arthur D. Hyde
4536 Dupont Ave., South
Minneapolis, Minn.

Dear Arthur,

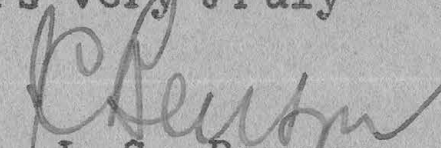
I have not received the Dividend Consent which I sent you with our letter of April 7th. It occurred to me that perhaps the forms may have been misplaced, or miscarried in the mail, and I have, therefore, prepared duplicates which are enclosed. Please sign both copies and have them acknowledged before a notary public.

We expect to mail out the dividend checks shortly after Colonel Dwight's return to New York, which will be about May 1st.

I would appreciate your giving this matter your immediate attention, as these forms have to be filed early next month, with our Income Tax returns.

With kind regards,

Yours very truly


J. C. Benson

JCB:S
enclosures

DWIGHT & LLOYD SINTERING COMPANY, INC.

19 RECTOR STREET

NEW YORK, N.Y.

CABLE ADDRESS "SINTERER" NEW YORK

NOTICE OF ANNUAL MEETING

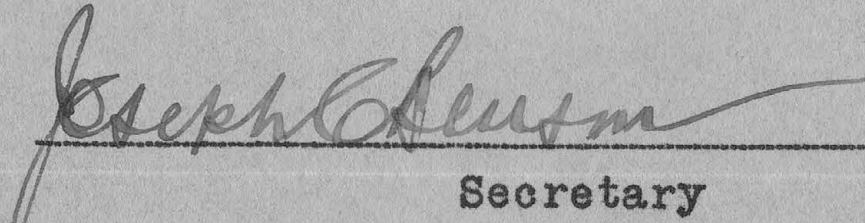
OF

DWIGHT & LLOYD SINTERING COMPANY, INC.

The By-Laws having been amended by appropriate action of the Board of Directors to provide for holding the annual meeting of stockholders of this corporation on the third Tuesday in October in each year, notice is hereby given that the annual meeting of stockholders will be held at the office of the company, 19 Rector Street, New York City, N.Y., on Tuesday, October 15, 1940 at 11:30 A.M., for the purpose of electing a Board of Directors, receiving and acting upon the reports of officers and for the transaction of such other business as may properly come before the meeting.

In accordance with the laws of the State of Delaware, no stock can be voted which has been transferred on the books of the corporation within twenty days next preceding this election.

If you cannot be present in person, please execute the attached proxy and return it in the accompanying stamped envelope.


Secretary

September 20, 1940.

DWIGHT & LLOYD SINTERING COMPANY, INC.

19 RECTOR STREET

NEW YORK, December 20, 1938

THE BOARD OF DIRECTORS HAVING RECENTLY DECLARED A DIVIDEND OF \$3.00
PER SHARE PAYABLE THIS DATE, ENCLOSED PLEASE FIND CHECK TO COVER THE DIVIDEND ON
THE NUMBER OF SHARES OF STOCK REGISTERED IN YOUR NAME.

NO ACKNOWLEDGMENT IS NECESSARY; ENDORSEMENT ON THIS CHECK IS SUFFICIENT
RECEIPT.

JOSEPH C. BENSON

TREASURER

DWIGHT & LLOYD SINTERING COMPANY, INC.

19 RECTOR STREET

NEW YORK, N.Y.

CABLE ADDRESS "SINTERER" NEW YORK

December 20, 1938

To the Stockholders:

In connection with the dividend of \$3.00 per share payable today, we think it desirable to call your attention to the fact that this dividend and the one of \$6.00 per share which was paid in December, 1937 were both disbursed out of earnings (from royalties) not actually received but accrued.

A controversy has been pending for some years with one of our important licensees regarding royalties due us but not paid. Unfortunately, this controversy has resulted in litigation with this licensee, which is still pending. The result of this litigation thus far has been favorable to your Company, but the finality will depend upon the result of the appeal which this licensee is taking in the courts. It is our feeling, however, that the present favorable decision will not be materially altered.

Your Board of Directors have considered it expedient from a tax standpoint to accrue some of these royalties - as Accounts Receivable - rather than to account for the same in a lump sum, if and when paid. However, in taking such a step, it was necessary to make dividend disbursements in order to avoid the Undistributed Profits Tax and, more important, the Personal Holding Company Tax. In order to make these payments possible and receive the corresponding dividend credit on our tax returns, your Board of Directors negotiated collateral loans at their bank and with these funds were able to disburse these dividends.

With regard to future dividend payments, that will depend not only on the general business situation, as it affects your Company, but developments in the pending litigation.

DWIGHT & LLOYD SINTERING COMPANY, INC.

J. C. Benson
Treasurer

C. O. Smith
Helmick
W. R.

Dwight + Lloyd Sentering Co

DWIGHT & LLOYD SINTERING CO., Inc.

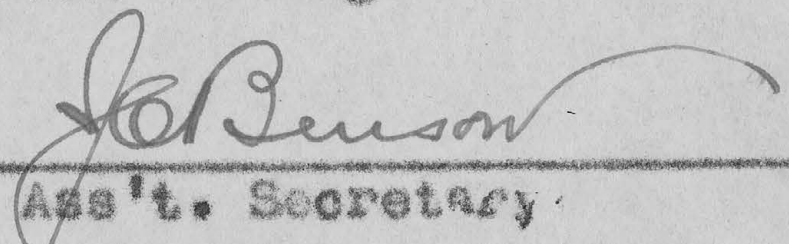
Copy of preamble and resolution
adopted at a special meeting of the Board of Directors,
held August 30, 1921.

The chairman stated that the meeting was called to order to consider the question of a further reduction of the capital stock of the Company, as well as the transaction of any other business which may properly come before the meeting.

The chairman called attention of the Board to the desirability of further reducing the capital stock of the Company from \$500,000., to \$250,000. in order to amortize the value of the Company's patents for the three year period ending October 31, 1921. In this connection the Secretary of the meeting was called upon to read the minutes of a meeting of the Board of Directors held on August 24, 1918 (minutes on page 97) also the minutes of a special meeting of the stockholders of the Company held on September 30, 1913 (page 100) which contemplated and ratified the reduction of the original capital stock from \$750,000. to \$500,000., and upon motion duly made and seconded it was

RESOLVED that the Directors of the Dwight & Lloyd Sintering Co., Inc. recommend to the stockholders that the capital stock of the Company be further reduced \$250,000., to a face value of \$250,000., to cover the estimated depreciation in the value of the patents of the Company for the three year period ending October 31, 1921, and that such reduction be made pursuant to Section 23 of the General Corporation Laws of the State of Delaware, by reducing the par value of the shares of the Corporation from \$50. to \$25., and that proper offsetting entries be spread on the books of the Company. It was further

RESOLVED that a meeting of the stockholders for the purpose of voting upon this further decrease of the capital stock of the Company be held at the office of the Company, 29 Broadway, New York City on Monday, September 19, 1921 at 1.30 P.M., and that the Ass't Secretary be instructed to send notice of such meeting together with a copy of the preceding resolution of each stockholder by mail to his address as same appears on the books of the Corporation at least twenty days before the date of such meeting.


Ass't. Secretary

DWIGHT & LLOYD SINTERING COMPANY, INC.

ROASTING AND SINTERING OF FINE ORES AND CONCENTRATES

29 BROADWAY, NEW YORK

CABLE ADDRESS "SINTERER" NEW YORK

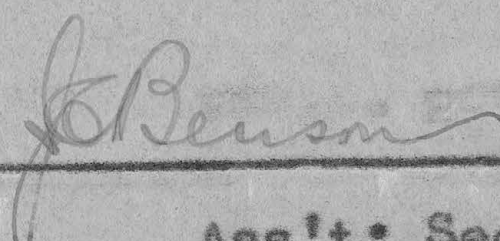
August 30, 1921.

NOTICE OF SPECIAL MEETING OF STOCKHOLDERS.

A special meeting of the stockholders of the Dwight & Lloyd Sintering Company, Inc., will be held at the office of the Company, 29 Broadway, New York City, on Monday, September 19, 1921, at 1.30 P.M., to consider the advisability of further reducing the capital stock of the Company to \$250,000., as recommended by the Board of Directors at a special meeting held August 30, 1921.

A copy of the preamble and resolution adopted at that meeting is enclosed.

If you cannot be present in person, kindly sign and return the enclosed proxy.


Ass't. Secretary.

DWIGHT & LLOYD SINTERING CO. INC.

-----O-----

REGISTERED

with

CORPORATION TRUST COMPANY OF AMERICA,
Wilmington, Delaware.

-----O-----

PROXY.

STOCKHOLDERS' MEETING.

-----O-----

KNOW ALL MEN BY THESE PRESENTS,

That I, the undersigned, being the owner of 30 shares of the capital stock of the corporation above named, do hereby constitute and appoint Arthur S. Dwight my true and lawful attorney in my name, place and stead, to vote upon the stock owned by me or standing in my name, as my proxy, at the special meeting of the stockholders of the said corporation, to be held at the corporation's office, 29 Broadway, New York City, on the 19th day of September 1921 ~~191~~, and on such other day as the meeting may be thereafter held by adjournment or otherwise, according to the number of votes I am now or may then be entitled to cast, hereby granting the said attorney full power and authority to act for me and in my name at the said meeting or meetings, in voting for directors of the said corporation or otherwise, and in the transaction of such other business as may come before the meeting, as fully as I could do if personally present, with full power of substitution and revocation, hereby ratifying and confirming all that my said attorney or substitute may do in my place, name and stead.

IN WITNESS WHEREOF, I have hereunto set my hand and seal
this day of , 191 .

Witness:

(L. S.)

DWIGHT & LLOYD SINTERING COMPANY, INC.

ROASTING AND SINTERING OF FINE ORES AND CONCENTRATES

29 BROADWAY, NEW YORK

CABLE ADDRESS "SINTERER" NEW YORK

New York City, Sept. 20, 1915.

Mr. L. H. Hyde,
Rossburn, Manitoba,
Canada.

My dear Louis:

I am in receipt of your favor of Sept. 13th, enclosing your proxy for the approaching meeting of the stockholders of the Dwight & Lloyd Sintering Company, Inc., which is to act upon the proposal to reduce the par value of the shares of said Company. I hasten to answer your question in regard to the dividends. The action we may take on the question of reducing the nominal par value of the shares will have nothing whatever to do with the dividends. We shall continue to pay (dividends) out of the earnings as large as these earnings will justify, after taking care of the operating expenses, providing proper working capital and a small reserve fund to cover possible litigation and unforeseen contingencies. Our present net earnings will just about provide for a 10% ^{annual} dividend on the original capitilization of \$100. per share, that is, \$10. per share per year. I can see no good reason why we should not be able to keep this up and continue to pay \$10 per share per year, for a while at least, and possibly increase the payment per share. If we continue to pay \$10. per year per share, the percentage on the new par value of \$75. per share would be 13-1/3%, but that really has nothing to do with the case. It is simply a question of distributing the net earnings of the Company among the shareholders, without regard to what the par value may be.

9/20/15.

It may interest you to know that at the last meeting of the Board of Directors it was decided to make the dividend payments semi-annually instead of quarterly, and a dividend of 5% on the par value of \$100. was declared payable October 1, 1915. The next regular dividend will be paid April 1, 1916 and will probably be 5%. Of course, this whole question of dividends is one that I cannot positively commit myself on, because it depends on the income. I am simply telling you what the general intention is.

I do not know what luck you would have in borrowing money on your stock. Possibly some of your banks would be willing to do it, but it would very likely end up in the thing being referred ^{through} ~~to~~ some New York correspondent of that bank to my office, with the request that we tell them exactly how much the stock is worth. Such a request has been made a number of times before, and I have always refused to commit myself in any way, for obvious reasons. Inasmuch as there has never been an actual sale of our stock, it is pretty hard to make a quotation on it when asked to do so. However, I do not know how such matters are handled out in your country, but I thought I would give you this information for what it is worth. Possibly when the time comes, if you want to borrow some money on it, I may be able to help you find somebody.

I am much interested in your account of your trials and tribulations with the Bates tractor, and am sorry that it has been the cause of your losing so much time. I imagine, from the little I hear on this subject from Joliet, that they are profiting by experience and building the machine better every day.

My family returned upon me yesterday, four strong; Jane, Alice Bates, Janie and Robert, and I am glad indeed to once more have some one in the house. I filled in part of the time that Jane was

Mr. L. H. Hyde-3.

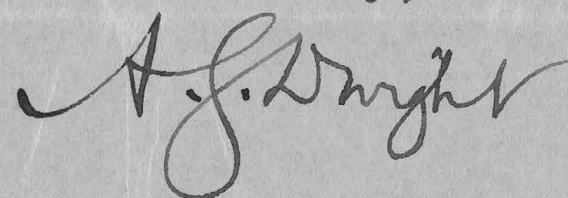
9/20/15.

in Joliet and Montreal with the Van Hornes, by making a trip to Norfolk, where Mr. Lloyd is temporarily located, but still had a day or two to myself at the Great Neck home. Janie is looking splendidly after her summer in Canada, and has told me a good deal about the fine times you all had together.

I am very glad to receive your letter and to hear from you once more. Our office is comparatively deserted just at present, Miss Stanley and Mr. Benson being the only ones here with me. Stehli is out at Northport, Washington, studying the plans for a 4-machine sintering plant. John Knox is down at Norfolk with Mr. Lloyd, putting in a second unit of the sintering plant at that place, and I do not know when either of them will be back.

Give my love to Howard, and with best wishes, believe
me

Yours affectionately,



ASD:CMS

Dx L.S. Co
9/20/15

DWIGHT & LLOYD SINTERING COMPANY, INC.

ROASTING AND SINTERING OF FINE ORES AND CONCENTRATES

29 BROADWAY, NEW YORK

CABLE ADDRESS "SINTERER" NEW YORK

New York City, September 1, 1915.

NOTICE OF SPECIAL MEETING.

A special meeting of the Stockholders of the Dwight & Lloyd Sintering Company, Inc. will be held at the office of the Company, 29 Broadway, New York City, on Wednesday, September 22, 1915, at 10.30 A.M., to consider the advisability of reducing the capital stock of the Company to \$750,000., as recommended by the Board of Directors at a special meeting held on August 31, 1915. A copy of the preamble and resolution adopted at that meeting is enclosed herewith.

If you cannot be present in person, kindly sign and return the enclosed proxy.

J. R. Dwight
Secretary.

Mr. L. H. Hyde,
502 South Eastern Avenue,
Joliet, Illinois.

Lellis
Dwight & L. S. Co

9/1/15

30

750
2250

4) 3000.00
750
2250

Copy of preamble and resolution
adopted at a special meeting of the Board
Directors held on Aug. 31, 1915

The chairman called attention to the desirability of reducing the capital stock of the company in order to amortize the valuation of the patents owned by the company. The situation being as follows:

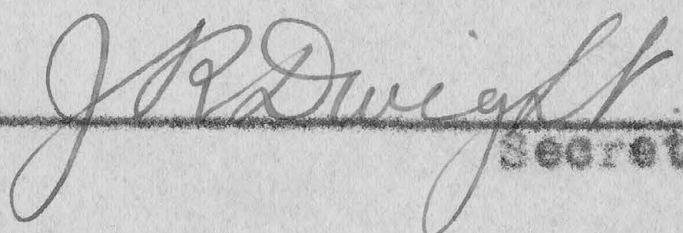
Practically the entire capital stock of \$1,000,000. has been issued for patents, and in our income tax return to the Government for the years 1913 and 1914, we have claimed a depreciation charge at the rate permitted by law of one-seventeenth (1/17) of the cost of the patents or approximately \$60,000 for each year, but we have not reduced our surplus by the amount of such depreciation. At the same time we have disbursed in dividends out of surplus, an amount which, if the depreciation had been written off, would encroach upon our capital, and while we have been advised by our counsel that there is nothing in the Federal Income Tax Law which expressly authorizes the collector to impose as a condition upon the allowance of a depreciation charge (which is expressly permitted by the Act) a requirement that the amount of such depreciation shall be written off on our books, it is possible at some future time that the collector may take issue with us on this score. Therefore, as a means of forestalling this possible difficulty, it seems desirable and expedient to arrange to reduce the capital stock of the company by periodically absorbing the shrinkage of value which is constantly taking place, and at the same time permitting a continuance of dividends without - in the eye of the law - impairing capital.

The plan is to decrease the authorized capital stock of the company 25% once every three years, the first decrease becoming effective as of October 31, 1915, and leaving the authorized capital stock

\$750,000. This would cover the estimated depreciation in value of our patents for the three years ending on that date. The patents were purchased in February 1913, but the company began business as of November 1, 1912; the oldest patents having twelve years to run from the time they were taken over in 1913. To offset this decrease in capital it is planned to make proper entries on the books of the company decreasing the book value of the assets to the extent of \$250,000. The chairman further stated that the most convenient way to accomplish this decrease of capital is to reduce the par value of the stock from \$100. to \$75. per share. If this plan of reducing the capital stock of the company is acceptable to the stockholders, they will be called upon to return their certificates of stock to have the new par value of \$75. per share endorsed thereon. Upon motion duly made and seconded the following resolution was unanimously adopted.

WHEREAS in the opinion of the Directors present it seems advisable to effect a decrease in the authorized capital stock of the company as outlined in the foregoing preamble, now therefore be it

RESOLVED that the Directors of the Dwight & Lloyd Sintering Company, Inc., recommend to the stockholders that the authorized capital stock of the company be reduced to the extent of 25% thereof, to a face value of \$750,000., and that such reduction be made pursuant to Section 28 of the General Corporation Law of the State of Delaware, by reducing the par value of the shares of the corporation from \$100. to \$75..


Secretary

DWIGHT & LLOYD SINTERING COMPANY, INC.

ROASTING AND SINTERING OF FINE ORES AND CONCENTRATES

29 BROADWAY, NEW YORK

CABLE ADDRESS "SINTERER" NEW YORK

March 17th 1915.

Mr. L. H. Hyde,
502 South Eastern Ave.,
Joliet, Ill.

Dear Louis:

Mr. Bliss called me up to-day by telephone from Washington and stated that he expects to go to Chicago in a day or so, and would probably get into communication with you about Saturday or Sunday - and will arrange for a conference and the taking of your deposition. I hope it may be convenient for you to meet him.

I sent you a few days ago, blueprints of some of the exhibit drawings relating to the Perth Amboy, Salida and Douglas hoods and igniters which were used in my deposition, and which I hope you may recognize.

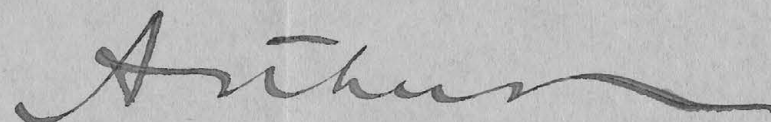
Mary and Reed arrived safely, and we are enjoying them very much.

Jane and I have to go to Boston to-night to attend my Aunt's funeral to-morrow, leaving Mary in charge.

Regards from all in the office.

Faithfully yours,

ASD



DWIGHT & LLOYD SINTERING COMPANY, INC.

ROASTING AND SINTERING OF FINE ORES AND CONCENTRATES

29 BROADWAY, NEW YORK

CABLE ADDRESS "SINTERER" NEW YORK

New York City, March 1, 1915.

Mr. L. H. Hyde,
502 Eastern Avenue,
Joliet, Illinois.

My dear Lou:

I was very glad to receive your letter of February 22nd, but was so deeply immersed in the legal business of a very complicated patent interference suit that I have had no chance to reply before this. The suit in question is an interference case with John E. Greenawalt, relating chiefly to details of ignition devices, and this particular case chiefly involves what we did with gasoline burners and hooded structures in connection with the same at Cananea, Perth Amboy, Salida and Douglas. The coal box igniter at Salida is also of interest as it contains some of the elements of a hood over the ore to be ignited and containing an igniting element, in this case a flame from the coal fire. We want to establish as clearly as possible the use by us of a hood over the igniting zone containing the hydrocarbon burner or burners, the edges of the hood making a comparatively tight connection with the upper surface of the ore or the sides of the pallets, so as to prevent disturbing currents of air from coming in to interfere with the uniformity of the ignition.

In order to refresh your memory on the arrangement at Perth Amboy, I am sending you herewith a blueprint of one of the exhibits we have put in, showing the burner pipe connected to the Sunset burner and covered by the asbestos hood which forms the de-

3/1/15

vice we found most efficient up to the time we got in city gas, about June 17th, which we found considerably cheaper as fuel. The records show that gasoline ignition cost about 13 ¢ a ton, while the city gas cost about 8 ¢ a ton. Of course, in many ways the gas was better, and more flexible and convenient, but from the standpoint of the Patent Office and in view of the matters involved in this case, we are perfectly justified in standing on the fact that the gasoline arrangement was, up to that time, the best of its kind, and the same idea has ^{since} been used by us frequently in other installations where gasoline was considered the proper fuel and, therefore, was not by any means abandoned when we substituted gas for gasoline at Perth Amboy. The patent law is very strict about "abandoned experiments", so we do not want to give a false impression in this respect.

I have no doubt that your note book contains many entries that would be of interest and possibly of help to my case, and I want to ask if you would be willing to do me the favor of going up to Chicago some day and seeing my attorney, Mr. H. H. Bliss, who is at present at the Auditorium Hotel (not Annex) and will be there for some days this week. He is a very busy man and hard to get hold of, but I am writing him that you will put yourself into communication with him, either by telephone or otherwise, and make an appointment for a conference with him, showing him this book and telling him what information you can give about certain points that he will bring up. I have told him that you must get away from Joliet for the north about March 15th, and told him that anything that he wants from you he must get before that time.

It is possible that he may want to put you on the stand and get from you corroboration on a few dates and facts that would

add strength to my testimony. That seems to be all that remains to be done now, as the whole case has been now mapped out in very elaborate form in my testimony and has stood the test of cross-examination by the opponent's attorney. Nobody else will have to go through anything like the strain that I had, and it is only to emphasize a few of the high points that Mr. Bliss may want some other witnesses. The chances are that he would want to ask you only a very few questions of a very limited scope. Such testimony would be given simply in the presence of a notary and typist, with Mr. Bliss and the other lawyer present. It is very different from a court proceeding.

I had a pretty heavy dose of it, however, as I was continuously on the witness-stand for 19 days consecutively, except Sundays but including Lincoln's and Washington's Birthday. I did not get through until last Thursday night. I think, however, our case is in excellent shape and with a little additional corroboration on a few details, we ought to stand a good chance of winning. While the matters involved in this interference are more or less detailed in character and relate chiefly to matters of ignition, it is being prosecuted by the other side with the hope of getting the thin edge of a wedge into our proposition, and it is highly important that their attack should be overwhelmingly defeated.

I have heard with much interest of your plans for going up to improve the Canadian land, and sincerely hope that your enterprise may meet with all success. We are looking forward to seeing Reed some time this month, and can imagine what the joy will be to you all to see him once more.

All of our household are well, and Janie is making fine

Mr. L.H.H.-4.

3/1/15.

progress in her college work.

Yours affectionately,

A. J. Dwight

P.S. Do not let Bliss scare you. He is rather an intense individual, but he knows his business, and his bark is decidedly worse than his bite, at least, for those on his side.

DRAWING No. 27

SUNSET HYDROCARBON BURNER.

U.S. PATENT OFFICE.

JOHN E. GREENAWALT VS ARTHUR S. DWIGHT.

INTERFERENCE No 3541G.

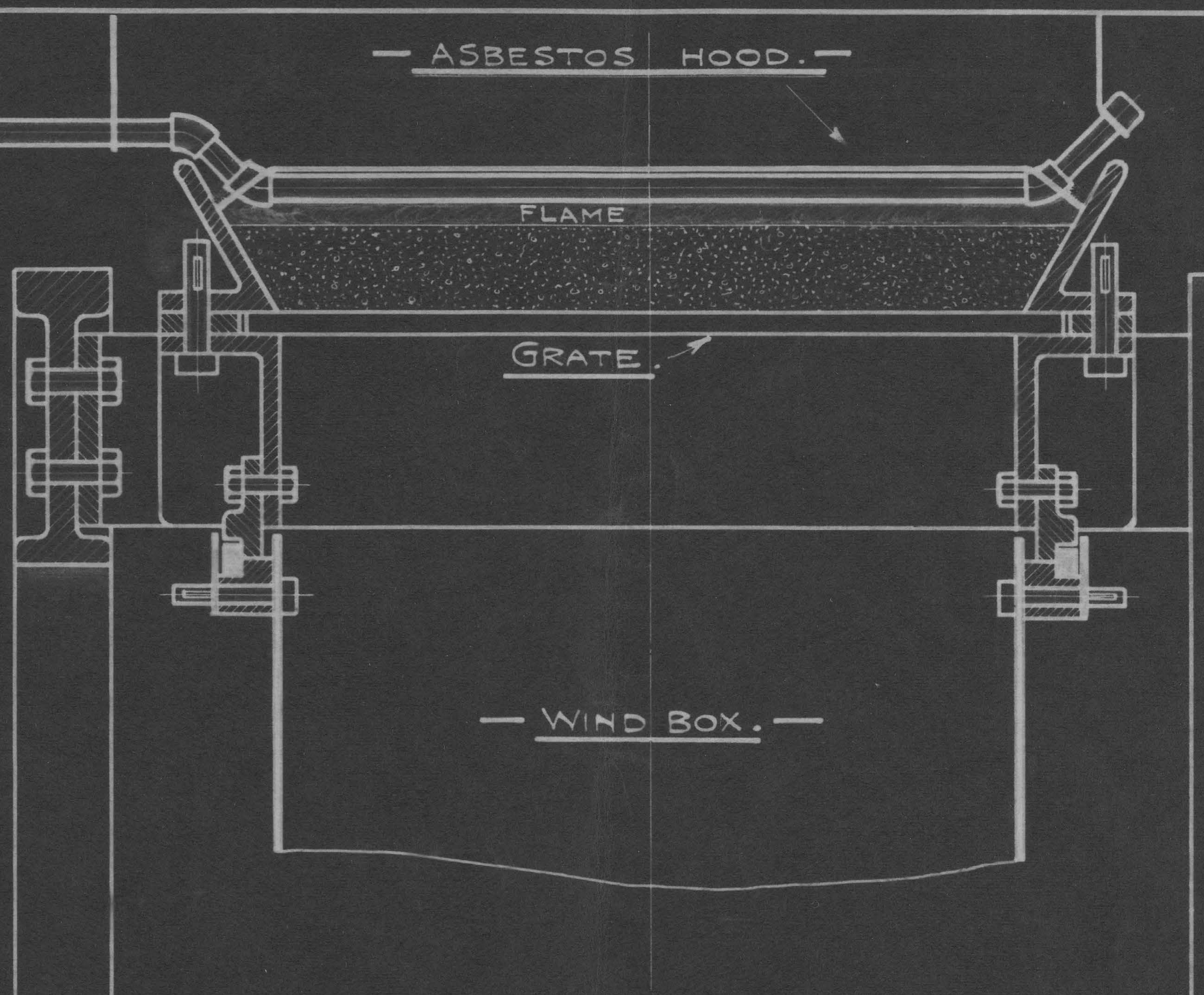
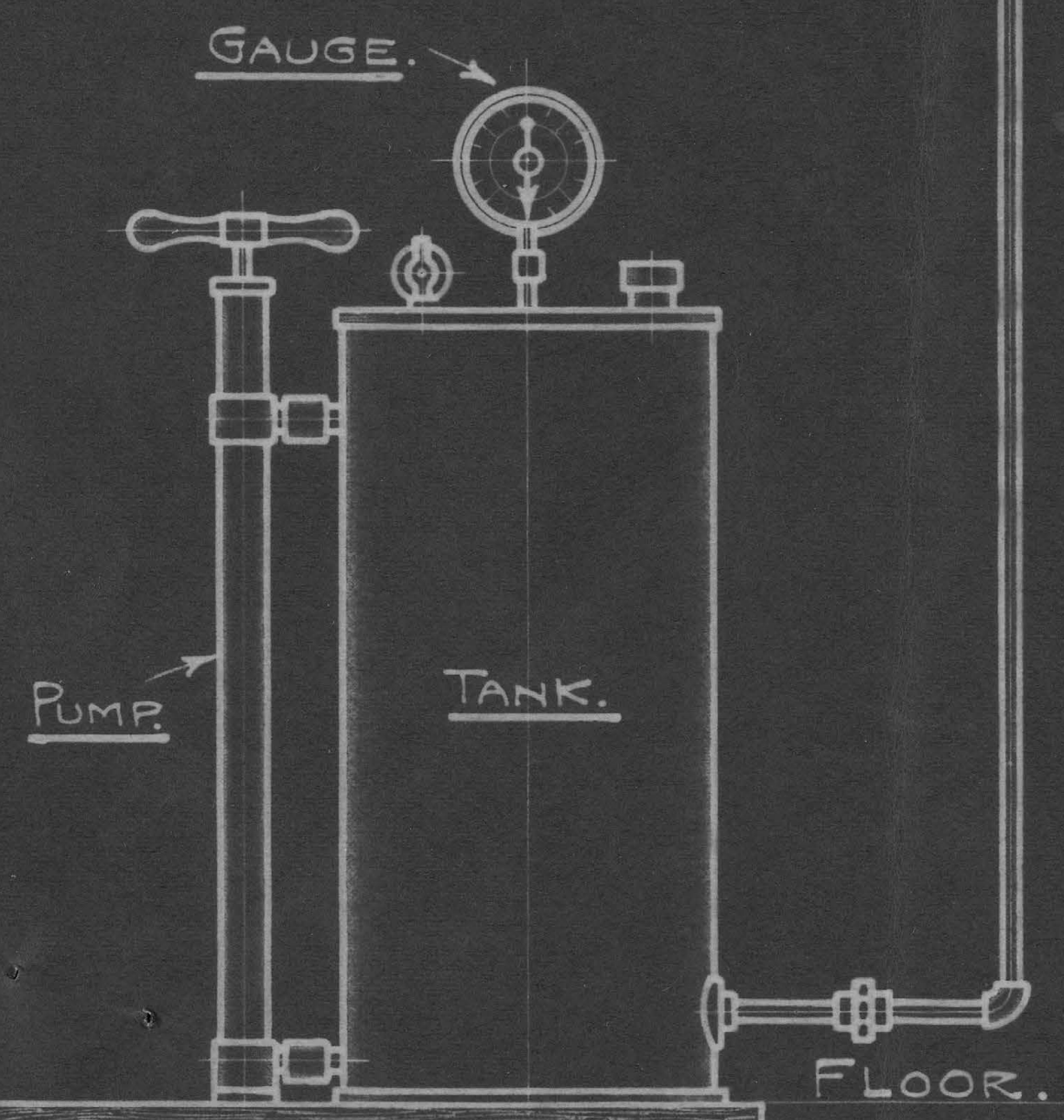
SUBJECTS.

APPARATUS FOR ROASTING OR SINTERING ORES.

PROCESS OF TREATING ORES.

DWIGHT EXHIBIT DRAWING No 27

John E. Greenawalt vs Arthur S. Dwight



VIEW FROM BACK OF IGNITER.

— DIAGRAM OF IGNITION SCHEME. —

— PERTH AMBOY MACHINE. —

— USING SUNSET GASOLINE BURNER. —

— APRIL 18TH 1907. —



Miss W D Palmer

3 miles East Johnst

2 1/2 " West New Ten

Monday Mch 8

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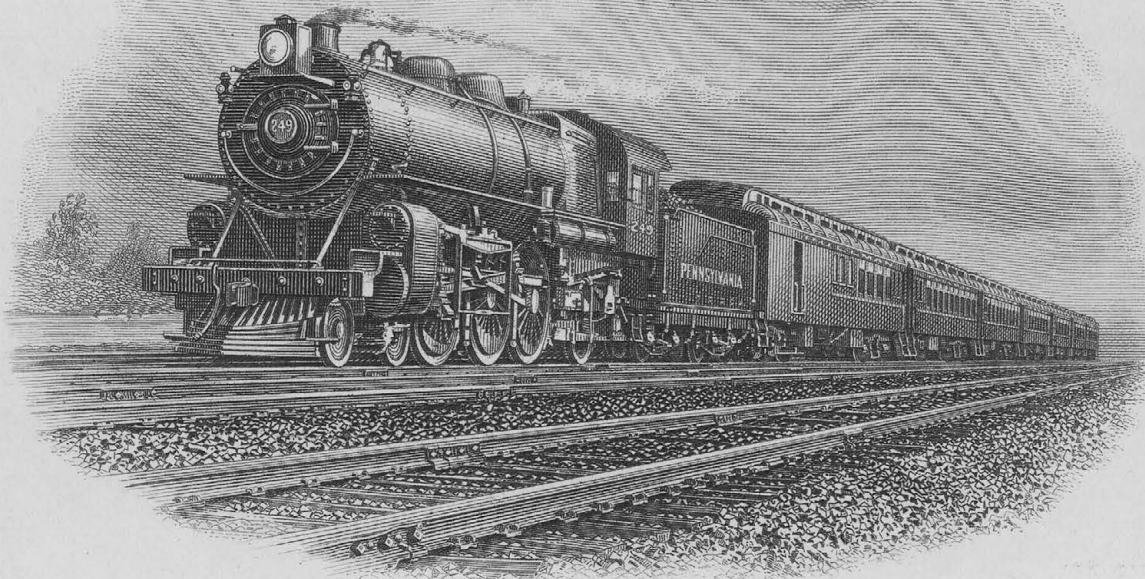
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D + L S

BROADWAY LIMITED

TWENTY HOURS BETWEEN
CHICAGO AND NEW YORK

Dictated to the
Official Stenographer



ALL-STEEL CARS
ROCK BALLASTED ROADBED

SPECIAL FEATURES
STENOGRAPHERS OBSERVATION CARS
BARBERS TELEPHONES
LADIES MAIDS BATH ROOMS
MANICURES

PENNSYLVANIA LINES, EN ROUTE. March 4th, 1915.

Mr. Louis H. Hyde,
502 Eastern Avenue,
Joliet, Illinois.

Dear Mr. Hyde:

I hoped last evening to be able to send you a line by midnight mail from Chicago to Joliet after you called me on the 'phone. But I was at that time in a meeting with several parties which continued in session until nearly midnight and was unable to send word.

I had received at the hotel an hour or two before our 'phone talk a letter from Mr. Dwight; but I did not have opportunity to read it carefully and, therefore, was not as well equipped, when talking with you on the 'phone as I would have been if I had had opportunity to thoroughly digest his letter. I gave it careful consideration after talking with you on the 'phone and saw that it referred to many of the same topics which you mentioned. But the fact is that I was hurrying through some matters at Chicago in order to get this morning's fast train back to Washington, where I have an important argument in a case set for tomorrow. I mentioned in our 'phone talk that I would have to leave by 12 o'clock and saw that that would not fit in with your possibilities and so suggested that we arrange for a conference when I am back in Chicago, which I think will be from Wednesday to Friday of next week.

I was particularly anxious to get a chance to look over the notebook that Mr. Dwight refers to in writing me which, as I understand it, shows a good many historical data of matters occurring in connection with the sintering business from and after May, 1907.

BROADWAY LIMITED

TWENTY HOURS BETWEEN
CHICAGO AND NEW YORK

Dictated to the
Official Stenographer



ALL-STEEL CARS
ROCK BALLASTED ROADBED

SPECIAL FEATURES
STENOGRAPHERS OBSERVATION CARS
BARBERS TELEPHONES
LADIES MAIDS BATH ROOMS
MANICURES

PENNSYLVANIA LINES, EN ROUTE.

Mr. Louis H. Hyde -- #2.

For some reasons it may turn out better that we should have the conference a week or so later, as I will be able to bring with me drawings and data from the East for your review and which I have not with me this trip. Mr. Dwight's recollection is, as presented by him in his statement, that he began along in April and May, 1907, to employ the ignition system having oil flames and a superjacent hood device, that these were used on the Perth Amboy machine before June 17th, 1907. And that after that he made use, more or less extensively, on succeeding machines of oil flames and hoods of one form or another. That he employed such hood and ignition systems at later dates (1909 and later) there will be no question; but I am very anxious to establish that he was fully acquainted with and had practically used such an ignition system prior to July, 1907. Mr. Dwight has in his office in New York a number of large drawings which have been made as exhibits and show the various hood mechanisms that he has used from time to time. It may be that by this time they have had copies made of these and if, on my return to the East, I find that to be the case I will have some copies sent to you for your review.

Yours truly,

H. H. Belino

NIGHT MESSAGE.

THE WESTERN UNION TELEGRAPH COMPANY.

INCORPORATED

24,000 OFFICES IN AMERICA. CABLE SERVICE TO ALL THE WORLD.

ROBERT C. CLOWRY, President and General Manager.

Receiver's No.

Time Filed

Check

SEND the following night message subject to the terms on back hereof, which are hereby agreed to.

2/1/15

190

To

Dwight Lloyd Smiley to
29 Broadway

was

gasoline used when I reached
Rattle Amboy - City gas much later.

Have engagements here Feb fifth, eighth
and nineteenth. Expect to leave for Canada

March twenty second. Can come between these
dates. Would I wanted, notify me as far ahead as possible.

READ THE NOTICE AND AGREEMENT ON BACK.

Have written

NIGHT MESSAGE.

ALL NIGHT MESSAGES TAKEN BY THIS COMPANY ARE SUBJECT TO THE FOLLOWING TERMS:

The Western Union Telegraph Company will receive messages, to be sent during the night, for delivery not earlier than the morning of the next ensuing business day, at reduced rates.

To guard against mistakes or delays, the sender of a message should order it REPEATED; that is, telegraphed back to the originating office for comparison. For this, one-half the regular rate is charged in addition. It is agreed between the sender of the following message and this Company, that said Company shall not be liable for mistakes or delays in the transmission or delivery, or for non-delivery of any UNREPEATED message, beyond the amount received for sending the same; nor for mistakes or delays in the transmission or delivery, or for non-delivery of any REPEATED message beyond ten times the sum received for sending the same, unless specially insured, nor in any case for delays arising from unavoidable interruption in the working of its lines, or for errors in cipher or obscure messages. And this Company is hereby made the agent of the sender, without liability, to forward any message over the lines of any other Company when necessary to reach its destination.

Correctness in the transmission of a message to any point on the lines of this Company can be INSURED by contract in writing, stating agreed amount of risk, and payment of premium thereon, at the following rates, in addition to the usual charge for repeated messages, viz, one per cent. for any distance not exceeding 1,000 miles, and two per cent. for any greater distance. No employee of the Company is authorized to vary the foregoing.


No responsibility regarding messages attaches to this Company until the same are presented and accepted at one of its transmitting offices; and if a message is sent to such office by one of the Company's messengers, he acts for that purpose as the agent of the sender.

Messages will be delivered free within the established free delivery limits of the terminal office. For delivery at a greater distance, a special charge will be made to cover the cost of such delivery.

The Company will not be liable for damages or statutory penalties in any case where the claim is not presented in writing within thirty days after the message is filed with the Company for transmission.

ROBERT C. CLOWRY, President and General Manager.

WESTERN UNION



NIGHT LETTER

Form 2289 K

GEORGE W. E. ATKINS, VICE-PRESIDENT

NEWCOMB CARLTON, PRESIDENT

BELVIDERE BROOKS, VICE-PRESIDENT

RECEIVED AT

B 3 CH NR 47 NL

TD- GREAT NECK NY JAN 31 ST--1915

L H HYDE,

502 EASTERN AVE,

JOLIET ILLS.

ON ACCOUNT PATENT QUESTIONS PLEASE WIRE MY OFFICE DO YOU REMEMBER
WHETHER WE WERE USING GASOLINE IGNITION OR CITY GAS WHEN YOU ARRIVE
PRETHAMBOY DO YOU REMEMBER USE OF ASBESTOS HOODS OR DEFLECTORS
AROUND BURNER IF SO MAY WANT YOU COME ON FOR CONFERENCE COULD YOU
COME.

A S DWIGHT.....755AM

DWIGHT & LLOYD SINTERING COMPANY, INC.

(SUCCESSOR TO DWIGHT & LLOYD METALLURGICAL CO.)

ROASTING AND SINTERING OF FINE ORES AND CONCENTRATES

29 BROADWAY, NEW YORK

A. S. DWIGHT

PRESIDENT

January 2nd 1914.

Mr. Louis H. Hyde
502 South Eastern Ave.,
Joliet, Ill.

Dear Sir:

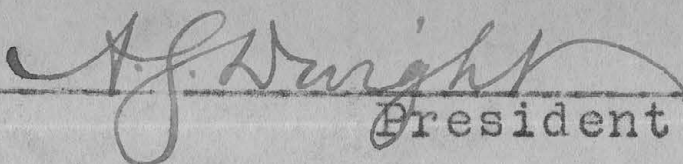
We take pleasure in enclosing herewith check in payment of Dividend No. 1 of one and one-half per cent ($1\frac{1}{2}\%$) due this day on the number of shares of stock of the DWIGHT & LLOYD SINTERING COMPANY, INC., registered in your name.

No acknowledgment is necessary; endorsement on the check is sufficient receipt.

Yours very truly,

DWIGHT & LLOYD SINTERING COMPANY, INC.

JCB
encl.



President.

DWIGHT & LLOYD METALLURGICAL COMPANY

ROASTING AND SINTERING OF FINE ORES AND CONCENTRATES

25 BROAD STREET, NEW YORK

A. S. DWIGHT

PRESIDENT

New York, March 1, 1913.

ANNOUNCEMENT

Owing to the rapid growth of the business of this Company, it has been found expedient to make a division of territory and place the responsibility for the business in the North American countries, viz: United States, Dominion of Canada, Republic of Mexico and the Republic of Cuba, in the hands of a separate corporation. Accordingly, the Dwight & Lloyd Sintering Company, Inc., has been organized under the laws of the State of Delaware, as successor to the Dwight & Lloyd Metallurgical Company within this territory, and has taken over the title to all those letters patent previously owned by the Dwight & Lloyd Metallurgical Company in the above mentioned countries which relate to the combined roasting and sintering of ores, together with all pending applications for patent, outstanding licenses and the good will of the business.

In future, therefore, all of our business relating to the countries of North America will be carried on by the Dwight & Lloyd Sintering Company, Inc.

The Dwight & Lloyd Metallurgical Company will continue to own and administer such of the Dwight & Lloyd foreign patents as have not otherwise been disposed of, especially in Australia and South America. It will also specialize along the line of general metallurgical research work.

The treatment of iron ores by the Dwight & Lloyd process will remain, as heretofore, in the hands of the American Ore Reclamation Company, 71 Broadway, New York, Special Licensee for Iron and Steel in North American Countries.

These new arrangements will inure to the distinct benefit of existing and future Licensees of the Dwight & Lloyd sintering process, as additional patents of great value have been acquired by the new Company, for use by our Licensees without additional royalties. These patents supplement in an important way the regular chain of Dwight & Lloyd patents, and safeguard our Licensees against annoyance from other claimants, at the same time greatly broadening the field of utilization.

Among these newly acquired patents may be mentioned the following:

The basic patents of Perkins & Cox, covering broadly the use of an ignited inflammable gas for kindling a mass of material to be sintered, represented by U. S. Patent No. 852,611 of May 7th, 1907.

The Perkins and Requa patents relating to certain phases or variations of the Dwight & Lloyd process and apparatus, and represented by U. S. patents Nos. 951,198 and 951,199 of March 8th, 1910.

It should also be mentioned that the Company owns patent No. 916,903 issued March 30th, 1909 to F. D. Weeks, covering a stationary grate or sintering hearth in combination with a travelling distributing hopper and igniter.

The Company also has a number of other important improvements which are still in the Patent Office, and which when issued will contribute still further to the convenience and security of our Licensees.

Mr. Arthur S. Dwight, one of the original patentees will remain in direct charge of the operations, as President of both Companies and will give his personal attention to the direction of the business as heretofore.

Licensees are reminded that they are free to avail themselves of the services of the staff of experts which we maintain, to help them in solving any special problems in sintering ores, or in locating causes of irregularity and inefficiency in their sintering



1882
Will County National Bank
CAPITAL STOCK AND SURPLUS \$310,000
C. E. WILSON, PRES. J. W. FOLK, VICE PRES. HENRY J. WEBER, CASHIER
JOLIET, ILLINOIS

Mr. A. S. Dwight.
Dwight and Lloyd Sintering Co. Inc.
29 Broadway - New York City.

Gentlemen:

I am forwarding the certificates
of stock held by Mr. Louis H. Hyde, as
you requested in your letter to him
of Sept. 22nd ^{addressed to Boston Mass.} which has just reached
me. Will you kindly return them
the new certificates to him in
in Joliet - as he will soon be
returning from Manhattan.

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very possible
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t, New York City.

URGICAL CO.
President.

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plants. The charges for this service are merely nominal, and are specified in the license contracts. Correspondence is also invited in connection with any minor troubles which may develop, for it is the earnest desire of the Company to assist Licensees in every possible way to make their plants eminently successful, and thus to give "value received" for their royalties.

In future, therefore, please address all communications relating to our North American business to

DWIGHT & LLOYD SINTERING COMPANY, INC.

Address (until May 1, 1913) 25 Broad Street, New York City.

Respectfully,

DWIGHT & LLOYD METALLURGICAL CO.

A. S. Dwight, President.

NOTICE OF REMOVAL

On May 1, 1913, the New York offices of the Dwight & Lloyd Sintering Company, Inc., and of the Dwight & Lloyd Metallurgical Company, will be removed to the Columbia Building, 29 Broadway, N. Y. City, Rooms 1500-1502.

DWIGHT & LLOYD SINTERING COMPANY, INC.

ROASTING AND SINTERING OF FINE ORES AND CONCENTRATES

29 BROADWAY, NEW YORK

CABLE ADDRESS "SINTERER" NEW YORK

New York City. March 13, 1915.

Mr. L. H. Hyde,
502 Eastern Avenue,
Joliet, Illinois.

Dear Hyde:

I received your letter of February 25th some time ago, and have been planning to answer it every day since that time. I have not yet been able to get up the energy so far and, as you are going away in a few days, I take it for granted that you would prefer to have a typewritten letter that you can read, to a hand-written letter that you would not be able to read.

You have lost your pull with Mrs. Stehli. She thought that that negative of her had been made away with long ago. In fact, she stole it from me a couple of times, but I always succeeded in getting it back. She, however, agrees with me that it is a pathetic picture, and that when she feels down on her luck she will be able to refer to this picture and see that there have been worse times in the past, so that your work will not have been entirely wasted. You are mistaken about the cup of tea. It was canned soup.

Father and Mother and also Edgar have moved into their new house, which is just over the crest of the mountain from Upper Montclair. They like it very much and are very comfortable. We are still living down on Christopher Street. I do not know whether you ever were in this house or not. I have already gotten my vegetable garden started, and am going to have a wonderful display of

Mr. L. H. Hyde-2.

3/13/15

tulips, hyacinths, etc. this spring. I planted about 8000 of them last fall. I imagine you will be able to make an early start all right on your Canadian property this year, as it looks as if we were going to have an early spring. I most certainly would like to go there and pay you a visit, and it is quite possible I will drop in on you some time during the summer if I get out west. Just where are you located up there? It certainly must be a great game country and I would enjoy a couple of weeks up there in September. I judge that your gasoline tractor that you refer to is a Bates. I hope he makes them better than sintering machines. Also, it seems to me like tempting Providence to have a Bates gasoline tractor and a Ford automobile at the same time. However, when one is out of business, you can use the other one to do the work.

Things have been pretty slow with us here, and we have not been doing much new business lately. Mr. Morse has been here frequently, and is now in the hospital undergoing an operation. Hampton-Cloncurry have not been doing any sintering for a considerable while and, apparently owing to the war, nearly all of the Australian plants are shut down. Here in this country, those which we already have in are working along on regular time, but nobody is putting in any new construction.

We are sending you under separate cover a package of blueprints, containing:

#22	}	Salida firebox.
34		
#24	}	Douglas hood and burners.
25		
#16	}	Perth Amboy burner and hood.
17		
33		

which Mr. Bliss has requested us to send to you, and these he will

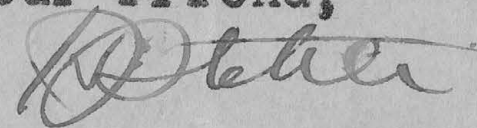
Mr. L. H. Hyde-3.

3/13/15

probably talk over with you the next time he is in Chicago.

Mrs. Stehli joins me in very kindest regards to Mrs. Hyde and all the family. We both would very much like to see you all.

Sincerely your friend,



HJS:CMS

6 SHARES DWIGHT & LLOYD
SINTERING STOCK



INCORPORATED UNDER THE LAWS OF
DELAWARE



Dwight & Lloyd Sintering Company, Inc.

Full Paid and Non-Assessable

This is to certify that Arthur S. Hyde is the
owner of Six Shares of \$25 Par Value of the Capital Stock of

Dwight & Lloyd Sintering Company, Inc.

transferable on the books of the Corporation by the holder hereof in
person or by duly authorized Attorney upon surrender of
this Certificate properly endorsed.

Witness the Seal of the Corporation and the
signatures of its duly authorized Officers affixed
this thirtieth day of March 1934

Joseph Chrusan
Secretary
Ass't Treasurer

R. R. Clay
President
Vice-President



For value received _____ hereby sell, assign and transfer unto

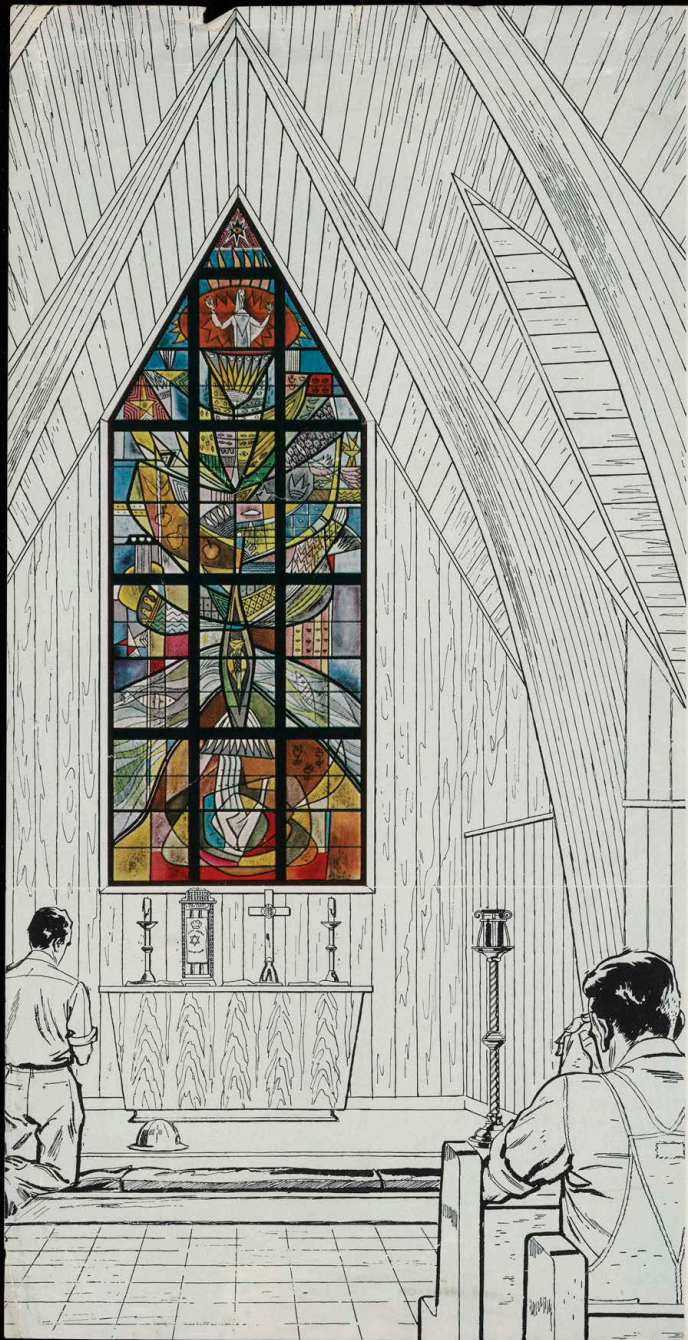
_____ shares
of the capital stock represented by the within certificate and do hereby irrevocably constitute and appoint

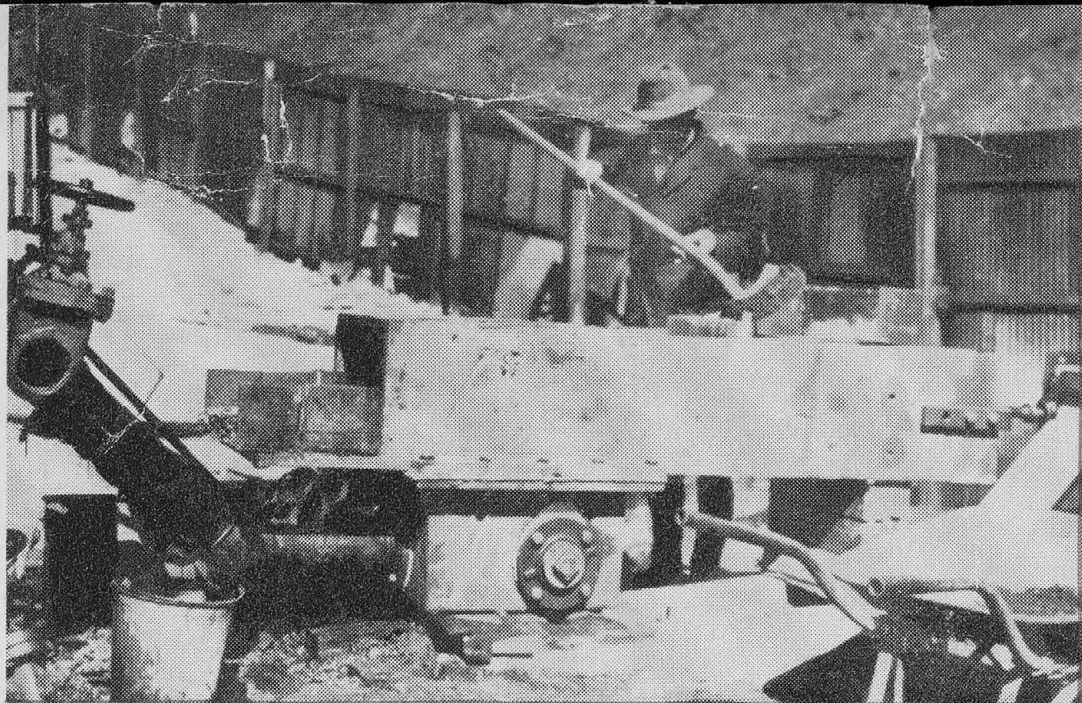
_____ Attorney to
transfer the said stock on the books of the within named corporation with full power of substitution in the premises

Dated _____

In presence of _____

NOTICE:—THE SIGNATURE TO THIS ASSIGNMENT MUST CORRESPOND WITH THE NAME AS WRITTEN UPON THE FACE OF THE CERTIFICATE IN EVERY PARTICULAR, WITHOUT ALTERATION OR ENLARGEMENT OR ANY CHANGE WHATSOEVER.





First Dwight-Lloyd machine, seen above being hand loaded by coinventor Lloyd in 1906, was prototype of big modern sintering plants like that pictured below

BIRTHDAY FOR A CAKE

SINCE this is the fiftieth commercially successfully year of the Dwight-Lloyd continuous sintering process, it might be an appropriate occasion for the American steel industry — to which that process is increasingly important — to be thankful that a 1906 obituary notice was premature.

On June 2 of that year Arthur Smith Dwight was reported among those killed in a two-day battle with rioting strikers at a copper mine in Cananea, Mexico, where Dwight was superintendent and general manager. In recording the event, the *New York Sun* referred to Dwight as “one of the greatest metallurgists and mining experts in America.” That description was undoubtedly accurate. But the gifted engineer fortunately suffered only a minor scalp wound. The injury did not keep him long from his regular duties, or from work on the machine that was to bring metallurgical fame to him and to its coinventor, Richard L. Lloyd, who ran the mine’s smelting department.

Oddly, Dwight and Lloyd did not develop their sintering machine for the iron and steel industry but rather for the solution of an urgent problem at the Cananea mine where they worked. The mine’s blast furnaces were becoming increasingly choked by fine particles of copper sulphide which were blown up the flues. Resulting inefficiency had developed to a point where it seemed advisable to close the mine.

The solution lay in fusing the fine ore and flue dust into firm, porous chunks that could readily be charged into the furnaces. This is known as sintering. In 1906 the process consisted of roasting a batch of “fines” in a big pot over coals through which air was forced. It was a slow, unsatisfactory job.

Dwight and Lloyd set out to remedy its disadvantages. After numerous dis-

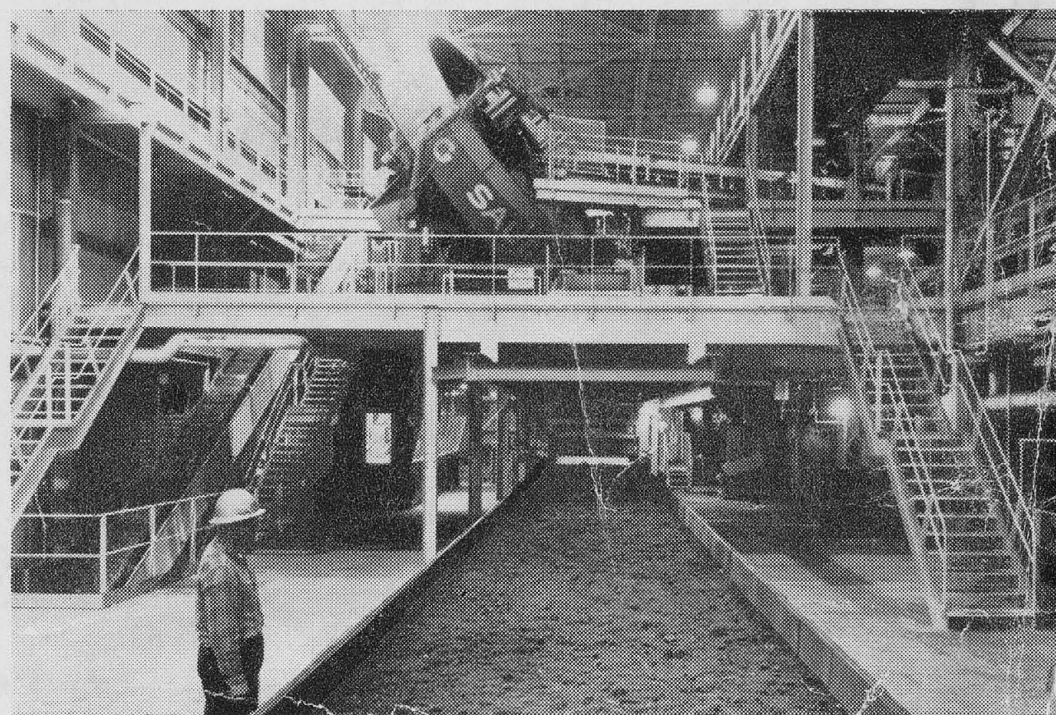
couraging experiments with various ignition and draft systems they came up with a hand-cranked machine that produced sinter of convenient size, delivered from an endless belt of pallets.

Having survived gunfire and achieved success, Dwight and Lloyd decided to leave Mexico and devote their full time to further development and marketing of the sintering machine. Their first sale was to a smelting company in Salida, Colo., where they installed and operated a machine in August 1908. Three years later the first testing plant for sintering iron ore was built for a Pennsylvania iron company.

From there on the collaboration of Dwight and Lloyd was successful, although for many years their machines were used largely by the nonferrous metal industries. But with the gradual depletion of domestic highgrade reserves, sintered ore, with its high iron content, is virtually indispensable.

Today’s machines, which can produce up to 6,000 tons a day, seem a far cry from the device that turned out the first cake of Dwight-Lloyd sinter. But the basic process is unchanged.

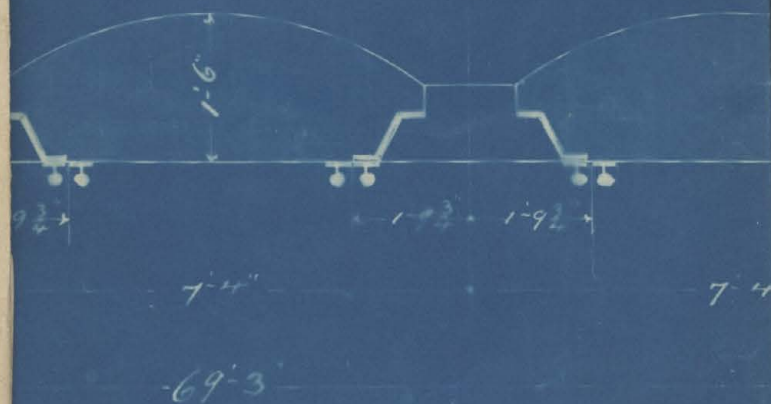
Maybe the two inventors didn’t know what was coming when they baked that cake. But they did much to help provide an ample diet for steel-hungry America.



El Paso Roaster
Kloz Design -

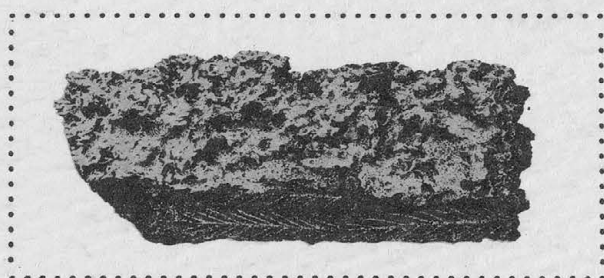
Kloz Design -

669.036



THE

CAKE



THAT

DWIGHT

AND

LLOYD

BAKED

This booklet was prepared for the occasion of the dedication of the new Dwight-Lloyd Sintering Plant of Ohio Works, United States Steel Corporation, Youngstown, Ohio, June 12, 1958.



The Cake that Dwight and Lloyd baked

How an Industry was born

In 1908 the first production continuous sintering machine was installed at a multi-metals smelting plant at Salida, Colorado. It climaxed five years of intensive work by the inventors, Arthur S. Dwight and Richard L. Lloyd.

It was natural that the invention of the continuous sintering process should have been born of need. It was odd that it should have taken place in a town like Cananea, in the remote hill country of northern Mexico, away from convenient sources of supplies and services. But Dwight and Lloyd were men of immense determination. Here follows a chronicle of the events leading up to the building of the Salida machine, and the beginning of a new metallurgical industry.

THE YEAR 1906 was the most eventful in Arthur S. Dwight's life. He had come to Cananea, Mexico, sixty miles south of Bisbee, Arizona in 1903, and since that time, problems connected with his work had been building up to a climax.

Dwight, general manager and superintendent of the Cananea Consolidated Copper Company, had lots to worry about. The expense and trouble of treating fines from the mines and processing equipment were mounting steadily. He and Richard L. Lloyd, superintendent of the smelting department, were devoting a constantly increasing amount of time to the problem. It would be out of the question to tear down the blast furnaces which were more and more choked by copper sulphide fines

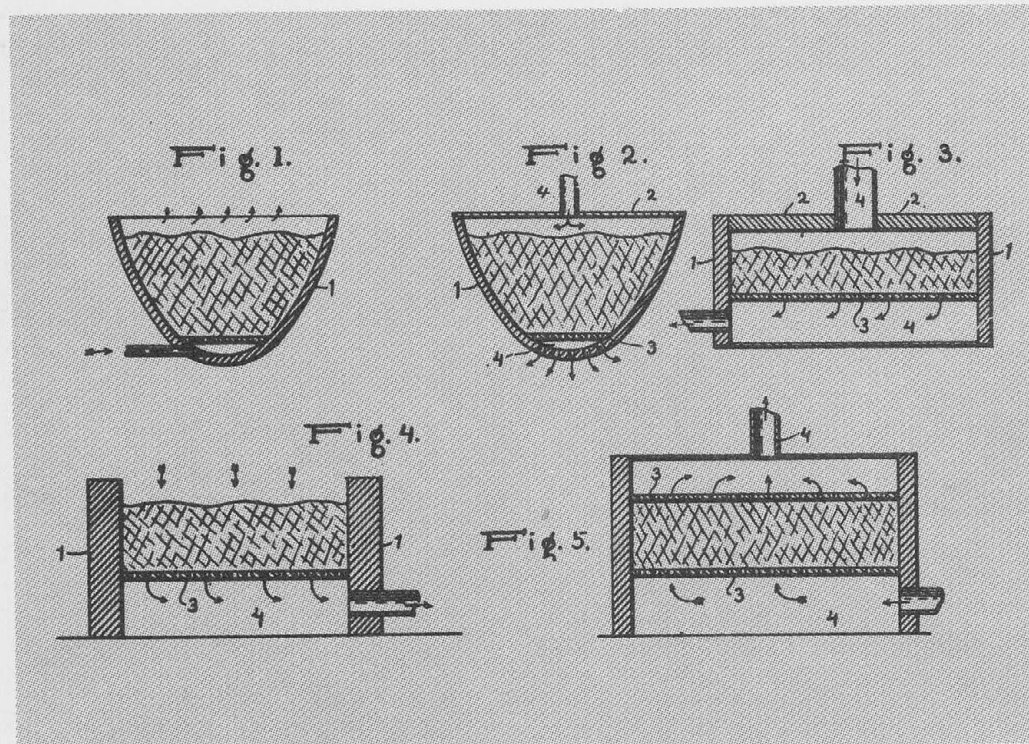


This is a vivid representation of the time consuming, back-breaking and expensive task of breaking up the product of the batch roasting processes in use before continuous sintering.



Early U. S. smelters seldom made good friends of nearby residents. This photo shows erosions near a Tennessee operation of pre-Dwight-Lloyd vintage. Cattle were similarly affected by burning of excess sulphur.

The Cake that Dwight and Lloyd baked



Dwight often used these drawings to show the inventors' metallurgical approach to continuous sintering. (1) Tried conventional batch sinter pot. (2) Tried downdraft, abandoned it. (3) Thin bed of ore, air forced downward from a nozzle. (4) Downdraft with broad distribution of air. (5) Updraft, with grates top and bottom to prevent agitation.

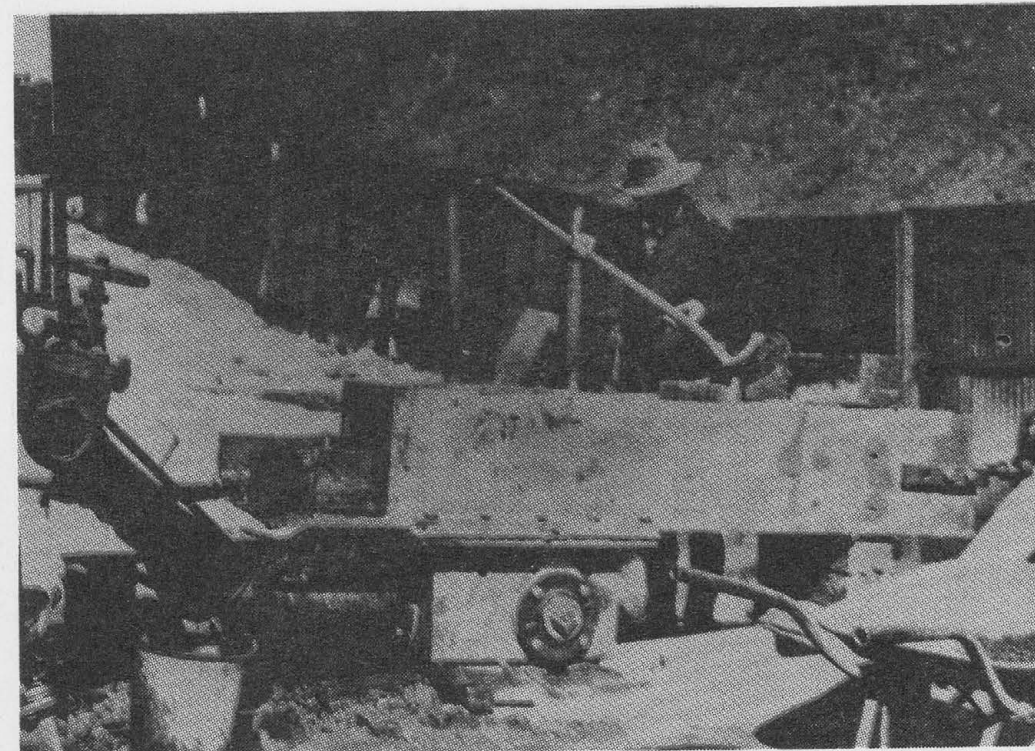
and build reverberatory furnaces which would tolerate them somewhat better. It would be wiser to close the mines.

Relations with the Mexicans were edgy. The Diaz regime was strongly anti-American. There were no complaints about the wages. Mexicans received the same as Americans who worked in the mines. There were reports that the newly organized International Workers of the World leaders had selected Cananea as a target. Complaints when they came from the workers were vague and the spokesmen could not be persuaded to put them in writing. At the bottom of it seemed to be an innate hatred of border city natives for the more enterprising capitalists from the north. After all, Dwight and the others wore white shirts and ties all day long. Mexicans did the work. It was difficult to be philosophical about the problem, since several members of Dwight's family were with him. Among his relatives was a youngster, Harold Rowen, who later was to play an important role in enhancing the heritage Dwight left.

If the Mexicans had known more about what Dwight was doing the complaints would have disappeared on the spot. Dwight was working to save the mines and smelter. It was a re-enactment of the old battle of man and his ingenuity against the dwindling offerings of nature.

Years before, after Dwight had graduated from the Columbia School of Mines, his star rose rapidly. He found rewarding work in the mines of Colorado and northern Mexico. His papers on metallurgy appeared frequently in the leading journals of that era. Col. William C. Greene, owner of the Cananea company, saw in Dwight experience and doggedness he needed to pull his irons out of the fire in Mexico. The company had paid no dividends for years. He hired Dwight as assistant to the president and consultant for his Cananea operations.

Dwight's resourcefulness paid off, and almost immediately Consolidated was paying large dividends. Greene promoted Dwight to superintendent and general manager. But the handwriting was on the wall, and Dwight saw it. He became almost exclusively occupied with an entirely new method of treating the fine ores which were choking Greene's blast furnaces into inefficiency.



Richard Lloyd shown charging the Dwight-Lloyd invention machine on the day the continuous sintering process was born. An original photo, preserved in the Dwight-Lloyd historical archives.

In a sense it was remarkable that Dwight should have undertaken this project. His early successes showed that he would do well at anything he attempted. Handling of fines was fraught with unattractiveness and even dangers. Yet Dwight loved the out-of-doors and had a close kinship with the fraternity of hard rock miners. In his work at Cananea he had both, and in addition—should he succeed—the hope of a considerable reward.

Dwight first experimented with a device known as the batch roasting pot. Fine ore was charged into the pot over a bed of hot coals. Air was forced upwards. In a number of hours, most of the ore had formed into a solid mass, and the entire charge was dumped. Fierce billows of noxious smoke arose, and the workers ran for cover. Production was unbearably slow. The solid masses had to be broken apart tediously with sledge hammers. The process was all wrong, but it was the only one then known.

Dwight got Lloyd to help, and the two determined the conditions that would have to be fulfilled if they were to develop a satisfactory method of agglomerating the dust-fine copper sulphides into solid clinkers—"sinter cake"—that could be charged into the blast furnaces.

Such a method, they realized, would have to be continuous, that is a steady charge of ore reliably delivering a rigid agglomerate at a constant rate. Its production would have to reach upwards of twenty five tons per day per unit, compared with five or ten by existing methods. The clinker would have to be porous, solid, and strong enough to endure handling. The equipment would have to withstand brutal treatment from abrasive ores. Processing would have to be very carefully controlled; that is, the charge would have to be brought up to the instant of fusion and then quickly cooled, else there would result an impervious mass.

The two men worked through 1904, 1905, and by the beginning of 1906 realized they were finally on the track of a method with real promise. They determined to build a device which would operate as an endless chain of pallets laden with relatively thin layers of ore past a combustion area. The ore would be held firm by per-

How an Industry was born

vous grates. The pallets would load from hoppers at the feed end, and dump sinter at the other. Air would be forced upwards, intensifying the heat at the combustion area. By means of the blast, flame and speed of the strand, a high degree of control could be reached.

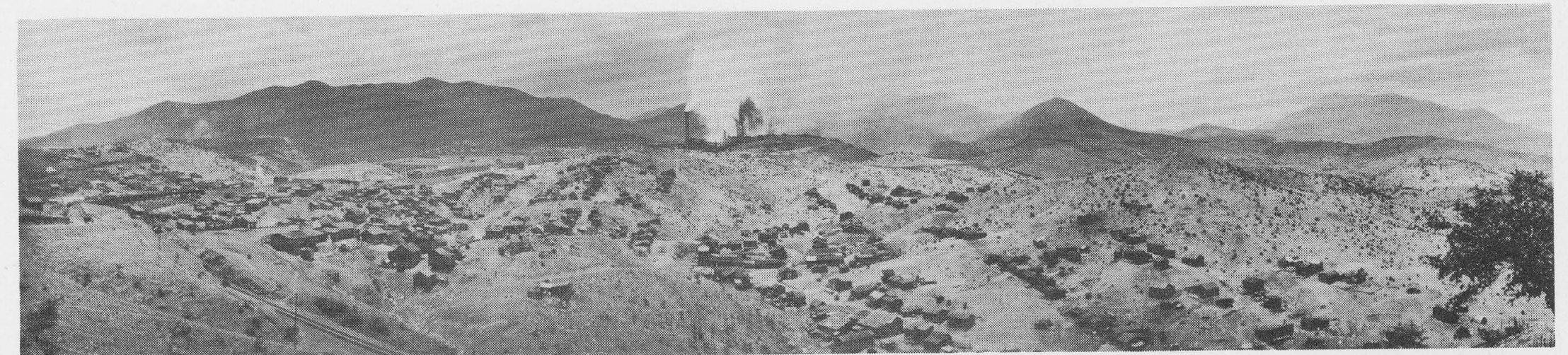
There followed an intensive series of experiments, agonizing because they approached but never reached the exact conditions needed. Dwight and Lloyd tried many variations on the ignition system, the grates, the blast, the pallets, but for a long time, couldn't come up with the right combination. Following a day of particular frustration, Dwight and Lloyd took a ride into the cool Mexican night, each intent upon the problems he faced. They began talking, and then, suddenly, both decided that their method of handling the draft was causing the trouble.

They got a couple of hours of sleep and went back to work. The next day, they completed a rough version of the first continuous sintering machine. Lloyd shovelled ore carefully into the feed end. An assistant held a gasoline blow torch at the combustion point. Another cranked the endless strand they had rigged. And a cake of sinter, almost perfect in its properties, fell from the pallet at the far end of the machine. This pioneer machine, Dwight said, "had the astonishingly great capacity of one ton a day." But it demonstrated the continuous process.

Soon after, Dwight built a larger, but still primitive machine for the Cananea mine, and it showed promising results. Then abruptly real trouble began at the smelter. A group of Mexicans, most of them outsiders, appeared with knives and guns and began to riot. The trouble grew and shooting started. George Metcalf, the company's rental and lumber agent, and his nephew Will Metcalf, were mercilessly stoned and knifed to death. The riots made headlines throughout the U.S. Dwight was reported dead and an obituary appeared in the Boston newspapers. But soon a wire was received by Greene reading "Matters clearing up satisfactorily." It was signed Arthur S. Dwight. Later he was learned to have been wounded, not seriously, while trying to bring the rioters under control. But, while the news of Dwight's death was somewhat exaggerated, the fact remained that the atmosphere in Cananea was less than ideal.

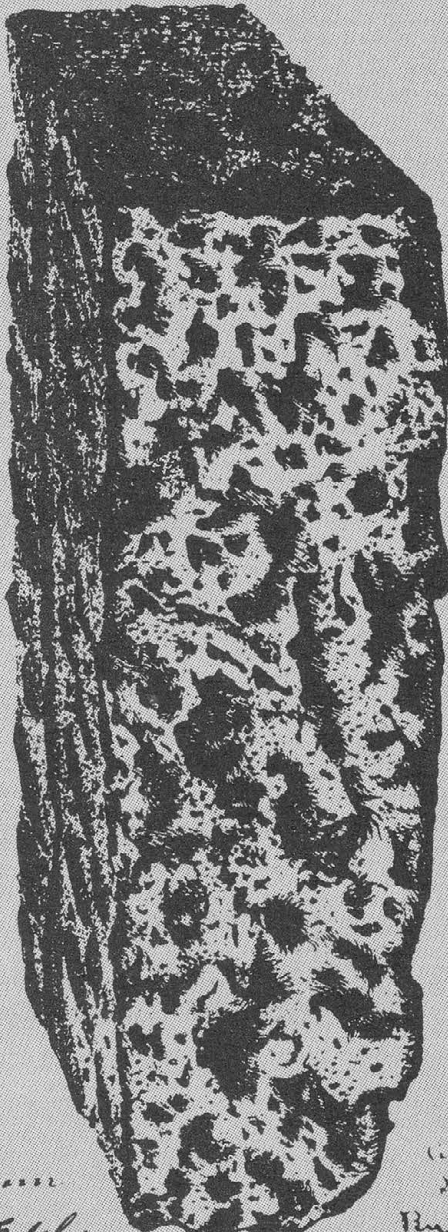
Early in the summer the inventors filed for patents, and in July, 1906, they left Cananea, determined to devote all their time to the development of the Dwight-Lloyd sintering process.

For demonstration purposes they built a drum-type machine in Perth Amboy, New Jersey, in 1907. It is



The Cananea Consolidated Copper Company nestled in the hills of Cananea, State of Sonora, Mexico. Dwight and Lloyd spent 1903-1906 working out a practical method of continuously converting copper

A. S. DWIGHT & R. L. LLOYD
METALLIFEROUS ORE PRODUCT
APPLICATION FILED APR. 9, 1908. RENEWED DEC. 6, 1910.
1,020,345. Patented Mar. 12, 1912.
2 SHEETS—SHEET 2



Witnesses
J. B. Francis
George E. Edger.

Inventors
A. S. Dwight & R. L. Lloyd
By H. H. (Signed)
Attorney

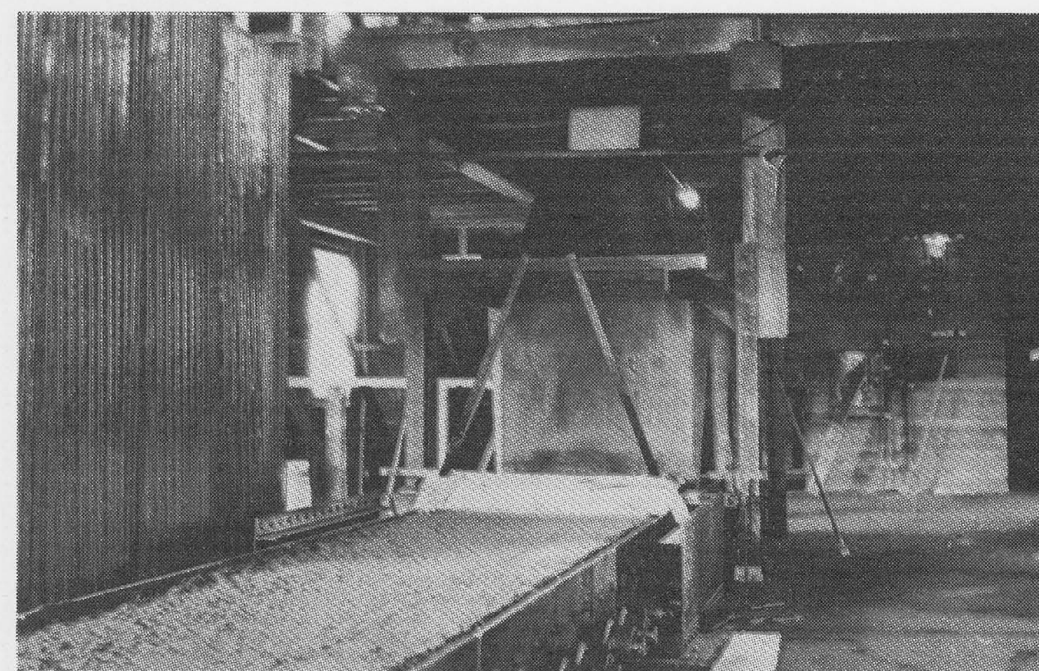
Here is the cake that Dwight and Lloyd baked—a cake of sinter made from ore fines. The cake was patented as the product of the Dwight-Lloyd process. Had it been made of solid gold, and a thousand times larger, it would not have been of such great value.

conservative to say that it was the marvel of the metallurgical world. Dwight, asked a few years later to give a bibliography of the process, answered that so many articles had been written about it that it would be a labor of much time to give anything like a complete accounting of them.

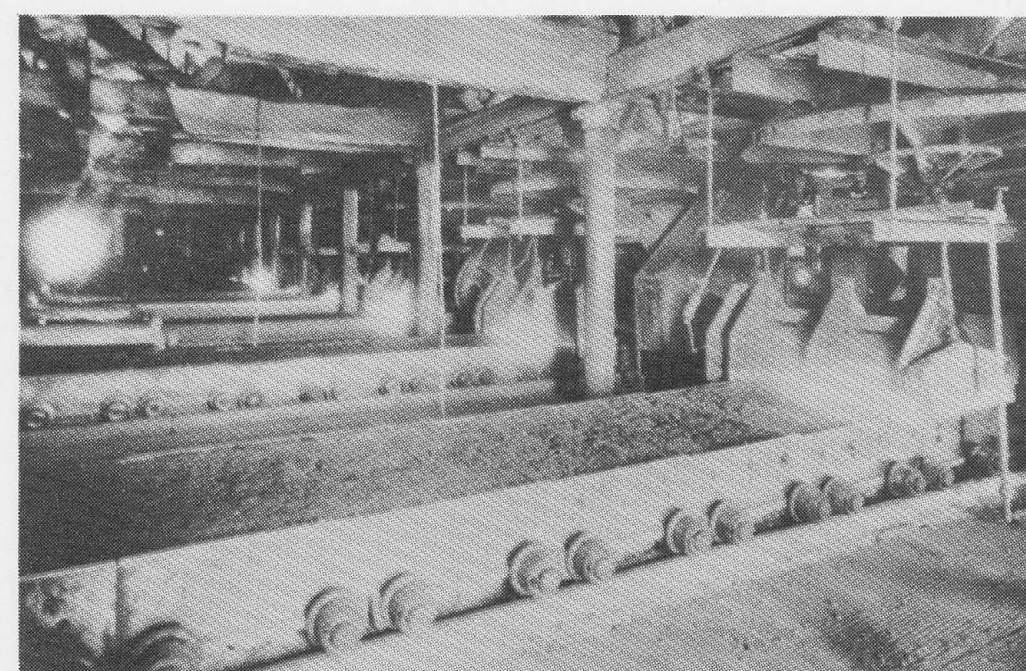
From 1906 to 1908, Dwight and Lloyd were developing a machine that would operate successfully on a com-

sulphide ore fines to a "uniformly porous, rigid, cellular material," suitable for charging into blast furnace. Cananea very nearly became their permanent resting place when the Mexicans rioted in 1906.

The Cake that Dwight and Lloyd baked



The first sintering plant for the ferrous industry was installed at Birdsboro, Pa., in 1911. It was designed by Dwight and Lloyd and delivered by their licensee, American Ore Reclamation Company.



Reliability is one of the great assets of Dwight-Lloyd sintering equipment. This multiple-strand, non-ferrous installation at East Helena, Montana, has been operating faithfully for nearly fifty years. Non-ferrous industries have long been major users of Dwight-Lloyd equipment, and have helped in developing the process to its present state.

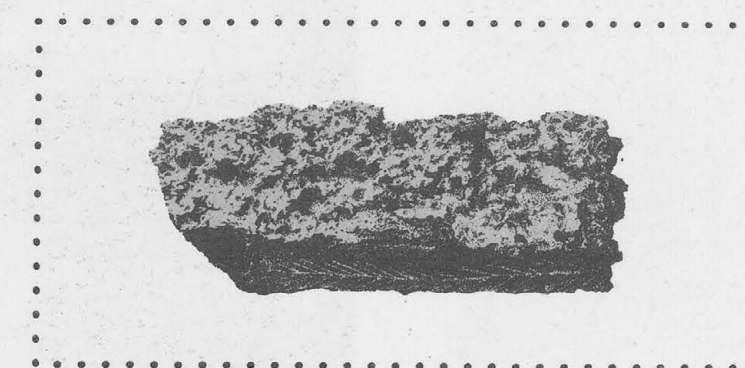
mercial scale. They had plenty of requests, but refused all where it seemed that conditions were not perfect for the maiden voyage of the process in production. Finally they agreed to build a production machine at Salida, Colorado, for The Ohio and Colorado Smelting Company. This machine, completed and put into operation in June, 1908, was the grandfather of every machine in operation today, differing only in size and details from the continuous sintering machines now being built throughout the minerals processing world.

It is difficult to realize today what a stir was caused by the cake that Dwight and Lloyd baked. Their patents were so complete that they even included a cake of sinter, the final product of the process. They received, for the life of their patents, a royalty on every cake of sinter continuously produced anywhere in the world. Dwight and Lloyd defended their claims to the process through numerous court proceedings by others who claimed priority, but they emerged in each case with complete victory. They continued to live full and useful lives, forming companies to produce sintering equipment and license the Dwight-Lloyd process for all branches of mining. Dwight became internationally recognized as a pyrometal-

lurgical authority. He was honored for his work and bravery in World War I when he served for two years in France and on the British front. Later he was made president of the American Institute of Mining and Metallurgical Engineers.

Dwight and Lloyd's activities embraced almost every aspect of the development, sale and production of continuous sintering equipment. Their intense concentration on research and development led to the construction and operation of a complete minerals processing laboratory, the first of its kind. From the countless improvements to the art which stemmed from this activity, it is second in importance only to the invention of the process.

The company Arthur S. Dwight and Richard L. Lloyd formed to manufacture sintering equipment was known for many years as Sintering Machinery Corporation. In 1955 it was purchased by McDowell Company, Inc., engineers, contractors, and manufacturers for the basic industries, and it is now their Dwight-Lloyd Division. It is interesting to note that Harold Rowen, who lived through the Cananea experience with his famous relative, is general manager of the division and is widely known in the minerals processing world.



Sintering's Golden Era

THE FIRST production continuous sintering machine was built at Salida, Colorado, 50 years ago. Today its successors serve minerals processing applications as the world's largest tonnage producers. Thousands of Dwight-Lloyd® sintering machines have been used for beneficiation and product synthesis.

Dwight-Lloyd machines consist of endless chains of grate-laden pallets with drive mechanisms for moving the pallets over horizontal windboxes. A sintering machine includes ignition burners for igniting the ribbons of charge material on the grates, and fans for inducing air through windboxes and grate apertures. Product is discharged by inverting the pallets around the discharge curve, after which pallets are automatically recycled. The product, sinter cake, is a strong cellular clinker, completely heat-hardened, with remarkably enhanced metallurgical properties.

In principle, the sintering process consists of charging a bed of fine moistened materials, which are then subjected to heat developed by combustion of fuel within the bed while individual particles are kept in quiescent state. An air draft is induced through the bed, made porous for the operation, and this draft combined with an ignited solid fuel provides combustion. Through heat transfer the sintering process is completed. Usually mixing, igniting, burning, and cooling are the main phases of the generic term "sintering". For all practical purposes, sintering has no parallel in nature, not even in diastro-

phism, and is therefore a wholly man-made phenomenon. There is no mining of "natural" sinters.

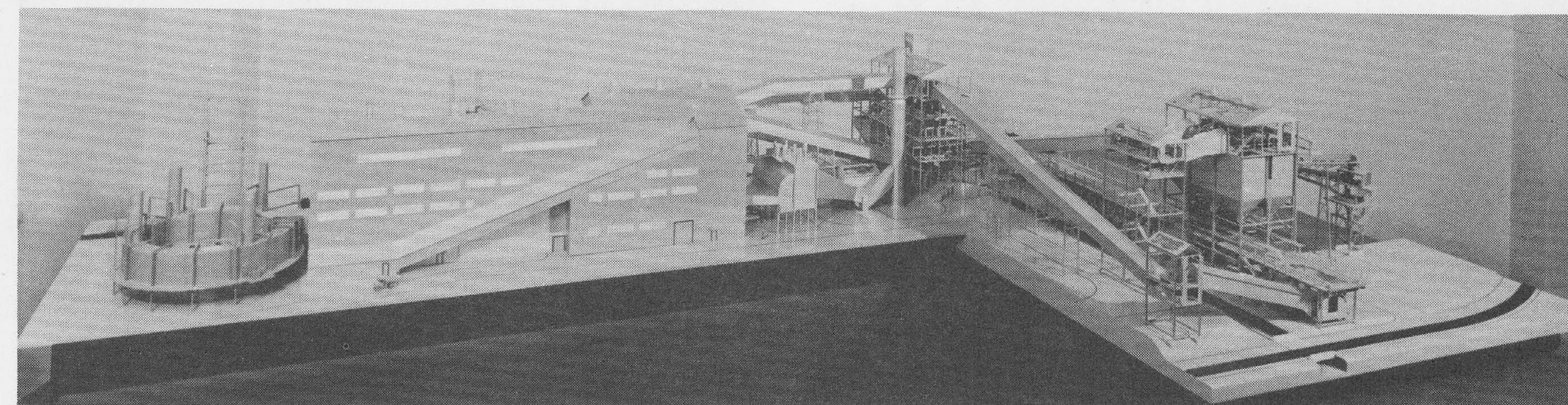
Its Appeal

Unique features of the Dwight-Lloyd machine and its sintering process have caused it to be widely accepted as a reactor in that it sustains a continuous chemical process—including: (1) continuous flow, (2) thermal efficiency, (3) design simplicity, (4) unit capacity and (5) applications of research.

The Dwight-Lloyd design gave continuity to operations which had been highly intermittent, or "batch". As an integral part of a smelter, with duties of preparing beneficiated feed for blast furnaces, the sintering machine gave wide latitude of positive production.

Further, economically moderate heat requirements were possible, because of combustion within a moving bed, thus minimizing heat losses. A heat exchanging phenomenon known as "counter-transverse" resulted in transmission of heat through the sinter bed. This continual heat exchange contributed to high thermal efficiency.

Metallurgists quickly grasped that control and simplicity of operation were characteristic of Dwight-Lloyd processing. Sustained bed porosity through rotary blending, simple ignition from stationary burners and maintenance of air draft, provided the main control. The speed of the sintering machine by mechanical drive



The benefits of sintering iron ore fines to increase production of iron in existing blast furnaces have been fully realized in recent years.

This precise model shows a modern Dwight-Lloyd sintering plant presently under construction for a U.S. steelmaker.

The Cake that Dwight and Lloyd baked

Recently completed Dwight-Lloyd Sintering Plant at Ohio Works of U. S. Steel Corp., Youngstown, Ohio. Flying Saucers at top center are preparing the raw material charge; automated control center is visible at left of sinter strand. Low plant manpower requirements are indicated.

systems assured solid flow control. Location of the zone of combustion termination or "burnthrough", was indicated by pyrometers, and with this knowledge, operators could get peak performance from the machine.

Because of the *thin* moving bed phenomenon, the sintering process falls within the range of two-dimensions reckoning, therefore it can be positively scaled to large production units. Structural considerations prevail rather than the complicated physics of gas-solid penetrations, for instance. This is the prime reason for the enormous productive capacities of Dwight-Lloyd machines. Continual applied research on the process since its inception by Dwight-Lloyd has been another big contributing factor.

These advantages have made sintering a standard in a broad range of industries. Plants have been built to sinter phosphate, bauxite, copper, iron, lead, manganese, nickel, vanadium, zinc and other ores. In addition to treating ores and calcines, there are many installations for reclamation of dusts, ashes, tailings and scrap metals. Lightweight concrete aggregate from smoke stack wastes and portland cement are two examples of more recent products developed by sintering.

The Big Four

Both ferrous and nonferrous industries use sintering as a means of liberating sulphur or other undesirables from ores. In certain applications some of the isolated substances are reclaimed as useful products.

Sintering is also commonly used to make lightweight aggregate from shale, clay and flyash. The product is strong and lightweight with excellent insulation and acoustical properties.

The chemical industry uses sintering to prepare intermittent products such as phosphate agglomerates for electro-thermal reduction and cement clinker for portland cement manufacture. U.S. cement makers currently use rotary kilns to make clinker, but active experimental work with the Dwight-Lloyd process shows advantages of sintering with regard to unit capacities, thermal savings and product yield.

These four industries—ferrous metallurgy, nonferrous metallurgy, aggregate, and chemical—are the world-wide major users of the continuous sintering process today. However, reactions involving pelletized masses and hot gases such as carbonizing, oxidation, direct reduction, heat exchanging, calcination, volatilization, drying and heat hardening are all open considerations for modified Dwight-Lloyd machines. Thus many horizons are being investigated with immediate and future applications goals.

The Old and the New

Although its basic principles are intact, the sintering machine has progressed considerably in 50 years. The Salida machine had a hearth area $2\frac{1}{2}$ feet by 10 feet and could produce about 25 tons of product a day. Though this was impressive then, today's machines are



immense by comparison. Modern sintering machines are about four times as wide, 20 times as long and have productivities which may be 200 times as great. Three of the new McDowell ferrous sinter plants each will deliver start-up tonnages in excess of 5000 tons per strand per day.

Air draft systems of early sintering plants were relatively inefficient, mixing was primitive, and the materials handling functions required considerable manual labor. Today's big plants have huge draft fans ranging upwards to half a million cubic feet per minute of exhaust, coupled with efficient dust collection systems and special wind-box seals for inducing the draft through the bed of raw materials with high efficiency. Proportioning and mixing have undergone similarly important changes. Rising labor costs have provided the impetus for greatly improved equipment and advanced automation.

The Mix is the Thing

But far and away the most significant refinement of today's continuous sintering is related to raw material preparation. This parallels beneficiation of material for blast furnace charging, a topic which has been widely discussed in recent years. It has long been said among personnel of the Dwight-Lloyd Research Laboratories that "you make sinter in the mix", and that the machine can produce only as well as the mix allows. Uniformity of fuel content, moisture content, and bed permeability

Sintering's Golden Era

are recognized as requirements for consistently efficient sintering. Mechanical means of dispersing heterogeneous solids with moisture into uniform nodular textures is best accomplished we believe, by the turbulent back-mixing action of the McDowell-developed Flying Saucer®.

Many ingredients, having various physical properties, may make up the charge burden for a typical ferrous sintering plant. These might be ores of varying sizes and moisture levels, dry blast furnace flue dust, sinter machine exhaust dust, dry granular returns—cellular in texture and varying in temperature, sticky iron bearing sludges, and damp granular coke breeze. It is important to proportion and blend these constituents into a homogeneous porous burden for the sinter machine. We regard our Flying Saucer as unsurpassed as a sinter mixing device. Patents are applied for.

Now Automation

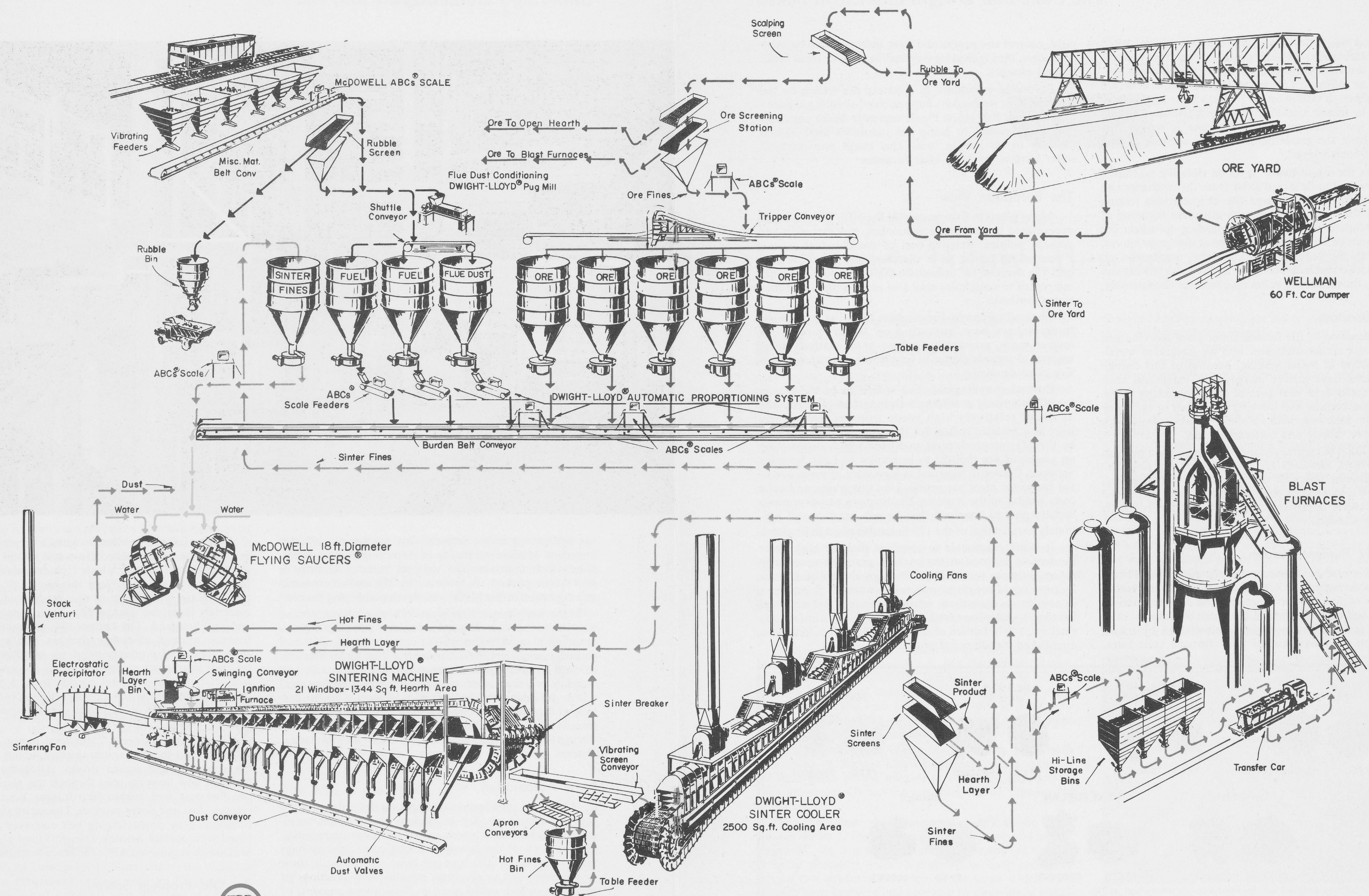
Obviously, production tonnages on the order of 5000 tons per strand per day in modern plants means correspondingly large hourly tonnages of sinter burden material. Certain parts of the flowsheet circuit cause flow tonnage rates in excess of 300 tons per hour. To reconcile these two factors, and to eliminate possibly slow reactions of operators—which could result in tremendous amounts of spillage or mechanical damage to machinery—automation is a necessity.

In a typical new ferrous Dwight-Lloyd plant, hundreds of functions are controlled from one master panel in an air conditioned center, which includes television. Communication is constant from this center to many areas of the plant while each of the feeders which delivers materials from the storage bins is separately controlled and synchronized. The factors that contribute to maintenance of high efficiency such as fuel consumption, draft, flow, and product output are constantly recorded by instruments by means of which the control center can refer current or trend conditions to a normal. The control center also enables an operator to observe visually an area of trouble or to search for a suspected trouble spot by dialing a reference.

Of the approximate 7500 total motor horsepower required by a modern sintering plant, about half is used for conveyor and screen drives. Altogether there are 9 major flow lines running through the plant—incoming ore, flue dust, fuel, rubble, hearth layer, hot returns, cold returns, dust and sinter product. The entire system is kept functioning by proportioning belt conveyor scales combined with control devices. Dwight-Lloyd plants include McDowell-engineered ABCs® Scales, a proprietary product.

An Old Problem Solved

In the important realm of manpower, less maintenance has resulted from improved plant design. For



SIMPLIFIED FLOW DIAGRAM - 5000 TON PER DAY DWIGHT-LLOYD® SINTERING PLANT-U.S. STEEL CORP., OHIO WORKS, YOUNGSTOWN, OHIO

The Cake that Dwight and Lloyd baked

example, a hearth layer of nut-sized sinter is deposited on the grates underneath the sinter burden. This practice provides several contributions to better maintenance economies, as follows: (1) grate bar temperatures are lowered through insulation, (2) hearth layer acts as filter medium to inhibit trickling of burden and/or plugging of grate bar apertures, (3) sinter cake is readily discharged from the grates because of an intrinsic parting nature of hearth layer.

Before the use of hearth layer on sintering machines, sinter cake had to be jarred loose from the discharge end of the machine. This caused the characteristic jerking action of the older machine, with attendant bumping of pallets. Modern machines have retarding sprockets for maintenance of minimum pallet gaps at discharge curves, which with the redesigned dual drive mechanism on Dwight-Lloyd machines, combine to eliminate jerking and bumping, thus lessening pallet maintenance considerably.

Even Elevators

The function of the ferrous sinter plant has emerged from a dust reclamation unit into an integrated metallurgical phase of metal making. Because of this change sinter plants have greatly increased in value and have been accepted as a vital part of the steelmaking cycle. Better housekeeping and working conditions of the sinter plant have followed, with resulting improvements both in employee morale and cost experiences.

In addition to centralized instrumentation and modern safety devices, elevators are provided for carrying personnel between floors of the building. Proper lighting, ventilation and weather protection have been introduced as architectural improvements. Dynamic color coding is becoming standard.

The Fifty Percent Burden

There are several reasons for the recent interest in ferrous sintering in the United States. First, increasing quantities of fine ore have necessitated consideration of sintering and more important, the value of sinter as blast furnace feed has finally been acknowledged by major steel plants. Improvement of blast furnace coke rates,

yield, control and production have been reported by most producers, thus indicating worthwhile benefits from benefited charges.

Favorable economics of sintering are shown by the fact that U.S. steelmakers have doubled sintering capacity over the past five years. Plants currently under construction are expected to bring the industry's total annual capacity to 60 million tons. This could provide 50% sinter burden for U.S. blast furnaces.

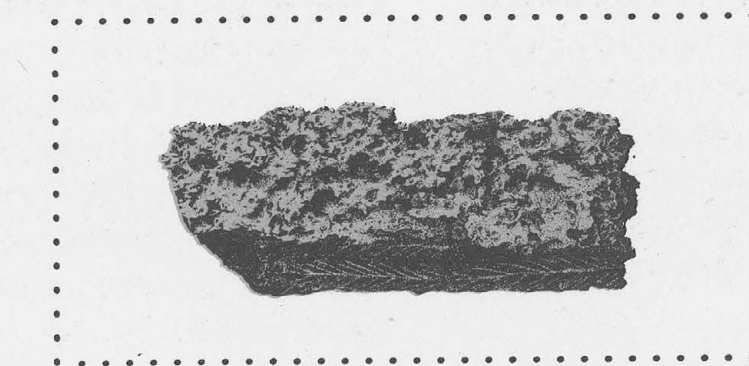
The European View

Many plants in Europe surpass the 50% sinter burden, necessitated by individual economics, raw materials and perhaps politics. Relative cost of metallurgical coke is a compelling factor, as is the chemistry of native iron ore. The demand for immediate blast furnace metal without regard to economics may also explain the use of high sinter burdens.

England's Appleby-Frodingham plant has reported its furnaces have been operating on 100% burdens for several years, principally because of a relatively large amount of volatile matter in lean iron ore, causing excessive coke demands.

Cost of metallurgical coke is said to be the reason for 90% burdens at Sweden's Domnarfvet plant, despite its use of relatively high grade iron ore. Iron at any price is a possible reason for the 80% burdens reported by the Magnitogorsk plant in Russia which is operating on grades of ore thought to be similar to Lake Superior varieties. France is regarded as a country of great potential for sinter plant expansion. Iron ore grades and coke costs similar to the Appleby-Frodingham situation cause metallurgists to conclude that French practice will ultimately parallel that of the 100% burden plant in England.

It is not reasonable to conclude that the high sinter burdens of European steelmaking practices necessarily reflect ultimate technology. Perhaps the entire ferrous industry could benefit by review of western U.S. practices in nonferrous operations, where continuous sintering was invented and pioneered. At many U.S. nonferrous smelters, 100% burden of self-fluxing sinter has long been established metallurgical practice.



Dwight-Lloyd® Research Laboratories

Sintering's Future: Revelation by Research

VARIETY is the only constant of minerals processing. The complex nature of the earth's crust is widely acknowledged by researchers. Geological deposition of heterogeneous materials poses many problems. Minerals processing investigation naturally has to respect the fact that the response of similar minerals of different deposits will exhibit this variation in processing behavior.

This was among the first discoveries of Dwight and Lloyd. For example, one combination of materials was found to make a perfect sinter; another, possibly varying only slightly in mineralogical characteristics, was found to be unsuitable. Between these extremes a wide range of products was observed—more or less difficult to make, more or less desirable in chemical properties, and more or less costly in production.

Dwight-Lloyd pilot research of minerals processes provides positive answers to three vital questions asked by industry: (1) using *our* raw material, can a product be formed, (2) would this be commercially feasible, using *our* individual logistics, and (3) if so, what would be *our* investment and engineering requirements to get into or expand production?

This was the dedicated purpose of their research as Dwight and Lloyd visualized it, and the extent of their foresight, until very recently, was known only to a comparative handful of industrial metallurgists, chief engineers, and others, who had come to rely on it as very good insurance against the mistakes of large capital plant expenditures based on unproved minerals processes.

It is probably safe to say that for every plant built as a result of Dwight-Lloyd pilot research, as many as 10 have fallen by the wayside of economic disapproval, thus substantially saving precious capital expense for many clients.

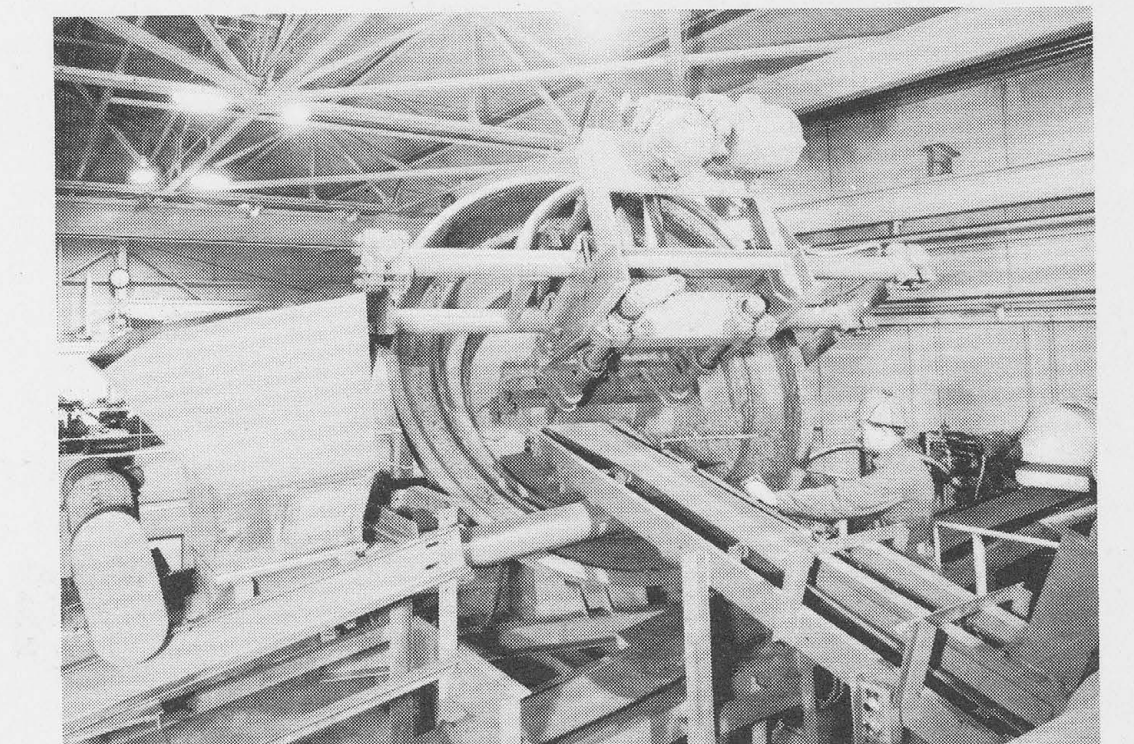
For these and other reasons, the work of the lab is known on its home reservation as "hammer and shovel research", for it is not the pure, but the applied variety. It is the processes research required by basic industries whose raw materials are earth elements which have already been analyzed and accepted by chemists or metallurgists or both.

Among thousands of minerals which have been

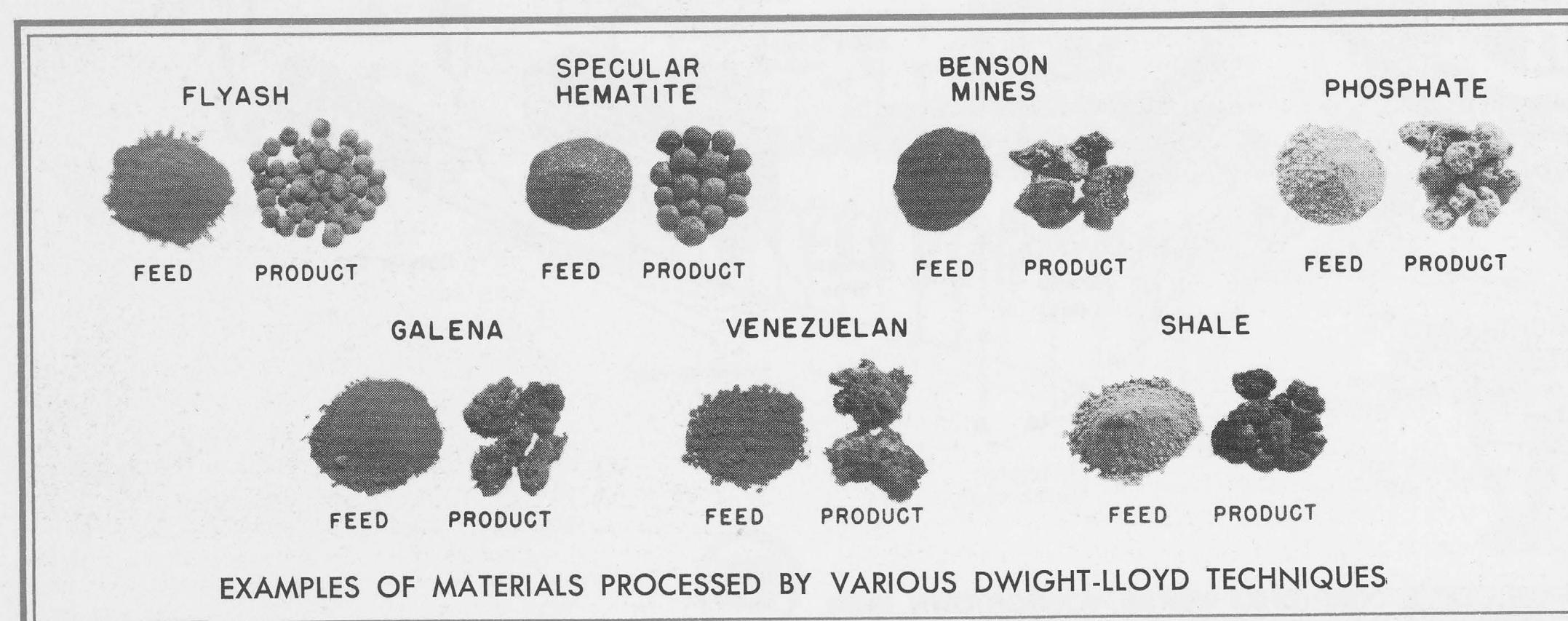
Dwight-Lloyd researched are many varieties of all basic ores. An international clientele have kept the lab supplied with samples in quantities ranging up to 50 ton shipments. Every major U.S. metallurgical company has sent some proprietary ore to be Dwight-Lloyd researched, and the results of many of these programs have been scaled to designs for production sintering or other pyrometallurgical plants. Research has actually *increased* in scope with the discovery of new mineral deposits. Wider applications, changes in economics, newer techniques, and industry mutations are responsible for this increased activity.

Competent research personnel have staffed the lab from its beginning, which may be said to date from experimental field work of Dwight and Lloyd as early as 1906, the year of the invention. Their great faith in continuous sintering gave impetus to prodigious travelling. They visited mines and smelters and university laboratories, demonstrating their equipment wherever they could evoke an interest in minerals fines processing. In 1908, Dwight himself took personal charge of the shakedown of the Salda equipment.

These many experiences among metallurgical colleagues took shape in the Dwight-Lloyd Research Labo-



The agglomeration mezzanine of the Dwight-Lloyd lab features the McDowell-developed Flying Saucer which reliably mixes and pelletizes materials uniformly at constant rates. The 7½ ft. model may be a successor to tilting mixing pans used in Confucius' time.



EXAMPLES OF MATERIALS PROCESSED BY VARIOUS DWIGHT-LLOYD TECHNIQUES

The Cake that Dwight and Lloyd baked

ratories, established at Netcong, New Jersey, in 1920—the only installation of its kind in the United States and perhaps in the world at that time. Since then the lab has operated continuously, with time out in 1955 for removal to Cleveland, Ohio, when it was acquired along with the Dwight-Lloyd business by McDowell Company, who brought its key people here and rebuilt it completely, to an investment of about one million dollars.

Now thought to be the world's most modern minerals processing pilot plant, the lab's major equipment includes: materials receiving and distribution bins having a combined capacity of approximately 150 tons, an agglomeration mezzanine with a 7½ ft. Flying Saucer®, and a 36-square foot Dwight-Lloyd® sintering machine—the entire plant being connected by belt conveyors of various lengths which are suitably augmented by feeders, scales, and proportioning devices. A separate fan room contains fans of various sizes for up or down draft or recycling of gasses, efficiently arranged to minimize heat loss. Electrical supply for various demands is assured.

For sintering experiments, the lab has facilities to make several simultaneous preliminary process evaluations with batch techniques, using 300 lb. samples. As a general rule this quantity is sufficient to determine if sinter can be made, as well as to establish approximate conditions for flowsheet development. Affirmative batch tests are converted to a pilot plant flowsheet using samples ranging up to carload shipments. The latter are processed at rates varying from 1,000 to 20,000 lbs. per hour. In a typical recent year, 17 separate pilot plant campaigns were conducted with as many materials, and more than 60 batch sinter test campaigns were conducted. Probably more kinds of materials are sintered at Dwight-Lloyd Research Laboratories than anywhere in the world.

Naturally, lab personnel acquire specialized information as a result of their countless observations. A good working knowledge of many of the materials handling implications of basic materials, for instance, is usual. This may include special knowledge of coarse fragments, sludges, dry powders, moist granules, slurries, and hot cellular cakes. At times many materials in these various states are handled simultaneously.

Earlier pages have defined the main phases of sintering as materials handling, blending, sintering, and cooling. Technologically, however, sinter unit operations, as analyzed by research personnel, are: (1) conveying (2) mixing (3) balling or granulating (4) size separation (5) drying and (6) heat transfer. Unit processes include (1) combustion (2) calcination and (3) vitrification. All are inter-related and are kept in continuity using major pieces of equipment. In order to analyze materials for sintering characteristics it is important to proportion ingredients continuously, blend the materials with moisture, ignite the blended burden, perform combustion on the Dwight-Lloyd machine and analyze the product. By operating continuously and measuring all flow and temperature and pressure parameters, the quality of product can be referred to the conditions under which it was made.

Materials Handling

Supply of raw materials for sintering may follow any of several systems, in some of which raw materials are

pretreated prior to delivery to the lab by such means as screening for removal of oversize material, or bedding for blending and minimizing size segregation. The lab is equipped to evaluate and determine suitable methods of handling and pretreating materials as its equipment includes bins and feeders of various designs, conveyors, conditioning devices, continuous weighing scales, clam-shell buckets, screens and crushers. From experience and data gained by lab investigations, empirical guides for custom engineering design of tonnage plants may follow.

The lab also obtains valuable data on flow and storage characteristics of raw materials and finished products as well as behavior of materials during various stages of processing. These data include bulk densities, angles of repose, physical characteristics such as structure, strength, moisture content, and temperature. Chemical characteristics are observed where there is danger from corrosion or violent reactions.

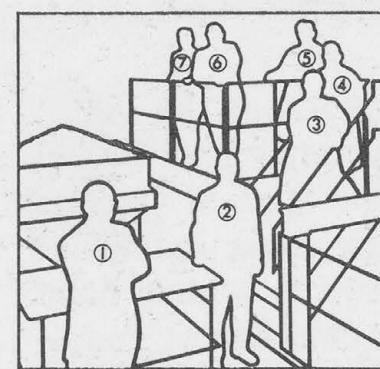
These data provide a sound basis for good engineering design of specific components of production plants such as bins, chutes, conveyors, crushers, and other materials handling equipment. The design and selection of equipment for commercial plants is thus derived from actual research of materials to be processed by the plant and not from general handbook technology.

Blending

Blending of proportioned materials is one of the most important phases of sintering because a thorough dissemination of fuel, moisture, and other raw feed materials in sinter burden is essential for the production of sinter at economic and efficient capacities. Sinter is made as a continuous thin long band of material which requires homogeneity and porosity for uniform combustion of the entire band area.

The blend should contain a uniform texture and sufficient moisture for proper sintering characteristics and the mass should have sufficient porosity to permit a relatively violent draft for combustion. This porosity and moisture consistency is acquired through a balling action if there is an abundance of very fine material in the burden, such as iron ore screenings. Balling action produces a myriad of small spherical particles from fine materials, as well as agglomeration of some fine with coarser particles. Some mixing apparatus act both to mix and induce porosity to the charge by forming a nodular textured burden.

The Dwight-Lloyd lab flowsheet circuit is arranged to permit material to be continuously blended by several



Key Dwight-Lloyd personnel are shown in photo at right. (1) Robert C. McDowell, President, McDowell Company; (2) Patrick V. Gallagher, Vice president, McDowell Company; (3) Thomas E. Ban, Director of Research, McDowell Company; (4) Charles D. Thompson, Assistant to the Director of Research; (5) Charles A. Czako, Research Metallurgist; (6) Harold E. Rowen, General Manager, Dwight-Lloyd Division; (7) Allen R. Rowen, Chief Project Engineer, Dwight-Lloyd Division.



The Cake that Dwight and Lloyd baked

devices including: (1) a trough-type pug mill, (2) a pelletizer-mixer drum, and (3) a balling or mixing disc.

The balling or mixing disc featured in the lab was developed by McDowell Company from the long-known inclined pan mixer (which may date from Confucius' time) into a highly efficient balling-mixing device known as the Flying Saucer. This unit consists of an inclined pan fitted with concentric steps and both stationary and oscillating scrapers which trim the contour of its interior and promote balling. The speed of rotation, inclination, point of feeding, and depth of the pan can be changed to suit type and feed rate of material being processed, and to produce a desirable product. Rotary action of the Flying Saucer causes backmixing to occur in the solids turbulent state while the nodular texture is imparted to the tumbling medium.

Sintering

To repeat the principle of the sintering process, it consists of subjecting a bed of fine moistened materials to heat developed by combustion of fuel within the bed while the individual particles are kept in quiescent state. An air draft is directed through the bed made porous for the operation and this draft combined with the ignited solid fuel provides the combustion. Through heat transfer, sintering is completed.

The Dwight-Lloyd lab sintering machine is two feet wide and has an active hearth area of 36 square feet. Air is induced through the traveling grates from eight wind boxes which can be individually controlled. Draft flow from the wind boxes is arranged to provide special circuits for normal downdraft combustion, updraft combustion with heat recovery, and downdraft heat exchange in single or double pass. Data are acquired from the sintering machine which is fully instrumented to provide pressure, air flow, and temperature conditions. Speed of the machine is variable to suit tonnages which may range from one-half to ten tons per hour.

The lab sintering machine is equipped with a hearth layer bin for distributing the dressing on the grates, ignition burners, and an oscillating conveyor for distributing the burden evenly across the pallets. Hoods are used for recirculating hot gases, and a high velocity gas torch is used for calcining and downdraft heat exchange experiments.

Tests are conducted continuously by running materials through the flowsheet circuit for predetermined periods, during which the entire product from the sintering machine is collected, weighed and screened. Various screen fractions are then subjected to further physical tests to determine strength and bulk characteristics of the product. During test runs periodic samples are taken of the raw material constituents and blended burden to



An overall view of the sintering section of the Laboratories. Materials to be tested are fed onto collecting belt from the bins shown at the right, and are fed onto the up-sloping conveyor that crosses the rear of the photo. Next they are automatically weighed by the ABCs Scale,

then delivered to the Flying Saucer, located on the mezzanine at left. After being mixed or pelletized, the material is delivered to the Dwight-Lloyd traveling grate, where the mixture is heat-hardened and the test cycle is completed.

Sintering's Future: Revelation by Research

measure feed quality and determine its relation to the action of the process.

Cooling

Sinter cooling is of critical importance to the physical character of the finished product. Rapid cooling results in a strained friable sinter which degrades during subsequent handling.

Partial cooling is accomplished on the machine during the sintering process. As the pallets progress across the machine, the ignition zone, which begins on the surface of the bed, gradually burns down through to the bottom of the bed. At the end of the sintering machine, the top portion is completely sintered, and has been cooled to as low as 100° F. by the sinter draft. The bottom portion is completely sintered but is still red hot, with some temperatures as high as 2500° F.

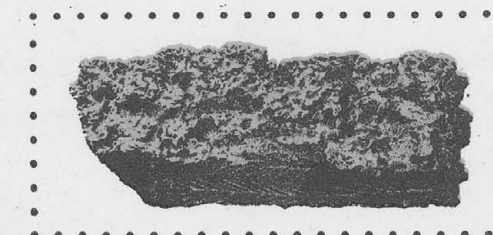
Choice of cooling method depends on desired strength of the sintered product. Any of three cooling methods may be chosen: (1) water quenching, (2) sinter may be stockpiled and cooled by radiation and, (3) the preferred system, hot sinter may be crushed and cooled by forced draft convection on a cooler. Cooling on a forced air cooler is desirable in that it results in a strong product which is easily handled on conventional rubber belt conveyors.

Batch cooling tests are conducted at the Dwight-Lloyd lab by making hot freshly sintered material in two small stationary pots, then charging the hot sinter to a third pot, which is equipped with special grates such as are

used on production coolers. The sinter is then subjected to an air draft, and pressure, air flow, and temperature data are recorded periodically. The test is continued until the temperature of the sinter and the exit gases is below the desired limit. The data from tests of this nature provide a basis for the design of the cooler and its auxiliary equipment.

Now, after 50 years' pioneering experience, the Dwight-Lloyd destiny is being fulfilled, perhaps beyond even the fondest dreams of the inventors of the continuous sintering process, whose creative work we honor throughout the pages of this book. For as a member of the family of related enterprises of McDowell Company, whose range of engineering services for basic industries is from mine to mill through finished product, Dwight-Lloyd offers a unique service in minerals processing—beginning with raw materials research, through engineering development of plant and complete installation, delivered in operation.

And the next 50 years? Well, whenever men are commercially curious about the process behavior of minerals—even if these should be obtained from the surface of the moon—they will continue to find Dwight-Lloyd experience to be comprehensive, its personnel realistically evaluating from the solid perspective of applied research the engineering and economic implications of processing the homely earth elements upon which all basic industries, and all civilization, must ultimately depend.



Capsule History of Continuous Sintering

1906 The continuous sintering process was invented by Arthur S. Dwight and Richard L. Lloyd following extensive experiments at the Greene Consolidated Smelter in Cananea, Mexico. Patent was applied for.

1908 The first patents on the process were granted.

1908 Dwight and Lloyd applied for a patent on the product—a cake of sinter—which was granted.

1908 The first commercially successful continuous sintering plant was installed at Salida, Colorado at a multi-metals smelter. It marked the establishment of the "straight line" or classic machine which has formed the basis of all succeeding continuous sintering machines.

1908 Dwight began his first investigations of a sintered beneficiated blast furnace charge for ferrous industries.

1909 Dwight and Lloyd granted a license to Lurgi-Gesellschaft to build sintering equipment under the Dwight-Lloyd patents.

1911 The first ferrous sintering plant was installed at Birdsboro, Pennsylvania. The plant was designed by Dwight and Lloyd and delivered by a licensee, American Ore Reclamation Company.

1920 The Dwight-Lloyd Research Laboratories were established to fully investigate minerals processes.

1955 McDowell Company, Inc. acquired the business and assets of Dwight and Lloyd, including the Laboratories, and moved them to Cleveland, greatly expanded.

...about McDowell

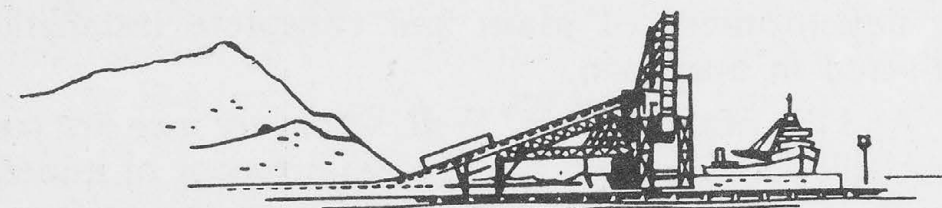


McDOWELL COMPANY, INC. was established in 1944 by Robert C. and Lorraine McDowell. In the space of a few years the company had established a sound reputation for engineering and construction work for the basic industries, including steelmaking, mining, bulk materials handling, cement, etc. The company purchased The Wellman Engineering Company and its three divisions (Anker-Holth, Locomotive Crane, and Williams Bucket) in 1954. In 1955, McDowell acquired the business, key personnel and research facilities of Sintering Machinery

Corporation of New Jersey and its division, a manufacturer of belt scales and feeders now named ABCs® Scale Division. The transaction brought to McDowell Company the Dwight-Lloyd® internationally patented pyrometallurgical processes, as well as its international clientele and reputation.

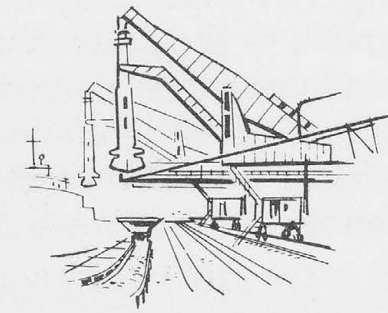
The members of the McDowell family are in closely related fields, each contributing to the total corporate complex in engineering, manufacturing, construction and research.

McDOWELL COMPANY, INC.



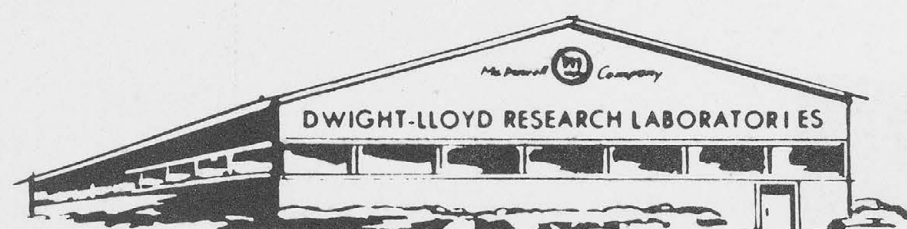
Engineers and contractors, serving the basic industries from mine to mill through finished product. McDowell delivers complete mechanical plants in operation: bulk materials handling plants and docks, quarrying, mining, preparation, etc.; minerals processing plants for cement making, chemicals, minerals beneficiating, etc.; metal working and finishing plants; movable or fixed bridges for highways and railroads.

THE WELLMAN ENGINEERING CO.



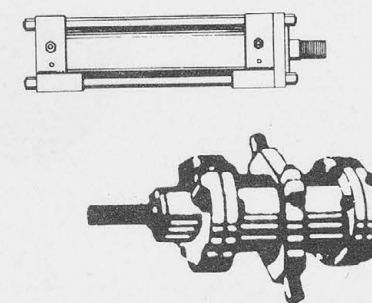
Engineers and builders of all types of heavy hoisting equipment, steel-making machinery specialties, bulk materials handling plants, docks, etc., including the exclusive Hulett ore unloader; and Wellman-Galusha gas producing plants. Founded 1896 by S. T. Wellman, early open hearth steelmaking pioneer.

DWIGHT-LLOYD® DIVISION



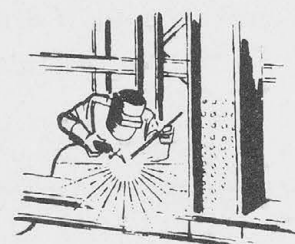
Design and complete installation of Dwight-Lloyd continuous sintering and other minerals processing plants and equipment. Operates Dwight-Lloyd Research Laboratories of applied minerals processes research.

ANKER-HOLTH DIVISION



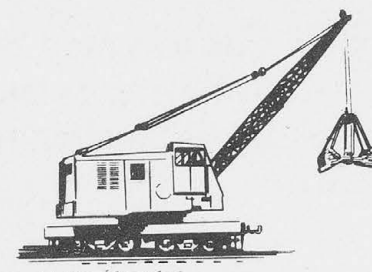
Manufacturers of air and hydraulic power cylinders and valves. The division makes a complete line of standard and special power cylinders and engineers special power cylinder applications for the steelmaking and manufacturing industries.

RIVERSIDE DIVISION



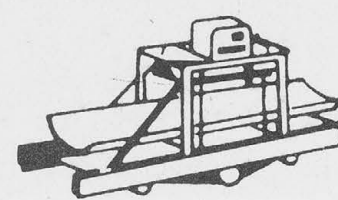
Structural steel fabrication for members of the McDowell group of companies. The division specializes in welded construction.

LOCOMOTIVE CRANE DIVISION



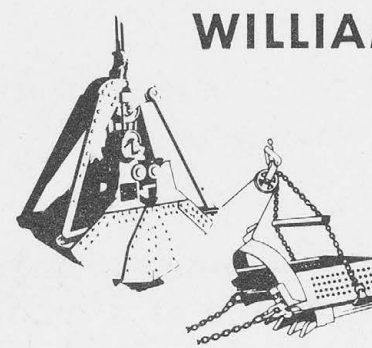
Builder of diesel-electric and mechanical locomotive cranes for construction, railroad, steel mill, scrap yard, up to 100 tons capacity. Successor to Browning Locomotive Cranes.

ABCs® SCALE DIVISION



Designs and manufactures integrating conveyor belt scales for weighing, totalizing, feeding and proportioning of free flowing bulk materials.

WILLIAMS BUCKET DIVISION



Manufacturers of contractors' and industrial buckets. Contractors' buckets include clamshell and draglines in a complete range of sizes. Industrial buckets are engineered up to thirty tons capacity.

Dwight-Lloyd Division, McDowell Company, Inc., 16300 Waterloo Road, Cleveland, Ohio, U. S. A.

